# 2010 Oregon State University Research Annual Report of Accomplishments and Results

**Status: Accepted**

**Date Accepted: 06/09/2011**

## I. Report Overview

### 1. Executive Summary

The Oregon Agricultural Experiment Station (OAES) has six programs that address the five thematic areas defined by the new National Institute for Food and Agriculture. Program foci cover Bioenergy, Climate Change, Global Food Security, Food Safety, and Obesity, as well as a theme critical to Oregon and the Western United States -- Water and Watersheds. In this annual report, the Oregon Agricultural Experiment Station (OAES) will summarize outputs and outcomes from these six Planned Programs. The following are highlights from these Planned Programs.

**Sustainable Energy**

OAES faculty from the Department of Biological and Ecological Engineering continue to make strides in production of bioproducts, biofuels and biohydrogen from sunlight and agricultural and cellulosic feedstocks. Hydrogen, one of the cleanest and most desirable fuels, is expected to play an increasingly important role in our economy. At present, non-renewable fossil fuels including natural gas, oils and coal are the main sources for hydrogen gas production, necessitating research into renewable sources. The focus of one such project was to gain a good understanding of the factors affecting hydrogen production from complex woody biomass. This work significantly enhanced the understanding of some fundamental issues about the kinetics and mechanisms of biohydrogen generation from lignocellulosic biomass using microbial electrolysis cells.

**Climate Change**

This 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 team has worked to develop and assess techniques and strategies for wetland restoration and management. Specifically, research on river flow management has been used by the U. S. Army Corps of Engineers to support a decision to expand a program for modifying flows on the upper Mississippi River to benefit riparian wetland function. This work will positively influence wetland ecosystem function and species conservation and assures policy makers that existing policies and programs benefit do what is intended, in this case, restore function to wetlands and damaged ecosystem, and conserve susceptible species.

**Global Food Security and Hunger**

This program comprises a major portion of the research in the Oregon Agricultural Experiment Station (OAES) and includes research activities on animal production systems, crop management, plant biology and genetics, agricultural economics and food science and technology. Researchers work to improve agricultural and food systems through new varietal development, disease identification and abatement, improved animal health and economic models that ultimately will make these systems more efficient and increase revenue for growers and producers. Potatoes are an important commodity crop in Oregon, the Pacific Northwest, and northeast United States. At farm-gate, Oregon potatoes are valued at more than $150 million. However, potato tuberworm (PTW) infestations cause growers significant economic loss. By the mid-2000s, potato fields in Oregon were infested by PTW, resulting in catastrophic losses. Researchers have been searching for ways to tackle this serious pest to the global potato industry, and an ongoing multi-state collaborative effort seeks to fill information gaps of PTW distribution, ecology and population. Results have provided insight into the biology and life cycles of this pest leading

to informed pesticide application. It is hoped that this work could conservatively be worth $3 million in savings to Oregon potato growers alone.

**Food Safety**

OAES faculty from the Colleges of Agricultural Sciences, Health and Human Sciences and Veterinary Medicine are working toward improved animal and human health through better nutrition, safer food products, more efficient pharmaceuticals and a reduction in exposure or mitigation of exposure to toxic chemicals. The specialty foods production is currently unregulated and the training needs of specialty food processors had not been evaluated. Researchers have intiated a safety program to address these training needs. Specific activities include: 1) to develop training and education, 2) to develop and provide pilot type of training program in specialty food safety, and 3) to conduct specialty food testing on selected quality and safety parameters. Over 3500 specialty food processors were surveyed and 120 food safety inspectors were surveyed for their understanding in specialty foods and training needs for this sector. Training and education materials developed, presented at workshops, posted on the specialty food network website developed for this project.

**Childhood Obesity**

Research has addressed the importance of teaching women to make changes in their own health behaviors that become part of their lifestyle, and then to model these healthy behaviors in the home to improve the health of the family. Study results suggest that changes in both diet composition and level of physical activity are important to reverse risk factors for chronic disease in individuals who are overweight or obese as well as modelling behaviors for their families, especially children in the household.

**Water and Watersheds**

This program uses advances in technology and field observations of physical and biological processes and functions, benthic macroinvertebrate community, numerical and statistical models play critical roles in understanding the driving principles of watershed and river ecosystems and linkages. Current irrigation management in containerized nursery production results in the over-application of water. This increases the leaching fraction resulting in increased leaching of nutrients and pesticides. These practices result in water misuse and threaten water quality. Growers were educated on current irrigation scheduling research and practices through workshops, seminars, and a popular article. Irrigation scheduling by leaching fraction in container nurseries in the Willamette Valley and in the Midwest has reduced water use by more than 30%. Researchers have developed a gravimetric approach which could decrease water use by nursery growers a minimum of 100,000 gal per growing acre per year, increasing water conservation and decreasing water costs.

**Total Actual Amount of professional FTEs/SYs for this State**

| Year: 2010 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 5.6 | 0.0 | 86.2 | 0.0 |
| Actual | 0.0 | 0.0 | 136.0 | 0.0 |

## II. Merit Review Process

### 1. The Merit Review Process that was Employed for this year

- Internal University Panel

- External Non-University Panel
- Expert Peer Review

**2. Brief Explanation**

## III. Stakeholder Input

**1. Actions taken to seek stakeholder input that encouraged their participation**

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of the general public
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public

**Brief explanation.**

We have multiple methods for stakeholder participation. We hold town halls, our deans and directors travel throughout the state to attend agency, industry or community meetings, we have general Q/A email addresses, we use social media like facebook and blogs, and our units and we have advisory committees.

**2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them**

**1. Method to identify individuals and groups**

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys
- Other (blogs, fairs, websites,)

**Brief explanation.**

we use all of the above to identify stakeholders

**2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them**

**1. Methods for collecting Stakeholder Input**

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Survey of the general public
- Meeting specifically with non-traditional groups
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Survey specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public

**Brief explanation.**

we use all of the above

**3. A statement of how the input will be considered**

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

**Brief explanation.**

we use input for all of the above

**Brief Explanation of what you learned from your Stakeholders**

They are very concerned about closures of experiment stations and loss of base faculty and staff position. They are increasingly willing to help support the mission through advocacy and fund raising as well as putting more time into prioritizing and and participating in discussions about strategic directions. They feel that formula funding allows for greater long-term stability of programs that make a difference locally, regionally, and ultimately contribute to the national good. They understand the role of competitive programs to move various national priorities forward, but these may not always serve the local needs or be generalizable to the local production parameters.

## IV. Expenditure Summary

| 1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS) | | | |
|---|---|---|---|
| Extension | | Research | |
| Smith-Lever 3b & 3c | 1890 Extension | Hatch | Evans-Allen |
| 0 | 0 | 3320314 | 0 |

| 2. Totaled Actual dollars from Planned Programs Inputs | | | | |
|---|---|---|---|---|
| | Extension | | Research | |
| | Smith-Lever 3b & 3c | 1890 Extension | Hatch | Evans-Allen |
| Actual Formula | 0 | 0 | 3320314 | 0 |
| Actual Matching | 0 | 0 | 0 | 0 |
| Actual All Other | 0 | 0 | 0 | 0 |
| Total Actual Expended | 0 | 0 | 3320314 | 0 |

| 3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous | | | | |
|---|---|---|---|---|
| Carryover | 0 | 0 | 0 | 0 |

# V. Planned Program Table of Content

## V(A). Planned Program (Summary)

**Program # 1**

**1. Name of the Planned Program**

Sustainable Energy

### V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

| KA Code | Knowledge Area | %1862 Extension | %1890 Extension | %1862 Research | %1890 Research |
|---|---|---|---|---|---|
| 133 | Pollution Prevention and Mitigation | | | 10% | |
| 402 | Engineering Systems and Equipment | | | 20% | |
| 511 | New and Improved Non-Food Products and Processes | | | 40% | |
| 609 | Economic Theory and Methods | | | 30% | |
| | **Total** | | | 100% | |

## V(C). Planned Program (Inputs)

**1. Actual amount of professional FTE/SYs expended this Program**

| Year: 2010 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 0.0 | 0.0 | 3.3 | 0.0 |
| Actual | {NO DATA ENTERED} | {NO DATA ENTERED} | {NO DATA ENTERED} | {NO DATA ENTERED} |

**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 | 166846 | 0 |
| 1862 Matching | 1890 Matching | 1862 Matching | 1890 Matching |
| 0 | 0 | 0 | 0 |
| 1862 All Other | 1890 All Other | 1862 All Other | 1890 All Other |
| 0 | 0 | 0 | 0 |

## V(D). Planned Program (Activity)

**1. Brief description of the Activity**

In summary:
- conduct research experiments
- develop models and simulation tools
- develop new culture strains and metabolic engineering tools.
- develop products, resources

- conduct surveys, data analyses, assessments
- conduct workshops, provide training
- partner

**2. Brief description of the target audience**

public sector
private sector
economists
policy makers
agricultural biotechnology firms
farmers
bioenergy and biofuel producers
industrial manufacturers of hydrogen and fuel cells

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

| 2010 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Actual** | 100 | 600 | 60 | 60 |

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

Year: 2010
Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

| 2010 | Extension | Research | Total |
|---|---|---|---|
| Actual | 0 | 10 | 10 |

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- OTHER SCHOLARLY EXCELLENCE: participation on professional boards and panels, as well as science panels, awards, etc.

| Year | Actual |
|---|---|
| 2010 | 10 |

**Output #2**

**Output Measure**

- DEVELOP IMPROVED BIOPRODUCT PRODUCTION SYSTEMS: Indicators - Type 1...Improved technologies and production systems for biofuel and bioenergy a) better solar energy capture for hydrogen production b) improved fermentation processes c) new and improved sensors for bioprocessing

| Year | Actual |
|---|---|
| 2010 | 1 |

**Output #3**

**Output Measure**

- DEVELOP IMPROVED BIOPRODUCT PRODUCTION SYSTEMS: Indicators - Type 2... Improved feedstocks a) microbial and algal feedstocks for biodiesel production b) use of agricultural by-products as feedstock c) use of invasive species as feedstock d) development of a cellulosic feedstocks for hydrogen, ethanol, and biodiesel production

| Year | Actual |
|---|---|
| 2010 | 1 |

**Output #4**

**Output Measure**

- PROVIDE TECHNOLOGY, MODELS AND ANALYSES THAT INFORM DECISION-MAKERS, INDUSTRY, AND PEERS REGARDING AGRICULTURAL PRODUCTION: Indicator ...theoretical and computation tools development and application a) generate tools, both parametric and non-parametric, for evaluating technological change, capacity utilization, and productivity growth b) apply economic tools to a number of industries and products c) identify determinants of innovation in agricultural biotechnology d) examine coordination between public and private sector and the mix of public-good and private-good inventions e) test assumptions

about basic research's influence on downstream applications and product development f) understand role and influence of intellectual property regimes on innovation

| Year | Actual |
|---|---|
| 2010 | 3 |

**V(G). State Defined Outcomes**

## V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Knowledge Type 1...Improved knowledge about composition and conversion of feedstocks for biofuels, bioenergy, and co-products a) production and harvesting of algae and micro-organisms b) cellulosic feedstock composition c) essential oils found in invasive species d) metabolic engineering for photobiological hydrogen |
| 2 | Knowledge Indicators 2 ... Improved engineering applications to advance production systems for bioenergy: - biomimetic models to create biobased generators to produce molecular H2 and O2 from water and light, with these generators incorporated into integrated H2 energy systems, providing generation, storage, and utilization of H2 in one unit. - optimize the photobiological process to yield higher energy efficiencies. - demonstrate that waste biomass, such animal wastes and organic component of urban wastewater, used as feedstock can not only yield biohydrogen, but that waste can be reduced. |
| 3 | Knowledge Indicators - Type 3...Models to look at productivity and technological processes a) Model to look at production simultaneous with negative externality outputs b) Productivity in the agricultural sector and electric utilities c) Network models d) biomimetic models to create biobased generators to product molecular hydrogen and oxygen |
| 4 | Knowledge Indicators - Type 4...Productivity information a) understand reverse impact of downstream on upstream research b) understand where to distribute investments on basic-to-applied research continuum and in which fields or subfields to focus |
| 5 | Action Indicators - Type 1...Industry apply production systems a) Energy producers optimize photobiological process to yield higher energy efficiencies b) new biobased hydrogen generators are incorporated into integrated hydrogen energy systems, providing generation, storage, and utilization of hydrogen in one unit. c) microbial fuel cells provide on-farm electrical generation |
| 6 | Action Indicators - Type 2...economic activity in rural areas a) bioenergy facilities are located close to potential feedstocks to generate additional economic activity |
| 7 | Action Indicators - Type 3...improved feedstocks are produced a) algae outproduce terrestrial oilseed crops and oil is easily extracted b) organic materials harvested from animal wastes and urban wastewater generate bio hydrogen and eliminate waste |

**Outcome #1**

**1. Outcome Measures**

Knowledge Type 1...Improved knowledge about composition and conversion of feedstocks for biofuels, bioenergy, and co-products a) production and harvesting of algae and micro-organisms b) cellulosic feedstock composition c) essential oils found in invasive species d) metabolic engineering for photobiological hydrogen

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Pretreatment of cellulosic biomass is an important step that determines the efficiencies of the subsequent hydrolysis and fermentation processes. Many pretreatment technologies have been proposed for different biomass. Pretreatment conditions such as the temperature, pH and residence time influence the effectiveness if the pretreatment. There is a large body of literature applying specific pretreatment conditions to individual/multiple feedstocks. There is no consolidated analysis of multiple feedstocks and pretreatment conditions. While there were few attempts to describe different pretreatment processes under various conditions, they were not complete and there is no comprehensive framework for such analysis.

**What has been done**
A comprehensive analysis of the chemical composition of different biomass was performed. To address the challenges mentioned, analysis of multiple feedstocks under different pretreatment conditions was carried out under standardized pretreatment conditions. Pretreated biomass was enzymatically hydrolyzed using commercially available enzyme mixtures.

**Results**
Different hydrolysis profiles from chemically similar feedstocks indicated that it is important to consider both physical structure and chemical composition of biomass along with the pretreatment conditions. We are using the insights from these studies to develop a unified modeling framework for the pretreatment of cellulosic biomass.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|

| | |
|---|---|
| 133 | Pollution Prevention and Mitigation |
| 402 | Engineering Systems and Equipment |
| 511 | New and Improved Non-Food Products and Processes |

**Outcome #2**

**1. Outcome Measures**

Knowledge Indicators 2 ... Improved engineering applications to advance production systems for bioenergy: - biomimetic models to create biobased generators to produce molecular H2 and O2 from water and light, with these generators incorporated into integrated H2 energy systems, providing generation, storage, and utilization of H2 in one unit. - optimize the photobiological process to yield higher energy efficiencies. - demonstrate that waste biomass, such animal wastes and organic component of urban wastewater, used as feedstock can not only yield biohydrogen, but that waste can be reduced.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Hydrogen, one of the cleanest and most desirable fuels, is expected to play an increasingly important role in our economy. At present, non-renewable fossil fuels including natural gas, oils and coal are the main sources for hydrogen gas production. The finite reserve of fossil fuels and ever-increasing pressure on reducing greenhouse gas emission have generated a need for the production of hydrogen from renewable sources such as biomass.

**What has been done**

The overall goal of this project was to develop an efficient microbial electrochemical system to generate hydrogen from abundant, inexpensive, and readily available lignocellulosic biomass. The focus of this project was to gain a good understanding of the factors affecting hydrogen production from complex woody biomass. Such a study is critical for improving the overall efficiency of the process and ultimately achieving the application of this technology. More specially, the following tasks have been accomplished:

(1)Evaluation of how individual sugar in the hydrolysate of woody biomass, a mixture of different sugars, and other degradation byproducts affect the efficiency of hydrogen production in the microbial electrochemical system.

(2)Investigation of whether there is any compound in the hydrolysate of woody biomass that will

inhibit the growth of microorganisms and lower the efficiency of hydrogen production. (3)Maximization of the hydrogen production through the modification of electrode materials and the optimization of the operational conditions of the microbial electrochemical system.

**Results**

Our work significantly enhanced the understanding of some fundamental issues about the kinetics and mechanisms of biohydrogen generation from lignocellulosic biomass using microbial electrolysis cells. Our new single-chamber MEC design and the development of non-previous metal free cathode catalysts greatly increase the efficiency of the system and reduce the cost for cell fabrication, thus increase the practical application potential of this technology. The scientific publications and presentations we made not only advance the development of knowledge and attract young people to the profession, but also attracts industrial collaborations for the commercialization of this technology.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 133 | Pollution Prevention and Mitigation |
| 402 | Engineering Systems and Equipment |
| 511 | New and Improved Non-Food Products and Processes |

**Outcome #3**

**1. Outcome Measures**

Knowledge Indicators - Type 3...Models to look at productivity and technological processes a) Model to look at production simultaneous with negative externality outputs b) Productivity in the agricultural sector and electric utilities c) Network models d) biomimetic models to create biobased generators to product molecular hydrogen and oxygen

Not Reporting on this Outcome Measure

**Outcome #4**

**1. Outcome Measures**

Knowledge Indicators - Type 4...Productivity information a) understand reverse impact of downstream on upstream research b) understand where to distribute investments on basic-to-applied research continuum and in which fields or subfields to focus

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
The biochar idea originates from research indicating that ancient cultures deliberately incorporated a mix of organic residues and charcoal into soils to improve soil fertility (the so-called Terra Preta soils of The Amazon Basin). However, the modern view of biochar is that of a relatively complex concept of sustainable resource management.
The first and most important element in this concept is the production of energy from biomass. Such energy would be carbon neutral because the carbon in biomass has been assimilated out of the atmosphere, its combustion does therefore not contribute to a net increase of the CO2 in the atmosphere. The second element of the biochar concept is the incomplete combustion of the biomass to leave a residue with long turnover times in the biosphere in general and in soils in particular. Therefore, the biochar concept removes CO2 from the atmosphere by converting part of the feedstock into a "stable" form (= char) from which it can not easily return to the atmosphere. The final element of the biochar concept is the option to take advantage of the unique physicochemical properties of artfully prepared chars to improve the soil by enhancement of soil fertility, modification of physical soil properties, or adsorption of pollutants.

**What has been done**
This research translates the theoretical biochar idea into practical solutions that would benefit the people of Oregon. The pyrolysis technology for biochar production holds the key to the benefits of biochar, and it is just that: a technology that needs to be developed, tested and proven. Our current research aims at developing a pyrolyses technology that captures as much energy as possible while simultaneously allowing us to create char products that are tailored to the needs of the industry. At the same we take great care to meet current and future environmental standards with our char products. From the beginning we have teamed up with private industry (Starker Forests at Philomath) and work with industrial size equipment to minimise the gap between experiment and implementation.

**Results**
Our most recent project investigates the usefulness of Biochar for the Oregon nursery industry. Oregon nurseries currently use approximately 5400 metric tons of vermiculite annually as a potting medium amendment, and pays about $6 per square meter annually to heat their houses. Biochar could be a way to significantly reduce these expenses. The reasons for using vermiculite are its abilities to increase both soil water retention and cation exchange capacity. Biochar is known for its ability to do the exact same thing: increase water storage and provide exchange capacity. Vermiculite is a mined and imported mineral, some coming all the way from South Africa (34%) or China (7%). To be able to store water, vermiculite must be exfoliated at temperatures exceeding 900ºC. But biochar can be produced from materials acquired on farm or from nearby waste streams. On farm biochar production can be achieved while simultaneously mitigating heating costs. After initial thermal input, pyrolysis evolves gases that can fuel maintenance of its own temperature requirements, while also heating greenhouses. This project will help the industry revisit what resources could be used and retool how they invest their funds for cost reductions and productivity improvements.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 609 | Economic Theory and Methods |

**Outcome #5**

**1. Outcome Measures**

Action Indicators - Type 1...Industry apply production systems a) Energy producers optimize photobiological process to yield higher energy efficiencies b) new biobased hydrogen generators are incorporated into integrated hydrogen energy systems, providing generation, storage, and utilization of hydrogen in one unit. c) microbial fuel cells provide on-farm electrical generation

Not Reporting on this Outcome Measure

**Outcome #6**

**1. Outcome Measures**

Action Indicators - Type 2...economic activity in rural areas a) bioenergy facilities are located close to potential feedstocks to generate additional economic activity

Not Reporting on this Outcome Measure

**Outcome #7**

**1. Outcome Measures**

Action Indicators - Type 3...improved feedstocks are produced a) algae outproduce terrestrial oilseed crops and oil is easily extracted b) organic materials harvested from animal wastes and urban wastewater generate bio hydrogen and eliminate waste

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

**Brief Explanation**

{No Data Entered}

## V(I). Planned Program (Evaluation Studies and Data Collection)

### Evaluation Results

{No Data Entered}

### Key Items of Evaluation

{No Data Entered}

## 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 professional FTE/SYs expended this Program**

| Year: 2010 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |

| | | | | |
|---|---|---|---|---|
| Plan | 0.8 | 0.0 | 18.8 | 0.0 |
| Actual | {NO DATA ENTERED} | {NO DATA ENTERED} | {NO DATA ENTERED} | {NO DATA ENTERED} |

**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 | 705496 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 0 | 0 | 0 | 0 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 0 | 0 | 0 | 0 |

## V(D). Planned Program (Activity)

### 1. Brief description of the Activity

The program includes studies that focus on development of models of commuity-level responses to perturbations, population dynamics and habitat management for individual aquatic and terrestrial species, and development of methods or monitoring ecosystem changes. The experimental approaches that will be used to meet the specific objectives of these studies include field studies in Oregon, the Pacific Northwest, the U.S. and abroad. In additiona, the experimental approaches will also include controlled laboratory experiments and 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. 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

- General public and those in natural resource-based communities, including ranchers and fishermen.
- 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.
- State and federal natural resources management and regulatory agencies, including land managers and policy makers.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

| 2010 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Actual** | 58000 | 60000 | 16000 | 57000 |

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

**Patent Applications Submitted**

Year: 2010

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

| 2010 | Extension | Research | Total |
|---|---|---|---|
| **Actual** | 100 | 86 | 1860 |

**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 |
|---|---|
| 2010 | 5 |

**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 |
|---|---|
| 2010 | 8 |

**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 |
|---|---|
| 2010 | 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 |
|---|---|
| 2010 | 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 |
|---|---|

| | |
|---|---|
| 2010 | 10 |

**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 |
|---|---|
| 2010 | 10500 |

**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 |
|---|---|
| 2010 | 1 |

**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 |
|---|---|
| 2010 | 5 |

**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 |
|---|---|
| 2010 | 5 |

**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 |
|---|---|
| 2010 | 5 |

**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 |
|---|---|
| 2010 | 1 |

**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 |
|---|---|
| 2010 | 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 |
|---|---|
| 2010 | 2 |

**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 |
|---|---|
| 2010 | 1 |

**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 |
|---|---|
| 2010 | 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 |
|---|---|
| 2010 | 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 |
|---|---|
| 2010 | 2 |

**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 Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2 | 0 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The rate of soil loss from surface furrow irrigation in northeastern Malheur County is high. Irrigation-induced erosion is contaminating surface water with sediment, E. coli, and phosphorus.

**What has been done**
Find irrigation methods and other cultural practices to reduce irrigation-induced erosion. Since the predominant surface furrow irrigation methods make inefficient use of water and fertilizer, more efficient irrigation practices are needed to protect surface water, improve crop yield and quality, and improve input utilization. Drip, sprinkler and furrow irrigation were compared for onion and potato production. Many trials tested polyacrylamide (PAM), straw mulch, and surge irrigation to reduce soil and bacteria losses. Many partners helped make the trials successful. Demonstrations of filter strips and sedimentation ponds have been conducted.

**Results**
We demonstrated that onions grown under drip irrigation had improved yield and quality with lower inputs of water and N fertilizer, hence lower chemical input costs. Results of onion trials have been widely adopted by growers locally and in other production regions. Many growers are substituting sprinkler irrigation for surface flood irrigation on crops other than onion. Groundwater nitrate contamination is decreasing in northeast Malheur County. Growers have adopted sprinkler irrigation systems, PAM, sedimentation ponds, and pump-back systems to reduce sediment, bacteria, and phosphorus losses to streams and reservoirs. Straw mulch and PAM substantially reduced irrigation-induced erosion by 90 to 95 percent. Growers are joining together to replace open canals and drain ditches and construct large piping projects to make sprinkler

irrigation system conversions feasible.

**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 | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 0 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
We are evaluating the economic costs and ecological benefits of conservation efforts on agricultural systems in the Calapooia River watershed, Oregon. This watershed evaluation is part of the USDA CSREES Conservation Efforts Assessment Project; this national ecosystem survey

will determine, in part, the degree to which farmers will be expected to conserve wild biodiversity on their land.

**What has been done**
Researchers are investigating the function of large river and stream ecosystems and assess the response of these ecosystems to restoration practices.

**Results**
Thus far, we have quantified strong taxon-specific associations to areas of minimal tillage practices and crop residue management. We have documented a significant increase in amphibian biodiversity in ponds and streams adjacent to farms utilizing these conservation efforts.

**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 | Quantitative Target | Actual |
|---|---|---|
| 2010 | 6 | 6 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

A major research effort aimed at learning more about where salmon from specific river systems migrate in the Pacific Ocean will resume this year after a two-year hiatus ? and expand to encompass the entire West Coast of the United States. The project has been shut down for the past two summers because the ocean was closed for most of that time to commercial salmon fishing. The re-opening of ocean salmon fishing coincides with an expansion of the research effort to include California and Washington. In the study, commercial salmon fishermen record data and clip fin samples that scientists will use for genetic testing.

**What has been done**

The research effort builds on a pioneering study by researchers at Oregon State University, who have worked for several years to streamline genetic testing of salmon. Their hope is to identify where in the ocean salmon from specific rivers travel so resource managers can still allow fishing while protecting depleted runs in the Sacramento and Klamath rivers, or other river systems. The PI has collaborated with a group of salmon geneticists on the west coast to develop and standardize a microsatellite genetic baseline for stock identification of ocean caught salmon. OSU researchers are also working with colleagues in Washington and California ? and with 200 West Coast commercial salmon fishermen ? to collect tissue samples this summer from as many as 20,000 chinook salmon. As the fishermen catch salmon, they will log the time and location using global positioning system (GPS) technology and enter the data through the Pacific FishTrax website (http://www.pacificfishtrax.org/).

**Results**

The outcome of this is that we are now able to identify encounter events and rates and assess impact of specific stocks that may be at risk (Klamath river fall Chinook and California Central valley Fall, winter or spring runs). The results are shown on the website: http://www.pacificfishtrax.org/ They also found some interesting patterns suggesting that fish from certain rivers ? including Oregon?s Rogue River ? moved in ?pulses? through the ocean, or arrived early or late in fishery management zones. This kind of banding in the ocean could be critical to in-season management decisions, but needs to be validated through broader and more extended sampling. Also, for the consumer, individual fish will have bar codes attached and when the fish are sold in local markets later, consumers can enter the bar code number in computer kiosks and learn when and where their fish were caught ? and even learn about the fishermen who caught the fish.

## 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 | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2 | 0 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Human reliance on marine resources in the United States and most of the rest of the world continues to grow, while efforts to manage and protect these resources encounter increasingly difficult challenges, including, for example, a changing climate and a higher demand for extraction. Management structures are almost necessarily based on a limited understanding of what a particular fish species requires to successfully live, grow, and reproduce. This, in turn, is due to the time and resources needed to gather sufficient information on any single species to make the best management decisions with the ability to adaptively respond to changes within that species and the environmental conditions it encounters. The Marine and Anadromous Fisheries Ecology component of this program conducts research to addresses this information gap with detailed studies of the species of interest, digging into their ways of "making a living" and reproducing, as well as tracing their patterns of migration. Our research examines aspects of the life history of certain species. A species' life history includes characteristics, such as, how long it lives, how often it reproduces, how many offspring it has, and its migration patterns. Of those fish species being investigated some spend their entire lives in the ocean (e.g., a cod), while a few are anadromous (e.g., a Chinook salmon), migrating between fresh and salt water. This research is focused on advancing ecological and evolutionary understanding of how a particular species of fish "makes a living." The information gathered should assist fishery management and conservation efforts of each species studied.

**What has been done**
In 2009-2010, several projects were completed that resulted in dissemination of research findings. Recent research efforts focused on developing new understanding of mixing and

migration in Chinook salmon. One project provided estimates of the stock composition for a local Oregon coastal fishery in which there was concern regarding the harvest impact to a wild population. In this instance, we combined two markers of provenance, i.e., genetics and otoliths (fish ear bones), to provide an estimate of stock composition at a finer spatial scale than previously accomplished and quantified the harvest contribution of the wild stock of concern. Additionally, we were able to provide novel information on juvenile rearing behaviors of Chinook salmon from the Central Valley, California. This population is of regional concern due to repeatedly low adult returns and our recently published findings provide insight into successful freshwater rearing behaviors. We also published the results of a laboratory study that provides important baseline information for ongoing research on Pacific cod in the Bering Sea. In that project, we are using the chemical composition of otoliths to provide novel information on mixing and migration in this species. Additionally, we were responsible for editing a Special Issue of the Environmental Biology of Fishes on the Proceedings of the 4th International Otolith Symposium, which is a forum held every five years where scientists from around the world present recent developments and new methodologies for research, conservation, and management of fisheries.

**Results**

Pacific salmon display a tremendous amount of life history variation, that is, they have found many ways to "make a living." Managing for diversity is a challenge that could lead to negative economic impacts, and, over time, some diversity is lost. However, not accounting for and maintaining diverse ways that a species "makes a living" can negatively affect the ability of populations to maintain themselves. Informed trade-offs are required to maintain sustainable fisheries and their associated coastal communities. We develop knowledge on life history diversity (i.e., who makes a living doing what in a population), which allows managers to determine which trade-offs have the greatest likelihood of success.

Chinook salmon juveniles migrate to the ocean in either their first or their second year of life depending on the conditions in their freshwater and marine environments. But the time and size at which they enter the ocean significantly affects their survival rate. We have provided knowledge on the variation in the size and timing of ocean migration of juveniles to better understand how their migration patterns interact with freshwater and marine conditions and influence their survival to reproduction.

We also further the development and range of applications of research methodologies. One example is our use of the fish's otoliths. A good way to recreate the migration patterns of an individual fish is to examine a small structure in its inner ear, its otolith. Otoliths are small particles composed of calcium carbonate in a gelatin matrix in the viscous fluid of the inner ear. Fish use otoliths for balance and orientation. Otoliths deposit layers of calcium carbonate throughout the life of a fish, which are analogous to tree rings. By counting the rings the age of a fish can be estimated in years. But in most species the accretion rate is daily, allowing fish age in days to be estimated (microscopically). Also, the thickness of an individual ring tends to be correlated with a fish's growth. Otoliths also record aspects of the chemical environment of a fish. Thus, using otolith information, it can sometimes be determined when a juvenile Chinook migrated from its natal river to the ocean. This, when combined with field ecology, laboratory experiments, and analytical chemistry, allows the research to examine the movement and migration of both marine (Pacific cod) and anadromous (Chinook salmon) fish. We have generated knowledge on the validity of several assumptions associated with these techniques and our currently applying that knowledge to address several key management questions regarding dispersal, mixing, and migration in marine and anadromous fishes.

### 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 | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2 | 2 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Our objective was to evaluate influences of habitat change on populations and communities of vertebrates. This research involves studies of responses of vertebrate communities in sagebrush landscapes to time since fire.

**What has been done**
Those studies have investigated how small mammal populations change with time since fire, whether or not those changes in mammal populations influence nest survival of birds because small mammals were thought to be predators on eggs and nestlings of birds, and how the variety of bird species living in sagebrush ecosystems changes as fire influences vegetation structure.

**Results**
We found strong changes in the mammal and bird communities. Our results have been communicated via field trips and in professional meetings to resource managers in the Great Basin.

**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 | Quantitative Target | Actual |
|---|---|---|
| 2010 | 12 | 12 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The main goal of our project is to engineer a gene expression and silencing vector for grapevine based on a genome of Grapevine leafroll-associated virus-2 (LR2). Grapevine is recalcitrant to transgenic technology, whereas traditional genetic breeding for improvement of disease resistance and other desirable traits is undesirable since crossing grape varieties eliminates the identity of grapevine varieties traditionally used in wine making (e.g., Pinot noir, Cabernet sauvignon, Sirah, Chardonnay). Utilization of the RNA virus-based vector avoids the need of either grapevine transformation or breeding for introduction of traits. Therefore, such vector has high potential impact on grapevine functional genomics and disease control. But a few examples of the vector?s utility are identification of the grapevine genes responsible for the flavor or disease resistance, as well as engineering vector variants targeting grapevine pathogens such as other,

more pathogenic viruses, arthropod disease vectors, or fungi.

**What has been done**

In 2010, our work was focused on two major objectives: i) Investigation of the genetic stability of the LR2 vector; ii) Testing the vector's utility for gene silencing via RNA interference (RNAi) in grapevine. Our experiments using LR2 engineered to express green fluorescent protein (GFP) as a reporter demonstrated excellent levels of the vector's genome stability. To demonstrate the RNAi capability of LR2 vector, we engineered several vector variants for silencing of the two endogenous grapevine genes, phytoene desaturase (PDS) and Mg protoporphyrin chelatase subunit (Chl I) (aka SULFUR). These genes function in chlorophyll metabolism pathway; their disruption by RNAi results in chlorotic (PDS) or yellowing symptoms (SULFUR). We have cloned cDNAs of these genes from Sirah plants and generated RNAi vector constructs that included ~400 nt- and ~1,000 nt-long fragments of the PDS and SULFUR genes in the sense and antisense orientations. Each of these variants was engineered for expression either from a separate vector mRNA, or as an addition to GFP mRNA.

**Results**

Our experiments using LR2 engineered to express green fluorescent protein (GFP) as a reporter demonstrated excellent levels of the vector's genome stability. Several LR2-GFP infected grapevine plants exhibited GFP fluorescence for at least 12 months. Because 1-year time frame enables vector utilization for functional genomics or pathogen control applications, we concluded that LR2 vector possesses desirable genetic stability. The inoculation experiments with these RNAi vectors showed efficient systemic silencing of the target genes validating LR2 vector utility for RNAi applications. Demonstration of the LR2 vector's genetic stability and RNAi capability fulfilled our research goals for 2010 on an industry-funded contract (Vinoculate Inc., Soledad, CA), and allowed us to begin a next, commercial application phase of the project. Currently, we are engineering LR2 RNAi variants targeting Grapevine leafroll-associated virus-3 (LR3). LR3 causes severe leafroll disease in all major grape varieties. This disease was detected in Oregon, and is currently rapidly spreading through the winemaking areas of California. Together with Vinoculate, Inc., we have started seeking involvement of additional business partners to fund the commercialization phase of the project. In 2010, we had 2 business meetings involving OSU, Vinoculate, and representatives of Syngenta and Dow Agrosciences. In addition, the results of the LR2 work were reported at the invited seminar at the National Institute for Agricultural Research (INRA), Colmar, France, 2010. The title of the presentation was: "Gene expression vectors derived from potyviruses and closteroviruses". In conclusion, we have demonstrated very strong potential of the LR2 vector for the functional genomics and disease control in grapevine with numerous practical and commercial applications.

**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 | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2 | 0 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
A research goal is to examine the effects of habitat fragmentation on small populations of salmonids, and develop watershed restoration planning and prioritization methods. This research has direct relevance to climate change science and global food security.

**What has been done**
We have been conducting studies of (a) irrigation dams on redband trout (Oncorhynchus mykiss gairdneri) in the Donner und Blitzen River (Malheur County), (b) topography and land use on Lahontan cutthroat trout (Oncorhynchus clarki henshawi), (c) tide gates on coho salmon (Oncorhynchus kisutch) and (d) agricultural drainage networks on floodplain fish communities.

**Results**
The main finding from the project on Lahontan cutthroat trout (b) that topography can be used during summer and early fall as predictor of cold water refuge areas for trout have attracted great interest from management agencies (BLM, BOR, USFWS, NOAA, ODFW, Nevada Department of Fish and Game), which are trying to apply this refuge identification "approach" to other basins in eastern Oregon (such as the John Day River). A rancher in McDermitt Creek (Oregon/Nevada border) has changed his grazing management approach to minimize cattle impact on the trout summer refuge spots found along 17 km of stream within his ranch. Our project on tide gates and coho salmon (c) is just completing its first phase (with one graduate student thesis completed) and although the results have not been published yet, the findings and recommendations have already prompted reconsideration of tide gate designs and replacement plans that were underway in the southern coast of Oregon. Finally, our project on fish communities within seasonal

waterways that drain agricultural fields in the Upper Willamette Valley (d) has shown that these intermittent habitats are important for the reproduction and winter survival of several native fish species in the basin. This research has direct relevance to climate change science and global food security.

**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 | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2 | 0 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Vibrio parahaemolyticus is a leading cause of foodborne infections associated with seafood consumption in the U.S. (nausea, headache, abdominal cramps, diarrhea). While oyster

producers have utilized freezing technology to deliver high quality frozen oysters to consumers for raw consumption, fluctuating warmer temperatures of Pacific coastal waters often produce high levels of Vibrio that cause food safety outbreaks for oyster consumers. Additional studies are needed to develop improved methods for detecting microbial pathogens and to evaluate new processing technologies to control food safety in seafoods.

**What has been done**
Research studies are underway to investigate new technologies to reduce pathogens in seafoods, including: 1) validation of high pressure processing for inactivating Vibrio parahaemolyticus in Pacific oysters (Crassostrea gigas); 2) application of probiotics in the oyster depuration process for reducing Vibrio contamination; 3) evaluation of antimicrobial activities of tea polyphenols against Vibrio; 4) low-temperature post-harvest processing for decontaminating Vibrio in oysters; and
5) studying the mechanism of high pressure processing on inactivating Vibrio.

**Results**
Application of these research findings and innovative technologies will enable the seafood industry to control microbial pathogens in seafood processing plants and finished products.

**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.

Not Reporting on this Outcome Measure

**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 Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The Pacific oyster industry on the West Coast, U.S. was established about 100 years ago. The oyster is the most important cultured marine species on the West coast with an estimated annual dock-side value of $85 million. The industry mainly depends on either production of larvae from commercial hatcheries or capture of wild seed from naturally spawning oysters. There is a need to improve yields of Pacific oysters both in the hatchery and in grow-out due to high mortalities. Larval mortalities appear to be due to recent changes in ocean conditions that result in acidified seawater with high concentrations of dissolved carbon dioxide. Mortalities during grow-out are due mainly to a temperature-stress syndrome called "summer mortality" that affects adult oysters > 2 years old. The annual dock-side value of the West Coast oyster industry is estimated to be $85 million. A 10% increase in production due to the efforts of MBP would translate into an increase of $8.5 million. Although experiments have indicated that improved yields of seed from MBP broodstock can be greater than this, not all hatcheries use MBP broodstock; therefore, a 10% increase in dock-side is a more realistic estimate of MBP's economic impact.

**What has been done**
The USDA-funded Molluscan Broodstock Program (MBP) has undertaken a selection program to improve yields of Pacific oysters since 1995. In 2010, the first fifth generation cohort (cohort 22) was produced from the top-performing families of the fourth generation. MBP developed mating schemes for commercial hatcheries to use MBP broodstock for large-scale seed production. New Kumamoto broodstock, derived from a collection trip to Japan in 2006, were released as broodstock to commercial hatcheries. In addition, a mass spawning of G1 Kumamoto oysters was undertaken to ensure long-term genetic diversity of the newly introduced broodstock. An annual review of MBP and the ARS Shellfish Genetics program was undertaken in June 2010.

**Results**

Analysis of yield data from the fourth MBP generation (produced after three selection cycles) indicated that cohorts with genetic contributions from Pipestem Inlet founders performed best, with average yields per cohort up to 36% greater than those of control families derived from non-selected broodstock, resulting in realized heritabilities for yield, survival and final individual harvest weight (growth) of up to 0.57, 0.49 and 0.19, respectively. Improvements in yield and realized heritabilities varied greatly among test sites. Environmental heterogeneity of test grow-out conditions, over different scales of space and time, is a difficult challenge for oyster breeding programs. Interim yields (cohort I2009) from crosses among selected inbred lines (Adam x Eve etc.) were twice that of unselected control families. The commercial oyster industry recognized the benefits of using selected MBP broodstock. Reports from hatcheries, nursery operators and growers have been very positive. One of the three major commercial hatcheries has been successful in asking for premium prices for MBP seed, generating about $12,000 that was donated to help support MBP. One of the recommendations of the review panel of the MBP/ARS shellfish genetics program was to establish a Liaison Committee to facilitate communication with industry. A Liaison Committee will be established early in 2011.

**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 | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 0 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
There has been a significant increase in the consumption of seafood over the past few decades. However, there are many low grade resources that need research and development to create safe, value-added food products. Additionally, knowledge transfer to industry is needed to enhance full utilization of resources.

**What has been done**
OSU's annual Surimi School has been a major avenue of information transfer to industry. As a result of research at the OSU Seafood Laboratory, surimi prepared from low-grade fish is being utilized more efficiently during production. With an increased optimization of fish proteins based on optimum chopping conditions per fish species, the manufacturers of surimi seafood now use a lesser amount of surimi, but still obtain equal performance in the finished seafood product.

**Results**
Even with a reduction of global surimi production (from 600,000 to 500,000 metric tons of the base material) over the last 2-3 years, the output of surimi-based seafood production has not changed significantly. Manufacturers of surimi seafood have adopted the new technology to optimize production, maintain economic levels, and targets fuller utilization of natural resources.

**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 Condition Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 1 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Sea turtles are some of the oldest, slowest growing creatures in the ocean; some species take up to 30 years to reach maturity. A researcher studying these ancient beasts might get the chance to observe just one generation. Science communication is central to the work of students in Heppell's lab.

**What has been done**
Students partner with people in the field, such as fishermen in Port Orford working with rockfish, Oregon coast communities working to develop marine reserves, and agency scientists working on grouper conservation in the Cayman Islands. In each case, they help build conservation plans based on rigorous science and evidence based methods. In the highly charged world of fisheries management, Heppell insists on solid evidence to improve the mathematical models used to determine sustainable catch levels.

**Results**
Heppell has been asked to advise the National Marine Fisheries Service and to serve on the Pacific Fisheries Management Council. As a panel member for a National Research Council review, Heppell recently evaluated data collection and modeling of sea turtle populations. At the time, she strongly recommended that government monitoring should shift from simply counting turtle nests on beaches to measuring survival and growth rates of turtles at sea. Such a shift of monitoring would have made it more possible to understand the effects of the BP oil spill on highly sensitive species, such as the Kemp's ridley sea turtle in the Gulf of Mexico, which is making a comeback.

### 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 | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2 | 2 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Both plant and human diseases that can travel with the wind have the potential to spread far more rapidly than has been understood, according to a new study, in findings that pose serious concerns not only for some human diseases but also a new fungus that threatens global wheat production. Most plant and animal diseases that are spread by contact or close proximity tend to move in a fairly predictable and constant rate of speed, researchers say. However, a significant number of pathogens can be borne by wind-carried spores or migrating birds. In those cases, even though only small amounts of an invading pathogen may show up at any one remote spot, it has the potential to get a foothold and spread rapidly at this distant location ? giving the invading pathogen the ability to literally accelerate as the epidemic spreads.

**What has been done**
The research used stripe rust of wheat, which has spores that can spread on the wind, as a model to help explain how this and other pathogens can move.

**Results**
The research done by scientists at Oregon State University and other institutions, concluded that invading diseases do not always progress in an orderly, constant rate. These historical studies of both plant and animal diseases show that some pathogens that can be carried through the air can actually accelerate as they move, and can become widespread problems much faster than had been thought possible. The studies explain, in part, how West Nile Virus spread so rapidly across the United States when experts had been expecting a more plodding, methodical progression of the disease. They help analyze the progression of some historic disease problems, such as the catastrophic potato late blight that led to the Irish potato famine of the mid-1840s. And they suggest that a new fungal pathogen of wheat that emerged a few years ago in Uganda may pose a much more urgent threat to wheat production around the world than first thought.

**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 | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 2 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

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. Properly accounting for these services may provide powerful incentives to engage in conservation practices through mechanisms such as market based conservation schemes. To make these schemes work, however, we need more accessible and easier to use tools for quantifying the value of these services. In addition, Human activities such as agriculture and urbanization have dramatically reduced biological diversity. Unfortunately, our understanding of the functional importance of this diversity is poor. We need a better understanding of the link between biodiversity and functions such as the regulation of beneficial insect populations in order to design more sustainable horticultural systems. 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. There is, however, a great need for applied research to develop and assess these innovative technologies

**What has been done**

The following specific activities occurred: 1)The team developed an easy to use tool to help Oregon farmers evaluate the potential value of riparian restorations. The tool is based on a distributed computing framework for calculating ecosystem service credits. Farmers interact with this framework through a web based user interface similar to Google maps. 2) The PI is collaborating on an interdisciplinary project to calibrate and parameterize an existing ecosystem service support tool (InVEST) to investigate how shifts cuased by climate change will influence the provisioning of ecosystem services in the Willamette Valley. 3) The team is and collaborating on a project to test the effectiveness and improve the design of beneficial beetle habitat on farms. The project goals are to a) identify region appropriate beetle bank plants; b) determine how beetle banks influence predator activity patterns on farms; c) determine how beetle banks influence pest suppression patterns on farms. The work uses participatory on-farm research in collaboration with several regional farmers. 4)The team is a collaborator on on a project to develop and implement conservation biological control (CBC) by parasitoids of leafroller contaminant pests in Pacific Northwest caneberries. We are evaluating existing resources for leafroller parasitoids on cooperator farms by conducting on-farm floral resource surveys. We are also conducting assessments of adjacent off-farm habitat, and determine the scope for alternative host provision from non-crop flora.

**Results**

We have developed a working shade estimation tool (http://groups.hort.oregonstate.edu/content/stream-shade-tool). There is strong interest at USDA for this work, as it complements work on a web based nutrient trading tool by the USDA West National Technology Support Center. During the tool development we have also interacted with the Oregon Dept. of Environmental Quality, Clean Water Services, the Willamette Partnership, Parametrix, and CH2MHill to develop a common framework for developing a regional ecosystem services marketplace. Outreach for our participatory research on beetle habitat research included a well received and attended farm walk (22 total participants, 11 farmers) at Persephone Farm, July 22, 2008 and at the 2010 Biodiversity Working for Farmers Tour in Connell, WA (over 100 participants). We also presented a farmers? panel on habitat at OSU?s Small Farm Conference, February 21, 2009. Co-Pi Gwendolyn Ellen along with three cooperating farms (Persephone Farm, Gathering Together Farm, and Kenagy Family Farms) presented. Over 70 (mostly farmers) attended the presentation. As a result of the presentations two Oregon organic vegetable farmers requested aid in beneficial habitat development on their farms. One has been included in an another ongoing project Implementing Conservation Biological Control for

Caneberries.

**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

Not Reporting on this Outcome Measure

**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 | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Domestic animals have been implicated in land and stream degradation across the western United States, triggering the development of managerial strategies to reduce impacts. Our research is designed to develop GPS and electronic technologies that can be used to track animals, quantifying livestock use of locations on landscapes and monitor the effects of grazing. The goal of our research is to employ an adaptive management approach for sustainable livestock production with minimal negative environmental impact. We are also studying the effects of reintroduction of wolves on domestic animal distribution and production, which in turn influences profitability of ranching systems.

**What has been done**

For the last 3 years we have deployed more than 80 GPS collars on cattle grazing in Idaho and Oregon and monitored their position at either 1 second or 5 minute intervals. We have also collared and monitored wolf positions at 15 minute intervals in the same areas. The data were plotted on GIS layers (elevation, land slope and aspect, vegetative community, distance from streams, distance from roads, distance from houses, etc) and which provides insight as to landscape/resource use and travel pathways. With this data, we have also determined sites or loci on the landscape that receive more intense use and sites with light use by stock. This information has refined our understanding of stream and riparian use by cattle and allowed use to develop resource use models. The value of these technologies and methods were recognized by the broader scientific community and we have recently begun joint studies with research Universities in other states and the International Center for Agricultural Research in the Dry Areas (ICARDA). All our research efforts focus on the spatial ecology of ungulates and their interaction with the landscape and the monitoring of vegetation and the environment.

**Results**

This project has greatly expanded our understanding of the spatial interactions and habitat use of cattle, sheep, and goats on diverse landscapes. Studies of cattle distribution and riparian pastures in mountainous environments with high-frequency (1 second) DGPS logging indicates that cattle interact with streams (5 m buffer) about 1% of the day. Interaction percentage is largely influenced by topography and relative juxtaposition of foraging areas with stream corridors. Interaction is not uniform along streams either temporally or spatially. Favorite drinking and crossing sites on streams exist as well as favorite foraging, resting sites on the landscape. Rates of occupancy for buffers along streams were calculated and maps of relative site occupancy in 20m by 20m gridded cells were made. Relative preference by livestock for sites was quantified and modeled using resource selection theory. For 5 minute data collected for the entire grazing season, a similar process was employed and relative occupancy by riparian buffer zone and season was extracted. Results were similar to the riparian pasture study. Movement and habits of cattle were examined in relation to the position of wolves. On one study site with both collared cattle and collared wolves, interaction (presence within 500m) began on 5/23/2009 and lasted to 11/30/2009 (duration 191 days). With 10 cows in a herd of 450, there were 783 positions when wolf B446 was within 500m of a collared cow, 244 times <250m, and 53 times within 100m. There were 448 separate wolf positions within 500m of collared cows. Diurnal pattern of encounters indicated most took place at night. This ranch estimated losses at 5 cows, 2 yearlings, and more than 50 calves, but there were only 18 confirmed or suspected wolf attacks on cattle. Rough topography over large landscapes makes confirmation very difficult because carcasses are not found or are found too late to verify cause of death. Wolf B446 traveled close to human habitation sometimes remaining for up to 24 hours within 500m. Resource selection by cattle is being analyzed and compared to sites with no known wolf presence. We have partnered with other research groups studying resource selection by ungulates and are developing predictive models of landscape use.

**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 | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Haemonchus contortus, or ?barber pole? worms, is a parasite that causes significant production losses, and in some cases it?s the limiting factor to sheep production on pasture lands. The nematodes can cause internal bleeding, which in turn can lead to anemia, poor food conversion and growth, low protein levels, reduced lamb production and wool yield, and in some cases ? death.

**What has been done**
The new test is based on a peanut agglutinin that binds to eggs of the parasite and can be easily visualized with a microscope using ultraviolet light. It?s an improved version of previous technology developed by scientists in Australia that was slower, less effective, more expensive and required more advanced training to perform, researchers say. The relatively inexpensive test was developed by microbiologists and veterinary doctors at OSU and the University of Georgia, and is now available through those institutions. Its use should continue to expand and become more readily available around the world.

**Results**
Researchers at Oregon State University have developed an improved, more efficient method to test for the most serious of the parasitic worms in sheep, a problem that causes hundreds of millions of dollars in losses every year to the global sheep and wool industry. This technology is

now available, and will allow a faster, easier and less expensive way to test for the presence and quantity of Haemonchus contortus, or ?barber pole? worms, a species that is very pathogenic to sheep, goats and llamas. This will help sheep ranchers deal with this problem more quickly and effectively, optimize their management practices, and sometimes avoid costly therapies. The test may also be of special value to ranchers interested in organic production of sheep, goats and llamas, who try to avoid use of chemical treatments in maintaining the health of their animals.

**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 | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2 | 2 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Microbes are masters of adaptation. The SAR11 organism had eluded detection mainly because of its diminutive size -- small even for a microbe. The key to its success is simplicity and efficiency.

**What has been done**
The PI has discovered some of the most abundant life forms on the planet, in some of Earth's most extreme environments -- Antarctica's frigid ice fields, Yellowstone's sulfuric hot springs, Crater Lake's lightless depths, the oceans' deep-sea basalts. The PI has discovered thriving communities of bacterioplankton (ocean-drifting bacteria) specifically, this newly found branch of

bacteria, named SAR for the Sargasso Sea. It is among the most plentiful -- and thus evolutionarily successful -- life forms on the planet. After this astounding discovery in 2002, the PI's lab devised novel technologies for growing these kinds of extra-tiny organisms without Petri dishes. Using gene cloning and DNA sequencing, he and his colleagues have so far sequenced 27 hard-to-grow microorganisms never before described. They have shipped samples to scientists all over the world.

**Results**
This research has led to a general appreciation of how important these previously unknown organisms are to global ecology. In order to figure out how marine microbes compete for and adapt to spatial, temporal and seasonal niches and how they contribute to the cycling of carbon in the oceans, the PI is looking at everything from marine snow (carbon-carrying particles that sink into deeper ocean layers) to spring upwelling and summer stratification to species richness (total species in a sample) and surface warming.

### 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.

Not Reporting on this Outcome Measure

## 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.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 3 | 0 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Policy makers want to be assured that existing policies and programs benefit do what is intended, in this case, restore function to wetlands and damaged ecosystem, and conserve susceptible species.

**What has been done**
The research team has worked to develop and assess techniques and strategies for wetland restoration and management.

**Results**
Research has been used to influence wetland ecosystem function and species conservation. Specifically, research on river flow management (Dugger and Feddersen 2009) has been used by the U. S. Army Corps of Engineers to support a decision to expand a program for modifying flows on the upper Mississippi River to benefit riparian wetland function. Additionally, research on the biological value of wetlands created via the federal government's Wetland Reserve Program is being used by the Pacific Coast Joint Venture to prepare a conservation plan for ducks wintering in the Willamette Valley of western Oregon and the Lower Columbia River Valley of Oregon and Washington. Research on Dusky Canada Goose use of nest islands on the Copper River Delta was used by the U. S. Forest Service to help guide an expansion of an artificial nest island program that seeks to help Dusky Goose productivity that has suffered because of habitat changes caused the 1964 Great Alaska earthquake. Finally, we continue to work with the Oregon

Department of Fish and Wildlife on wetland management on state Wildlife Management Areas, focusing this year on developing the long range conservation plan for the Sauvie Island Wildlife Management Area.

**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 #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

Not Reporting on this Outcome Measure

**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 Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2 | 2 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
In the Pacific Northwest, surimi seafood is typically prepared from lower-value fish stocks including Pacific whiting or Alaskan pollock, and its texture and color mimic lobster, crab and other shellfish. Fluctuations in price and consumer demand drive the need to lower production costs and to improve the yields from the surimi process. Recent research studies have been focused on the characteristics and gelation of fish myofibrillar proteins.

**What has been done**
Research studies were conducted to maximize the value of surimi proteins by understanding the thermal stability of fish species (cold water fish vs. warm water fish). In addition, other proteins were evaluated for their effects on surimi fish protein gelation including three types of egg white protein (regular dried egg white, special dried egg white, and liquid egg white). Proteins were characterized for enzyme inhibition and time of egg white addition, either with cryoprotectants prior to freezing or during gel preparation, using Pacific whiting surimi. In addition, the setting (suwari) effect and fish protein?egg white protein interactions (dynamic rheological properties, total sulfhydryl groups, and fracture gel analysis) were evaluated using Alaska pollock surimi. After 12 mo frozen storage, adding 2% and 3% special dried egg white to Pacific whiting surimi during chopping significantly (P < 0.05) increased the force and deformation values compared to adding the respective egg white proteins before freezing.

**Results**
As a result of research and transfer of knowledge to the industry (for example, via OSU?s annual Surimi School) surimi prepared from low-grade fish is being utilized more efficiently during production. With an increased optimization of fish proteins based on optimum chopping conditions per fish species, the manufacturers of surimi seafood now use a lesser amount of surimi, but still obtain equal performance in the finished seafood product. Even with a reduction of global surimi production (from 600,000 to 500,00 metric tons) over the last 2-3 years, the output of surimi seafood production has not changed significantly. This indicates that the manufacturers of surimi seafood have adopted technology to optimize production.

### 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.

Not Reporting on this Outcome Measure

**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.)
- null

**Brief Explanation**

{No Data Entered}

## V(I). Planned Program (Evaluation Studies and Data Collection)

**Evaluation Results**

{No Data Entered}

**Key Items of Evaluation**

{No Data Entered}

## V(A). Planned Program (Summary)

**Program # 3**

**1. Name of the Planned Program**

Food Safety

### V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

| KA Code | Knowledge Area | %1862 Extension | %1890 Extension | %1862 Research | %1890 Research |
|---|---|---|---|---|---|
| 133 | Pollution Prevention and Mitigation | | | 5% | |
| 204 | Plant Product Quality and Utility (Preharvest) | | | 5% | |
| 306 | Environmental Stress in Animals | | | 5% | |
| 308 | Improved Animal Products (Before Harvest) | | | 5% | |
| 311 | Animal Diseases | | | 5% | |
| 314 | Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals | | | 5% | |
| 501 | New and Improved Food Processing Technologies | | | 10% | |
| 502 | New and Improved Food Products | | | 10% | |
| 602 | Business Management, Finance, and Taxation | | | 5% | |
| 603 | Market Economics | | | 5% | |
| 606 | International Trade and Development | | | 5% | |
| 607 | Consumer Economics | | | 5% | |
| 702 | Requirements and Function of Nutrients and Other Food Components | | | 5% | |
| 703 | Nutrition Education and Behavior | | | 5% | |
| 711 | Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources | | | 5% | |
| 712 | Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins | | | 5% | |
| 723 | Hazards to Human Health and Safety | | | 5% | |
| 724 | Healthy Lifestyle | | | 5% | |
| | **Total** | | | 100% | |

## V(C). Planned Program (Inputs)

**1. Actual amount of professional FTE/SYs expended this Program**

| Year: 2010 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 1.6 | 0.0 | 20.9 | 0.0 |
| Actual | {NO DATA ENTERED} | {NO DATA ENTERED} | {NO DATA ENTERED} | {NO DATA ENTERED} |

**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 | 796405 | 0 |
| 1862 Matching | 1890 Matching | 1862 Matching | 1890 Matching |
| 0 | 0 | 0 | 0 |
| 1862 All Other | 1890 All Other | 1862 All Other | 1890 All Other |
| 0 | 0 | 0 | 0 |

## V(D). Planned Program (Activity)

**1. Brief description of the Activity**

•Conducting laboratory, pilot-plant experiments and data collection.
•Conducting research experinments
•Developing knowledge and new technology of food processing systems.
•Developing curricular materials.
•Developing quality monitoring protocols
•Developing products, curriculum, resources
•Developing services
•Presenting seminars and professional talks.
•Conducting workshops and training sessions.
•Publishing scientific findings.
•Assessments
•Partnering

**2. Brief description of the target audience**

There are diverse audiences for information this project generates. They can be classified into four general groups: (1) the general public and food consumers; (2) state and federal food regulatory agencies; and (3) the research community including scientists working in government, industry, and academic sectors; and (4) the commercial food processing industry or commodity groups.

### V(E). Planned Program (Outputs)

**1. Standard output measures**

| 2010 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| Actual | 9000 | 25000 | 800 | 5000 |

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

**Patent Applications Submitted**

Year: 2010

Actual: 1

**Patents listed**

Sattertthwait, A., Zhang, X.K., Zhu, X., and Kolluri, S.K. Methods of regulating apoptosis. Patent No. US20100292145A1.2010.

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

| 2010 | Extension | Research | Total |
|---|---|---|---|
| Actual | 0 | 80 | 80 |

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- IMPROVED ANIMAL AND PLANT PRODUCTION SYSTEMS Indicator: number of experiments or tests - experiments to reduce percentage of mortality to enhance hatchability in poultry - tests to identify a marker of immunity in livestock

| Year | Actual |
|---|---|
| 2010 | 2 |

**Output #2**

**Output Measure**

- EFFECTS ON AND PROTECTION OF HUMAN HEALTH Indicator 1 ...Numbers of nutrients/minerals - increase health-enhancing nutrients in novel product development - number of mineral supplementation developed to reduce the incidence of cancer

| Year | Actual |
|---|---|
| 2010 | 1 |

**Output #3**

**Output Measure**

- EFFECTS ON AND PROTECTION OF HUMAN HEALTH Indicator 2 ...Obesity intervention strategies or measures - identify strategies (message, pricing, foods) that will increase choosing healthful food choices among adolescents and young adults - Identify key parent-child relationships that contribute to childhood overweight and resiliency in various populations. - identify opportunities for preventive interventions - Identify objective, physiological-based measures for tailoring interventions for specific groups and subgroups. - develop new or improved intervention strategies targeted to childhood overweight in low income families.

| Year | Actual |
|---|---|
| 2010 | 2 |

**Output #4**

**Output Measure**

- EFFECTS ON AND PROTECTION OF HUMAN and ENVIRONMENTAL/ECOLOGICAL HEALTH Indicator 1 ...Agricultural/Environmental chemical analyses - assess risks of toxins - develop analytical methods and biomarkers for agricultural chemicals and other contaminants - evaluate the variation and patterns in the incidence of human pesticide exposures - assess risk factors for the development of various cancers by DNA damage and compromising DNA repair mechanisms. - identify, validate, localize and characterize specific responsive genes, which have the potential to serve as biomarkers of toxins - develop and evaluate transgenic lines that show changes in reporter gene expression in response to toxicants - refine agrichemical risk assessment for aquatic insects to include life history and behavior - develop, refine, improve quantitative procedures that improve our ability to assess the risks that pest management practices pose to beneficial invertebrates.

| Year | Actual |
|---|---|
| 2010 | 1 |

**Output #5**

**Output Measure**

- ECONOMIC AND MARKETING MODELS AND ANALYSES THAT INFORM DECISION-MAKERS, INDUSTRY, AND PEERS Indicator 1 - market analyses - provide food industry with better understanding of market conditions and marketing strategies - develop demand and firm strategies (FIC) - analyze food consumption and import demand in the Pacific Rim and other international markets

| Year | Actual |
|---|---|
| 2010 | 1 |

**Output #6**

**Output Measure**

- ECONOMIC AND MARKETING MODELS AND ANALYSES THAT INFORM DECISION-MAKERS, INDUSTRY, AND PEERS Indicator 2 - consumer studies - establish survey tool and data to describe current consumer buying and consumption habits - determine relationship of

lifestyle to taste and consumer acceptance. - evaluate integrated research and extension activities between food scientists and business strategists

| Year | Actual |
|---|---|
| 2010 | 1 |

**Output #7**

**Output Measure**

- TECHNOLOGY, MODELS AND ANALYSES THAT INFORM DECISION-MAKERS, INDUSTRY, AND PEERS REGARDING FOOD PRODUCTS Indicator 1 - food quality attributes - determine quality attributes of Northwest fruits, vegetables, cereals, seafood, and beverages

| Year | Actual |
|---|---|
| 2010 | 2 |

**Output #8**

**Output Measure**

- TECHNOLOGY, MODELS AND ANALYSES THAT INFORM DECISION-MAKERS, INDUSTRY, AND PEERS REGARDING FOOD PRODUCTS Indicator 2 - value added products - develop value-added products through a systematic product development strategy

| Year | Actual |
|---|---|
| 2010 | 2 |

**Output #9**

**Output Measure**

- TECHNOLOGY, MODELS AND ANALYSES THAT INFORM DECISION-MAKERS, INDUSTRY, AND PEERS REGARDING FOOD PRODUCTS Indicator 3 - food technology - determine best use of innovative or emerging processing methods, e.g., high pressure processing, laser technology, and radio frequency identification tags.

| Year | Actual |
|---|---|
| 2010 | 2 |

**Output #10**

**Output Measure**

- OTHER SCHOLARLY EXCELLENCE: participation on professional boards and panels, as well as science panels, awards, etc.

| Year | Actual |
|---|---|
| 2010 | 10 |

**V(G). State Defined Outcomes**

## V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Knowledge Indicator 1a - Understanding Human Health and Nutrition (nutritional behaviors) * Understand the relationship between farm subsidy program and increasing obesity rates in the United States * Identify new or improved obesity intervention strategies in the community setting * Identify objective, physiological-based measures that correspond to target behaviors (bio-behavioral markers) for use later as measures of intervention progress and success or means for tailoring effective interventions * Identify key parent-child relationships that reflect resiliency and the interaction of these relationships with targeted nutritional behaviors * Understand various inputs and interactions of family and child, SES, nutrition, physiology and behavior * Identify strategies (message, pricing, foods) that will increase choosing healthful food choices among adolescents and young adults |
| 2 | Knowledge Indicator 2a - Characterize and model toxins arising from food production and processing (analytical methods and tools) * New analytical methods and biomarkers to cost-effectively identify and track agricultural chemicals and other contaminants through time and space * Develop transgenic lines of zebrafish for response to toxicants * Identify agents, mechanisms of action, and dose response for reducing fetal risk from toxic chemicals * Model system to evaluate dioxin toxicity to humans and characterize specific responsive genes to toxicants |
| 3 | Knowledge Indicator 3 - Methods to improve Animal Health production systems - improve maternal diet through understanding of fundamental relationships between maternal diet, fatty acid metabolism and egg hatchability - develop technological strategy to enhance the efficacy of vaccination programs in livestock - develop a diagnostic method to assess immune health of livestock |
| 4 | Knowledge Indicator 4... Improved knowledge of consumer and market conditions and factors that affect business survival - Improved understanding of market conditions and knowledge to determine business choices. - Development of a process map for food business development and planning. - Training of nascent and existing food entrepreneurs in food business management. - Expanded knowledge base of factors important to distinguish different types of consumers and their food choices - Develop an understanding of motivations for food choice and strategies to impact them |
| 5 | Action Indicator 1. Improved nutrition - More schools offer/encourage healthful foods - More effective programs and student experiences related to healthful foods - Markers and strategies become the standards of methods and measurement of childhood overweight and resiliency. - Policies consider health and financial implications of the farm subsidy program. |
| 6 | Action Indicator - 2. Percentage health risks reduced - Markers for oxidative stress and DNA integrity lead to novel approaches for identifying biomarkers of zinc deficiency in humans. - Zinc supplementation will be an effective strategy in limiting the incidence of prostate cancer - Effective dietary intervention strategies are broadly applied to reduce obesity - Modulate maternal diet to reduce the risk to the fetus from toxic chemicals |
| 7 | Action Indicator - 3. Improved food handling and regulations - Individuals and industry modify food production and handling practices. - Intervention strategies reduce bacterial contamination, increase shelf life, and reduce occurrences of food-borne illnesses. |
| 8 | Action Indicator - 4. Improved animal husbandry - Poultry industry changes feed formulations to reduce embryonic mortality during incubation (thereby enhancing hatchability) and to improve animal health and to produce health-enhancing nutrients (thus developing value-added poultry foods). - Livestock producers use diagnostic methods and new vaccination programs to increase immunity (innate and acquired) in domestic animals |

| | |
|---|---|
| 9 | Action Indicator - 5. Improved competitiveness of Pacific Northwest food businesses. - New and existing businesses expand markets based on new understanding about market factors - Increased business activity and success in the Northwest food industries. - More successful starts by food businesses |
| 10 | Action Indicator - 6. Informed policy-making and management - Policy makers will develop food processing regulations that prevent incidences of food-borne illnesses. - Improved decision-making/policy on regulation of PAH in aquatic ecosystems. - Public health recommendations reduce the burden of prostate cancer. |
| 11 | Action Indicator - 7. Protection of natural environment from agricultural chemicals - Reduce the fate of agricultural chemicals in remote aquatic ecosystems - Improve policies or regulation of pesticides |
| 12 | Change Indicator - Economic: - Application of knowledge and new leading-edge food technologies will result in improved food quality, value and safety with positive impacts on value-added food production, processing, handling, and distribution systems. - Sustainable competitive advantage for Northwest food industries that are able to accurately gage consumer demand for their products. - Improve the food economy by developing new, stronger, and growing food businesses in the state. - Help reduce the state's unemployment through the creation of jobs in these food companies. - Hatchability and value-added poultry foods will bring increased economic returns to the US poultry industry. |
| 13 | Change Indicator - Societal: - Better human and animal health, well-being, and survivability result with the use of nutrition and nutrigenomics and organic production. - Reduce health care costs associated with prostate cancer and improve the quality of life of thousands of American men . - Control the growth in the rate of obesity and osteoporosis among youth and solutions reverse trends in childhood obesity - Build environmental public health capacity - Mitigate how federal expenditures related to the farm subsidy program are linked to Medicaid expenditures for obesity related health conditions. |
| 14 | Change Indicator - Environmental (risk assessment, policies and management of exposure): - Enhanced environmental quality within an economically responsible context. - Reduced exposure of human and aquatic organisms to fluorochemicals - Moderate the relative contribution of regional U.S. and Canadian agricultural sources (both current and historic uses of these chemicals) and long-range or global sources in contributing to the deposition of agricultural chemicals to remote ecosystems in the Western U.S. - Minimize the risk of adverse impact of pesticide use on human health. |
| 15 | Knowledge Indicator 1b - Understanding Human Health and Nutrition (nutrition) * Identify new risk factors in prostate cancer and offer novel dietary modifications to reduce the incidence of prostate cancer * Knowledge of the mechanisms behind the health benefits of fruits and vegetables. |
| 16 | Knowledge Indicator 2 b- Characterize and model toxins arising from food production and processing (effects and extent) * Evaluate effects of aging on bioavailability of agricultural contaminants * Determine ways to evaluate extent that landfills are a significant source of fluorochemicals and the extent to which they are present in crops intended for human consumption |
| 17 | Knowledge Indicator 2 c- Characterize and model toxins arising from food production and processing (mechanisms) * Examine mechanisms that underlie the immune suppression * Identify role of human AhR polymorphisms and role of Arnt in mediating and relieving dioxin toxicity |
| 18 | Knowledge Indicator 2d - Characterize and model toxins arising from food production and processing (education) * Provide technical training and resources to agricultural and regulatory stakeholders on ecotoxicology of pesticides and integrated pest, nutrient, and water management. |

## Outcome #1

### 1. Outcome Measures

Knowledge Indicator 1a - Understanding Human Health and Nutrition (nutritional behaviors) * Understand the relationship between farm subsidy program and increasing obesity rates in the United States * Identify new or improved obesity intervention strategies in the community setting * Identify objective, physiological-based measures that correspond to target behaviors (bio-behavioral markers) for use later as measures of intervention progress and success or means for tailoring effective interventions * Identify key parent-child relationships that reflect resiliency and the interaction of these relationships with targeted nutritional behaviors * Understand various inputs and interactions of family and child, SES, nutrition, physiology and behavior * Identify strategies (message, pricing, foods) that will increase choosing healthful food choices among adolescents and young adults

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2 | 2 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
The research continues to explore the motivations behind parents' willingness and concern about teaching children to eat well and to include calcium rich food sources in their diets. Parental motivations to encourage positive habits will be used to develop messages for nutrition education and promotional campaigns to persuade parents to be involved in teaching positive habits and offering healthy food sources in the home.

**What has been done**
The project has focused on developing research strategies that coax or encourage parents to identify specifically what rewards or positive reinforcement they perceive when they do encourage their adolescent children to make healthy food choices, maintain rules about food consumption, and/or provide healthy and calcium rich foods in the home.

**Results**
The research reveals that there are few differences in calcium rich dietary sources among Asian, Hispanic and non-Hispanic White parents and their children. Milk, cheese, yogurt serve as major foods contributing to the calcium intakes among both parents and children. The intake of calcium among all three groups suggests that intakes do not meet current recommendations with the highest calcium intakes found among children of non-Hispanic whites, then Asians and Hispanics,

respectively. Research is also underway to determine the extent to which homeless families are able to provide healthy food choices for their children.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 502 | New and Improved Food Products |
| 703 | Nutrition Education and Behavior |
| 723 | Hazards to Human Health and Safety |
| 724 | Healthy Lifestyle |

**Outcome #2**

**1. Outcome Measures**

Knowledge Indicator 2a - Characterize and model toxins arising from food production and processing (analytical methods and tools) * New analytical methods and biomarkers to cost-effectively identify and track agricultural chemicals and other contaminants through time and space * Develop transgenic lines of zebrafish for response to toxicants * Identify agents, mechanisms of action, and dose response for reducing fetal risk from toxic chemicals * Model system to evaluate dioxin toxicity to humans and characterize specific responsive genes to toxicants

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 3 | 10 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
There is little doubt that humans are exposed to an increased diversity of chemicals and nanomaterials; as complex mixtures; however, the risk that these exposures pose remain largely unknown. In the absence of relevant toxicological data we are paralyzed to make science-based decisions to maximize technological advances while also protecting human and environmental health. There is a tremendous need to more rapidly identify chemical hazards and to thoroughly understand the mechanism by which chemicals and nanomaterials produce toxicity. Our long term goal is to develop computational methods that will allow predictions of toxic potential of novel compounds, thereby protecting human and the environment by reducing the use and release of highly toxic chemicals. These relevant studies are not feasible in any other vertebrate system, and have the potential to fill enormous information gaps. The tools generated from these studies could help to identify

important susceptibility or resistance genes that affect the toxic outcome.

**What has been done**

To accomplish these long term goals we have developed the embryonic zebrafish model as a powerful high throughput model for mechanistic toxicological studies. Specifically, we propose to develop high throughput methods and instruments to link teratogenic and behavioral effects of chemicals and nanomaterials to underlying gene expression changes. Over the past year there has been considerable progress to increase the throughput of the toxicological and behavioral studies to establish a high throughput screening system. Specific activities include: a)created the first and only specific-pathogen-free environment for fish lines; b)invented mass-breeding systems that enable us to collect virtually limitless embryos on demand; c) developed a high-throughput enzymatic procedure for removing the chorion, the transparent shell surrounding a zebrafish embryo, thereby improving the embryo's ability to internalize test agents; d)developed robots that can pick up zebrafish embryos, inject chemicals into them, and place them into 96-well plates without damaging them; e)developed machine vision systems that can observe the morphology and behavior of zebrafish; f)coupled the machine vision systems with computer algorithms that can detect anomalies. We have also completed a number of relevant toxicological screening experiments. For example, we
have completed the assessment of over 200 nanomaterials to identify the nanomaterial structural characteristics that drive toxicological responses. Using whole genome arrays and high throughput RNA
sequencing we have begun to identify biomarkers of exposures that are unique to these nanomaterials. We have also identified the global gene expression and microarray changes following developmental exposure to ethanol, retinoic acid, nicotine, and a series of polycyclic aromatic hydrocarbons (PAHs).

**Results**

Nanomaterials:we demonstrated that the media ionic strength affects agglomeration rates and thus the biological responses. Most importantly, the insensitivity of the zebrafish embryo to external ions indicates that it is possible, and necessary, to adjust the zebrafish exposure media conditions to optimize NP dispersion prior to assessment. This approach will dramatically extend the range of materials that can be accurately assessed in this powerful in vivo platform. Ethanol: computational analyses revealed that ethanol disrupts expression of miRNAs that direct neurogenesis. Antisense oligonucleotide morpholinos were used to transiently knockdown miRNA expression during development. Knockdown of multiple CNS-enriched miRNAs phenocopied ethanolinduced behavioral hypoactivity. Taken together, these data indicate that ethanol exposure misregulates
the expression of miRNAs that collectively choreograph nervous system development and function and support the concept that miRNA signaling pathways are targets of developmental neurotoxicants.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 133 | Pollution Prevention and Mitigation |
| 314 | Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals |
| 711 | Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources |
| 723 | Hazards to Human Health and Safety |

## Outcome #3

### 1. Outcome Measures

Knowledge Indicator 3 - Methods to improve Animal Health production systems - improve maternal diet through understanding of fundamental relationships between maternal diet, fatty acid metabolism and egg hatchability - develop technological strategy to enhance the efficacy of vaccination programs in livestock - develop a diagnostic method to assess immune health of livestock

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2 | 2 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**

Poor hatchability and chick mortality during the first two weeks of life remains a problem for the broiler industry. Without any significant disease, mortality in the first week post-hatch is 4-5%, i.e. over 0.48 billion chicks do not survive the first week post-hatch, emphasizing the need for early intervention. Despite this significant problem in broiler production, there are currently no effective means to improve quality and first week survival of chicks because the etiological aspects and underlying mechanism(s) that influence chick quality and early post-hatch health are largely unknown. Because pre- and the early post-hatch period is a major determinant of neonatal survival and bird performance, investigating factors that can modulate health and survival during pre- and early post-hatch will greatly enhance the efficiency of US broiler production. The long-term goals of this research are to understand lipid metabolism in pre- and post-hatch chicks so as to enhance chick growth, health and viability. The findings will generate new knowledge about the fundamental relationship between early access to n-3 fatty acids and lipid metabolism in post-hatch chicks. This research will have important practical implications for improving bird health and productivity and will bring increased economic returns to the $38 billion US poultry industry.

**What has been done**

Early access to n-3 fatty acids either through maternal diet (egg) or through post-hatch (within 5hr of hatching) feeding is investigated. The early exposure of n-3 fatty acids is obtained by feeding breeder hens diets varying in n-6 and n-3 fatty acids or providing chick starter diets varying in n-6 and n-3 fatty within 5 hr or after 36 hr of hatching. Blood and tissue samples were collected from growing chicks at different stages of growth and changes in fatty acid composition and patterns of inflammatory protein or gene expression upon challenge was examined. Our data shows that early access to n-3 fatty acids influence the progeny tissue n-6 and n-3 fatty acids and modifies

the expression of genes related to lipid metabolism and affects the expression of inflammatory protein upon challenge.

**Results**
Modulating egg yolk n-3 fatty acids through maternal diet led to enhancement of n-3 fatty acids with a concomitant reduction in arachidonic acid in progeny chick tissues. Tissue enrichment of n-3 fatty acids affected the proinflammatory eicosanoid production in progeny chick tissues and cells. These results indicate that supply of n-3 fatty acids through maternal diet can have long lasting effect on broilers when faced with a diet lacking in n-3 fatty acids. Results demonstrating the role of maternal fatty acid in modulating the progeny inflammatory eicosanoid generation during early growth may have practical applications. Broiler birds are raised commercially for 5-6 weeks. Under commercial conditions, mortality during the first 2 weeks of growth is around 5% and this remains a problem for the broiler industry. In addition, metabolic disorders and heart-related conditions are the major cause of mortalities and morbidities in broiler birds and have been reported in birds as early as 3 days of age. Considering the role of eicosanoids in the pathobiology of various inflammatory conditions, early access to n-3 fatty acids is of importance in enhancing chick health.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 308 | Improved Animal Products (Before Harvest) |
| 311 | Animal Diseases |

**Outcome #4**

**1. Outcome Measures**

Knowledge Indicator 4... Improved knowledge of consumer and market conditions and factors that affect business survival - Improved understanding of market conditions and knowledge to determine business choices. - Development of a process map for food business development and planning. - Training of nascent and existing food entrepreneurs in food business management. - Expanded knowledge base of factors important to distinguish different types of consumers and their food choices - Develop an understanding of motivations for food choice and strategies to impact them

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 3 | 3 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The research goal is to examine how product characteristics affect demand for new variety potatoes and whether information on health effects influenced consumer purchase. Findings from this research help producers and processors, commodity commissions, and others evaluate strategies to increase demand for their products.

**What has been done**
This objective will be achieved by using sensory and market research methodology to acquire data first from local Portland area consumers, then later Northwest regional consumers and beyond, and analyze and report findings to target agricultural industries. Five colorful potato varieties were tested by consumers. Consumer comments revealed that a uniform raw and cooked appearance, a distinct flavor with no undesirable aftertaste, and a smooth, firm, and consistent texture were all desirable characteristics.

**Results**
Health information about antioxidant effects had a significant impact on purchase intent. Purchase intent was also influenced by positive and negative associations with appearance, concerns about genetic engineering, tampering, and chemicals, preparation and presentation considerations, point of sale, family acceptance, and anticipated flavor. Consumer comments revealed that a uniform raw and cooked appearance, a distinct flavor with no undesirable aftertaste, and a smooth, firm, and consistent texture were all desirable characteristics.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 204 | Plant Product Quality and Utility (Preharvest) |
| 502 | New and Improved Food Products |
| 602 | Business Management, Finance, and Taxation |
| 603 | Market Economics |
| 606 | International Trade and Development |
| 607 | Consumer Economics |
| 703 | Nutrition Education and Behavior |
| 724 | Healthy Lifestyle |

**Outcome #5**

**1. Outcome Measures**

Action Indicator 1. Improved nutrition - More schools offer/encourage healthful foods - More effective programs and student experiences related to healthful foods - Markers and strategies become the standards of methods and measurement of childhood overweight and resiliency. - Policies consider health and financial implications of the farm subsidy program.

Not Reporting on this Outcome Measure

## Outcome #6

### 1. Outcome Measures

Action Indicator - 2. Percentage health risks reduced - Markers for oxidative stress and DNA integrity lead to novel approaches for identifying biomarkers of zinc deficiency in humans. - Zinc supplementation will be an effective strategy in limiting the incidence of prostate cancer - Effective dietary intervention strategies are broadly applied to reduce obesity - Modulate maternal diet to reduce the risk to the fetus from toxic chemicals

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Action Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 3 | 1 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Weight loss is very difficult for most women to achieve and it is even more difficult to keep the weight off once it is lost. Helping women address weight issues and chronic disease risk factors before they become obese and/or are diagnosed with a chronic disease will aid in improving the health of Oregon families and the US population.

**What has been done**
This research addressed the importance of teaching women to make changes in their own health behaviors that become part of their lifestyle, and then model these healthy behaviors in the home to improve the health of the family. We are also beginning a project in 2011 that focuses on kids, families and communities.

**Results**
Research suggests that changes in both diet composition and level of physical activity are important to reverse risk factors for chronic disease in individuals who are overweight or obese. Over 60% of adult Americans are currently overweight or obese (Body Mass Index [BMI]>25 kg/m2), we must identify ways to slow this trend, especially in our children and youth.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 702 | Requirements and Function of Nutrients and Other Food Components |
| 703 | Nutrition Education and Behavior |

| | |
|---|---|
| 723 | Hazards to Human Health and Safety |
| 724 | Healthy Lifestyle |

**Outcome #7**

**1. Outcome Measures**

Action Indicator - 3. Improved food handling and regulations - Individuals and industry modify food production and handling practices. - Intervention strategies reduce bacterial contamination, increase shelf life, and reduce occurrences of food-borne illnesses.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
For many people, slurping down a raw oyster straight from the shell is a gastronomic delight. For a few people, that delight can be followed by a belly punch. There's a nasty group of organisms called Vibrio that lurks in raw shellfish and can cause gastroenteritis. At this time, specialty food is unregulated. The training needs of specialty food processors had not been evaluated. In addition, food safety inspectors had little awareness of best practices in the processing of specialty foods. A 3-year, $42M collaborative specialty food safety program grant was secured through the USDA NIFA integrated food safety program to address these information and training needs.

**What has been done**
* Databases of specialty food processors, vendors, food inspectors in the 3 NW states. The databases were then used for the following needs assessment surveys and the future trainings.
* The 1st year's effort was to assess current practices and knowledge gaps in ensuring food safety of specialty foods. The 2nd year's efforts were 1) to develop training and education, 2) to develop and provide pilot type of training program in specialty food safety, and 3) to conduct specialty food testing on selected quality and safety parameters.
* 3,350 OR, WA, ID specialty food processors were surveyed. The survey response rate was 13.8 %.
* 120 food safety inspectors were surveyed (response rate was 56%) for their understanding in specialty foods and training needs for this sector.
* Advisory committee (9 members) formed to provide input and feedbacks on project plans.
* Training and education materials developed, presented at workshops, posted on the specialty food network website developed for this project http://specialtyfood.fst.oregonstate.edu/links.htm.

* Compiled materials from several land-grant universities trade organizations.
* Developed and delivered pilot training program (March 5, 2009, Portland, OR). Thirty-two participants from specialty food processors and state food inspectors. Workshop evaluation score was 4.63/5. Collected information on training topics for a spring 2011 training.
* Testing begun; selected products tested for pH, water activity, Brix, total plate count. Initial categories of selected for testing included acidified foods, ethnic foods, tea-based products. Testing results will be reported in 2011.

**Results**

* Through attending the training program and obtaining information provided on the specialty food safety website, food inspectors gained updated information and acquired appropriate knowledge about specialty food production in the northwest region, processing procedures/technologies in making specialty food products, concerns in food safety of specialty foods, and possible controls for ensuring product safety, thus allowing more practical and effective inspections and associated recommendations.
* Specialty food processors are now more aware of food safety concerns in specialty food processing and are cognizant of specific controls and practices to eliminate and/or minimize hazards.
* Better understanding about the specialty foods industry will lead to specific and appropriate controls and strategies for ensuring their safety.
* Information and materials developed as the results of this project were disseminated at the workshop (presented and provided as part of the training handout), shared with the advisory committee and at the professional meetings and through personal contacts, and posted on the specialty food safety website. A handbook with a tentative title "Production of Specialty Foods for Entrepreneurs: Processing Technology, Quality and Food Safety" is in development. It is expected that more audiences can be reached through this handbook.

## 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 204 | Plant Product Quality and Utility (Preharvest) |
| 314 | Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals |
| 501 | New and Improved Food Processing Technologies |
| 702 | Requirements and Function of Nutrients and Other Food Components |
| 703 | Nutrition Education and Behavior |
| 711 | Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources |
| 712 | Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins |
| 723 | Hazards to Human Health and Safety |
| 724 | Healthy Lifestyle |

## Outcome #8

### 1. Outcome Measures

Action Indicator - 4. Improved animal husbandry - Poultry industry changes feed formulations to reduce embryonic mortality during incubation (thereby enhancing hatchability) and to improve animal health and to produce health-enhancing nutrients (thus developing value-added poultry foods). - Livestock producers use diagnostic methods and new vaccination programs to increase immunity (innate and acquired) in domestic animals

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Action Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Omega-3 (n-3) fatty acids are considered as health-promoting nutrients. The consumption of n-3 fatty acids in the US diet does not meet the required amount of these nutrients. Increasing the concentration of n-3 fatty acids in poultry foods is a possible way for humans to increase their intake. Through incorporation of different oil seeds (e.g. flax, camelina) in poultry diets, a sustainable way of modifying the nutritional profile and thereby developing value-added poultry foods is investigated.

**What has been done**
The effects of different oil seeds (e.g. flax, camelina) on bird performance and egg and meat quality aspects were investigated. The use of flax seed in layer diets and camelina in broiler diets were conducted. For the layer feeding studies, a total of one hundred and twenty (n = 120), thirty-two-week-old ISA Brown Leghorn hens were used. The birds were kept in cages and were fed 1 of the 3 corn-soybean meal-based diets, a control diet (no flax) or a 10% flax diet with or without 100 IU of tocopherols, until the hens were 64 wk of age. Eggs were collected at different stages of production and external and internal quality, fatty acid content, lipid stability during storage, and sensory qualities were determined. In addition, the long term use of flax in bird health was assessed by examining hepatic and blood plasma lipids, TBA reactive substances, and histopathological aspects. The use of camelina in broiler diets were investigated by conducting a feeding trial with 160 one-day-old Cobb chicks fed diets containing 2.5. 5.0 or 10.0% Camelina meal.

**Results**

Results demonstrate that egg yolk n-3 fatty acid and α-tocopherol content can be increased through diet manipulation. However, storage reduces egg n-3 fatty acids and α- tocopherol, even in the presence of added antioxidants. Inclusion of tocopherol may be needed to reduce lipid oxidation in n-3 fatty acid-enriched eggs. Antioxidant supplementation did not enhance the acceptability of flax seed-fed eggs by trained panelists. Long-term feeding of hens with 10% flaxseed led to a reduction in plasma and liver lipids, liver triglycerides, number, and size of cells with fat vacuoles in the hepatocytes. However, tocopherol supplementation had no effect on hepatocellular lipid infiltration. Feeding studies with broiler birds showed that Camelina meal could be included up to 10% in the diets without compromising bird performance while increasing the n-3 fatty acid content of the meat.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 306 | Environmental Stress in Animals |
| 308 | Improved Animal Products (Before Harvest) |
| 311 | Animal Diseases |

**Outcome #9**

**1. Outcome Measures**

Action Indicator - 5. Improved competitiveness of Pacific Northwest food businesses. - New and existing businesses expand markets based on new understanding about market factors - Increased business activity and success in the Northwest food industries. - More successful starts by food businesses

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2 | 2 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Last year, Oregon farmers sold $6.8 million of barley harvested on 31,400 acres, according to a report by the OSU Extension Service. But Oregon barley rarely makes it into beer because there is little data on its suitability as malt. To gather that data you need a malter. But commercial malters are too big; their typical run is about 300,000 pounds of barley, producing about 175,000 gallons of beer, which is too much for research purposes.

**What has been done**
Oregon State University is working to change that. Students are working with researchers to design and build a malting unit that could soak, germinate and dry small batches of the grain as part of OSU's larger effort to create a market for barley grown in Oregon. The students will build the machine during winter term and test it in the spring. When finished, the portable unit will weigh about 1,000 pounds, measure about 4 feet wide and 6 feet long, and stand about 5 feet high. Great Western Malting Co., a commercial malter in Vancouver, Wash., is providing technical assistance.

**Results**
The malter will become part of OSU's existing research brewery; researchers and companies can pay to use the machine to test new barley varieties or malting techniques. The malter is part of OSU's efforts to find more uses for Oregon's barley and add value to it. For example, researchers are exploring the malting qualities in Oregon's six-row winter barleys, which hopefully can satisfy the region's taste for quality microbrews. The PI is also collaborating with an OSU food chemist and baker to develop a healthy, beta-glucan-rich food barley, which they have used to make bread. In the future, the departments involved in the malt unit may collaborate on a mini-pearler to remove hulls from barley. As with malters, current pearler machines are designed for very large or very small amounts.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 602 | Business Management, Finance, and Taxation |
| 603 | Market Economics |
| 606 | International Trade and Development |
| 607 | Consumer Economics |

**Outcome #10**

**1. Outcome Measures**

Action Indicator - 6. Informed policy-making and management - Policy makers will develop food processing regulations that prevent incidences of food-borne illnesses. - Improved decision-making/policy on regulation of PAH in aquatic ecosystems. - Public health recommendations reduce the burden of prostate cancer.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|

| | | |
|---|---|---|
| 2010 | 1 | 1 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**

New techniques to measure Willamette River contaminants in the Portland Superfund site over a long period of time have revealed ongoing problems facing some areas of the river, the complexity of trying to clean them up and the continuing concern that the pollution presents. most sampling for contaminants was done at certain spots in a specific point in time ? which may not have provided an accurate picture of river pollutants that move, flux higher and lower with fresh inputs from weather or human activity, and often experience low concentrations of toxic compounds over extended periods of time. New techniques have been developed to put ?passive? sampling devices in the river that can stay in place for longer periods and better capture episodic events of pollution that come and go.

**What has been done**

The studies examined concentrations of polycyclic aromatic hydrocarbons (PAH) ? carcinogenic and mutagenic compounds produced by industrial activities, automobiles, wood stoves and the combustion of almost any organic material. The work was done over five years in an 18.5-mile stretch of the lower Willamette River.

**Results**

Researchers found that in some sites efforts to ?cap? severely polluted areas and keep PAH contained have worked surprisingly well, while in other places efforts to remove them have nearly tripled dissolved PAH concentrations, at least for some period of time. Among the findings of the recent monitoring: a)Some of the higher and most toxic PAH depositions are downriver of the superfund site. b)Concentrations of these pollutants can be either higher or lower in different seasons, depending on the site and the nature of the pollution. c)A sand-and-clay sediment cap placed over 23 acres of creosote contamination in 2004 at the McCormick and Baxter Superfund site has dramatically reduced PAH pollution in the water, although there are questions about how long the cap will last. d)The dredging and removal of 11,500 cubic meters of coal tar at the GASCO site in 2005 nearly tripled freely dissolved PAH concentrations, in part because of a containment curtain that did not work as effectively as had been planned. e)The overall PAH level just above this giant ?tar ball? is still as high as it previously was, suggesting there are still other sources of pollution, some of which are unknown.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 133 | Pollution Prevention and Mitigation |
| 314 | Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals |
| 711 | Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources |
| 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

Action Indicator - 7. Protection of natural environment from agricultural chemicals - Reduce the fate of agricultural chemicals in remote aquatic ecosystems - Improve policies or regulation of pesticides

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Action Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 1 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Specific aims of this project are capacity building in addressing human health and environmental risks associated with pesticide use practices in rural communities and their irrigated agriculture. Capacity building focuses on monitoring for pesticides in the environment, including food and water, developing survey tools that provide data on pesticide use practices and human behavior that can be used to evaluate pesticide exposure and human health risks, and the use of risk assessment methodologies adapted to meet the needs of evaluating pesticide human health risks in developing countries.

**What has been done**
From 2005 to present, principle investigator in the collaboration between the IPPC at OSU and the Food and Agricultural Organization of the United Nations on a project which focuses on the human and environmental impact of pesticide use (including POPs) in rural communities along the Niger and Senegal rivers, spanning 7 West African countries.

**Results**
In April, 2010 the PI traveled to Dakar, Senegal to conduct a workshop on pesticide dietary risk assessment (Altelier sur
l'évaluation des risques des pesticides sur la santé humaine). This bilingual workshop was sponsored by the United Nations Environment Programme (UNEP), the Global Environment Facility (GEF), the Food
and Agriculture Organization of the United Nations (FAO), and OSU. Workshop participants were a diverse group from across West Africa, with expertise in medicine, toxicology, public health, pesticide
regulation, and analytical chemistry. In addition, as a part of the GEF project in West Africa, in partnership with FAO and Environnement et Développement du Tiers Monde (ENDA), we are working with one of ENDA's teams in Senegal, PRONAT, to develop a survey and focus group

protocols
designed to obtain information on pesticide use and human exposure in 30 rural communities along the Senegal and Niger rivers, spanning 7 West African countries.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 133 | Pollution Prevention and Mitigation |
| 306 | Environmental Stress in Animals |
| 314 | Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals |
| 711 | Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources |
| 712 | Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins |
| 723 | Hazards to Human Health and Safety |

**Outcome #12**

**1. Outcome Measures**

Change Indicator - Economic: - Application of knowledge and new leading-edge food technologies will result in improved food quality, value and safety with positive impacts on value-added food production, processing, handling, and distribution systems. - Sustainable competitive advantage for Northwest food industries that are able to accurately gage consumer demand for their products. - Improve the food economy by developing new, stronger, and growing food businesses in the state. - Help reduce the state's unemployment through the creation of jobs in these food companies. - Hatchability and value-added poultry foods will bring increased economic returns to the US poultry industry.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The primary objective of the project is to analyze the comparative advantage of US agricultural and food industries, and their counterparts in Oregon. Within this objective, a key activity is concerned with the role of productivity growth in changing comparative advantage among major

agricultural producers and exporters. While many studies show the important role of productivity in explaining comparative advantage, few have explored the causes and consequences of narrowing productivity gap among nations. This activity will identify the role of trade and investment flows as channels of knowledge spillovers, and address welfare consequences of the narrowing productivity-gap for leaders and followers. This research activity focuses on the role of public sector in alleviating the likely market failures in aiding productivity growth and the opening global markets for U.S. products.

**What has been done**

Technological leadership in food manufacturing industries was assessed using an internationally comparable database on 35 developed and developing economies. Among 17 food manufacturing industries, the United States was the leader in 10 industries based on an assessment of the productivity level. The United States held leadership position in industries important to the Pacific Northwest and Oregon, e.g. processing/preserving fruits and vegetables. In the remaining 7 industries, the United States had the 2nd largest productivity level. Despite such high productivity levels, several countries appear to be catching up to the U.S. productivity level at a rapid pace. Such a catch-up process suggests erosion in U.S. comparative advantage in food manufacturing industries. Fortunately, the growth in the U.S. productivity level in recent decades helped sustain its leadership position. The U.S. consumers appear to be the beneficiaries of productivity growth at home as well as abroad in food manufacturing industries. Gains to consumers include lower prices, and greater variety and quality of food products in the marketplace.

**Results**

Investment in technology has been known to be the major factor affecting technological progress in U.S. agricultural and food manufacturing industries. In an era of high commodity prices, arising from the nexus between agricultural and energy markets, these investments have become ever more important to hold prices down for consumers, while helping producers compete in international markets. With a shift towards sustainable and environmentally-safe practices, U.S. agriculture is facing competition in both green technology and commodity markets. With historically high budget and fiscal deficits, the United States confronts difficult choices in funding agricultural and food research. In contrast, emerging and other high-income economies with flexible budgets and low external debt have been increasing investments in green technologies and agriculture. The race to leadership in emerging green technologies and consequent producer competitiveness and consumer welfare critically depends on facilitating and investing resources in, where market failures abound, agricultural research and development.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 501 | New and Improved Food Processing Technologies |
| 502 | New and Improved Food Products |
| 602 | Business Management, Finance, and Taxation |
| 603 | Market Economics |
| 606 | International Trade and Development |
| 607 | Consumer Economics |

## Outcome #13

### 1. Outcome Measures

Change Indicator - Societal: - Better human and animal health, well-being, and survivability result with the use of nutrition and nutrigenomics and organic production. - Reduce health care costs associated with prostate cancer and improve the quality of life of thousands of American men . - Control the growth in the rate of obesity and osteoporosis among youth and solutions reverse trends in childhood obesity - Build environmental public health capacity - Mitigate how federal expenditures related to the farm subsidy program are linked to Medicaid expenditures for obesity related health conditions.

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Condition Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 1 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
China emits the most PAHs of any country in the world, followed by India and the United States. PAH pollution was definitely reduced by the actions China took during the 2008 Olympics, such as restricting vehicle use, decreasing coal combustion and closing some pollution-emitting factories. However, there are more than 3.6 million vehicles in Beijing and the number is rising 13 per cent per year.

**What has been done**
The study, among the first to examine how pollution control could impact the health of people in China, focused on pollutants called PAHs (polycyclic aromatic hydrocarbons) that arise from coal-burning, wood stoves and cars.

**Results**
Researchers found that if China continued with pollution cutbacks implemented during the 2008 Olympic Games, Beijing residents could see their lifetime lung cancer risk cut nearly in half. That could translate to 10,000 fewer cases of lung cancer. That's a positive step, and it shows that if such steps were continued it could lead to a significant reduction in cancer risk from these types of pollutants.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|

| | |
|---|---|
| 204 | Plant Product Quality and Utility (Preharvest) |
| 314 | Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals |
| 502 | New and Improved Food Products |
| 702 | Requirements and Function of Nutrients and Other Food Components |
| 703 | Nutrition Education and Behavior |
| 711 | Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources |
| 712 | Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins |
| 723 | Hazards to Human Health and Safety |
| 724 | Healthy Lifestyle |

**Outcome #14**

**1. Outcome Measures**

Change Indicator - Environmental (risk assessment, policies and management of exposure): - Enhanced environmental quality within an economically responsible context. - Reduced exposure of human and aquatic organisms to fluorochemicals - Moderate the relative contribution of regional U.S. and Canadian agricultural sources (both current and historic uses of these chemicals) and long-range or global sources in contributing to the deposition of agricultural chemicals to remote ecosystems in the Western U.S. - Minimize the risk of adverse impact of pesticide use on human health.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The goal of this research is to investigate the atmospheric transport and deposition of agricultural chemicals to remote western U.S. ecosystems, such as national parks. Toxic contamination from pesticides, the burning of fossil fuels, agriculture, industrial operations and other sources are a continuing concern in national parks of the West. The research should provide a better understanding of the risks, including which pesticides are most likely to accumulate and may require improved regulation.

**What has been done**

Studies were conducted to determine the sources of agricultural chemicals to remote ecosystems in western U.S. national parks and if these chemicals had an adverse impact on these ecosystems. In research performed by an international group of scientists over several years, pollution was found in all eight of the national parks and preserves that were studied, in terrain ranging from the Arctic to southern California. Most of it was caused by regional agriculture or industry, but some had traveled thousands of miles from distant sources in Asia and elsewhere.

**Results**
The biggest concern appears to be pesticides, which can bioaccumulate in the ecosystem and food web, and were most often linked to regional agricultural activities. Of the areas studied, the largest problems with pesticides were found in Sequoia, Rocky Mountain and Glacier National Park. This research resulted in the estimate that 93-98% of the pesticides being deposited to western U.S. National Parks are the result of historic use of these pesticides in the U.S. and their continued presence in U.S. agricultural soils. In some cases, the concentrations of these pesticides in the ecosystem were high enough to exceed USEPA guidelines for subsistence fish consumption.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 133 | Pollution Prevention and Mitigation |
| 306 | Environmental Stress in Animals |
| 314 | Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals |
| 711 | Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources |
| 712 | Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins |
| 723 | Hazards to Human Health and Safety |

**Outcome #15**

**1. Outcome Measures**

Knowledge Indicator 1b - Understanding Human Health and Nutrition (nutrition) * Identify new risk factors in prostate cancer and offer novel dietary modifications to reduce the incidence of prostate cancer * Knowledge of the mechanisms behind the health benefits of fruits and vegetables.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
This program seeks to identify, understand, and eliminate, in
so far as practicable, the specific toxicants in the food supply that contribute to health deficits as well as mechanisms of agent for dietary chemopreventive, beneficial food components.

**What has been done**
This program will continue to focus on mechanisms of cancer prevention by food by testing phytochemicals from cruciferous vegetables (indole-3-carbinol and sulforaphane) and compare the efficacy of these dietary supplements to the whole foods from which they were derived. The focus will be on colon, prostate and transplacental cancer(lymphoma, lung and liver). Studies are also underway to further investigate mechanisms of action of mycotoxins in food, primarily aflatoxin B1, the potential for this mycotoxin to cross the placenta and cause liver cancer later in life in the offspring and how we can supplement the mother?s diet to provide protection from that exposure.

**Results**
Researchers found that the metabolites of sulforaphane are much more potent HDAC inhibitors than the parent compound. He is applying this knowledge to enhance our understanding of the most efficient ways to inhibit cancer (primarily colon) through diet. The PI is continuing with his work on the transplacental model of cancer chemoprevention. Work underway will determine whether pure phytochemical or whole food is more effective in protection of the fetus from carcinogens that can cross the placenta, when is the critical time of exposure for the fetus for maximum protection. The research team is initiating chemoprevention studies with cruciferous vegetables with human volunteers. This enhances the translational nature of the research and the impact on human health. We have published this work in quality journals, been invited to speak at national and international meetings as well as academic institutions. The popular press has also found this story to be very interesting.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 702 | Requirements and Function of Nutrients and Other Food Components |
| 703 | Nutrition Education and Behavior |
| 723 | Hazards to Human Health and Safety |
| 724 | Healthy Lifestyle |

## Outcome #16

### 1. Outcome Measures

Knowledge Indicator 2 b- Characterize and model toxins arising from food production and processing (effects and extent) * Evaluate effects of aging on bioavailability of agricultural contaminants * Determine ways to evaluate extent that landfills are a significant source of fluorochemicals and the extent to which they are present in crops intended for human consumption

### 2. Associated Institution Types

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Pesticides represent a broad class of agricultural chemicals that can have adverse environmental impacts and pose health risks to both children and adults. Opportunities for human exposure to pesticides exist in many environments including the home, the workplace, rights-of-way, from their use in agriculture, and public health uses (including vector control). There is a need for improved surveillance of pesticide exposures, using data that can effectively be relied upon to communicate relevant findings on a regional (statewide) basis and to reduce the risk of adverse impacts on health. Sources of data that combine temporal and spatial elements could be of significant utility in the assessment and communication of findings to local public health agencies, and could provide opportunities for prevention. Sources of data that cover wide geographic areas would be particularly
useful, as they may enhance the inclusion of underserved populations.

**What has been done**
The source of data for this proposal is the Oregon Poison Control Center (OPC), a 24-hour health care information and treatment resource serving the entire state of Oregon. The OPC currently receives
approximately 70,000 calls per year, approximately 5% of which are related to pesticide exposures in humans. Spatial data collected by the OPC were utilized for geocoding, display, and analyses using Arc/Info 8.0 GIS software. Crude incidence rates were calculated for each county, using population statistics from the 2000 U.S. Census as denominator. In addition to incident cases and rates, data were analyzed at the level of each county to report demographic statistics relating to pesticide exposure incidents, location and circumstances surrounding exposures, a ranking of pesticide classifications most frequently associated with incidents, and a summary of severity of medical outcomes. An analysis for spatial and temporal clustering of human pesticide exposure incidents was conducted using SatTScan. This software program, developed by investigators at the National Cancer Institute, has been developed to analyze temporal and spatial data using spatial, temporal, or space/time scan statistics.

**Results**
This project continues to generate interest among regional regulatory and enforcement officials with responsibilities having to do with the use of pesticides. Specifically, the State Department of Public Health (Oregon Health Authority) has expressed interest in future collaborative efforts that would utilize spatial information on pesticide exposure incidents collected by the Oregon Poison Control
Center, Oregon Health Authority, and Oregon OSHA, to better understand where incidents occur

and to identify opportunities for prevention.
The investigator of this project provided consultation and assistance in the preparation of a grant proposal to US EPA for State Health Departments, which would enhance pesticide exposure surveillance activities. The proposed project would utilize spatial information on pesticide incidents to specifically target occupational exposure to pesticides among high-risk populations (agricultural workers) and utilize these data to develop preventive interventions.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 314 | Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals |
| 711 | Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources |
| 712 | Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins |
| 723 | Hazards to Human Health and Safety |
| 724 | Healthy Lifestyle |

**Outcome #17**

**1. Outcome Measures**

Knowledge Indicator 2 c- Characterize and model toxins arising from food production and processing (mechanisms) * Examine mechanisms that underlie the immune suppression * Identify role of human AhR polymorphisms and role of Arnt in mediating and relieving dioxin toxicity

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Dioxins are ubiquitous environmental pollutants and are potent mammalian toxins acting predominantly in the thymus and skin, in body weight regulation and in liver carcinogenesis. One of the dioxins, the 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) has gained special public and research interest and serves as a model compound because of its high toxicity. A protein, known as Aryl Hydrocarbon Receptor (AhR) binds and mediates the effects of dioxins.

**What has been done**

We are researching on how AhR binds various chemicals including dioxins and functions in mammalian cells. In collaboration with Dr. Kerkvliet's lab, we are also investigating how AhR signaling can be manipulated potentially to treat allergic and autoimmune diseases.

**Results**
Significant differences have been observed among various species in the ability of dioxins and other chemicals to bind the AhR. While a part of the AhR protein, known as the PAS domain is responsible for ligand binding, the structural basis for the inter-species differences remains poorly understood. To address this, we constructed homology models of the AhR PAS domain from several different species using available structural information from other closely related proteins. Using these models, many of the intra- and inter-species differences in AhR binding was structurally analyzed. We also conducted a screen for identifying compounds that activate the AhR signaling to probe AhR functions. Leflunomide, an immunomodulatory drug presently used in the clinic for the treatment of rheumatoid arthritis, was identified as an AhR activator. Our results demonstrated that leflunomide caused AhR to move into the nucleus from cytosol and increased expression of AhR-responsive target genes. Molecular Docking studies employing AhR ligand binding domain revealed favorable binding energy for leflunomide. We are characterizing several other AhR activators to understand the functioning of AhR and its utility as a therapeutic target in autoimmune disorders.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 501 | New and Improved Food Processing Technologies |
| 711 | Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources |
| 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 2d - Characterize and model toxins arising from food production and processing (education) * Provide technical training and resources to agricultural and regulatory stakeholders on ecotoxicology of pesticides and integrated pest, nutrient, and water management.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 1 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
The increasing use of nanomaterials in industrial processes and commercial products (potentially related to food packaging or processing) is expected to lead to accumulation of these materials in the environment. Because the consequences of increased environmental exposure are unclear, research studies need to be undertaken to determine potential risks. Previous studies reporting on potentially toxic interactions between aqueous fullerene nanoparticles (nC60) and microorganisms have been contradictory. Because of these complications and a lack of studies done with fungi, which comprise a significant component of the soil microbial community, a study was conducted to assess the toxicity of nC60 towards the yeast Saccharomyces cerevisiae and Escherichia coli.

**What has been done**
The toxicity of nano particles of fullerene (nC60) towards Saccharomyces cerevisiae and Escherichia coli was assessed based on a simple growth endpoint avoiding specific conditions of previous studies by others where confounding factors were encountered (i.e, hydrophobic agglomeration in aqueous media, insolubility, competition in mixed microbial cultures, etc.). Pure microbial cultures were grown in minimal media to which carefully washed and characterized independent lots of nC60 prepared using three different methods were added. At the single high dose used (about 30 micrograms/mL), no reduction in the cell yield of either S. cerevisiae or E. coli was observed.

**Results**
To our knowledge, this is the first report to present results showing a lack of microbial growth inhibition by nC60 under conditions where nC60 remained in solution and solvent effects were avoided (factors that could have contributed to previous negative reports in the scientific literature.) In light of these findings and reports of studies showing that damage requires physical contact between bacterial cells and carbon-based nanomaterials, the commonly used suspension-based microbial toxicity assay needs to be carefully reexamined.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 703 | Nutrition Education and Behavior |
| 724 | Healthy Lifestyle |

## 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.)

### Brief Explanation

{No Data Entered}

## V(I). Planned Program (Evaluation Studies and Data Collection)

### Evaluation Results

{No Data Entered}

### Key Items of Evaluation

{No Data Entered}

## V(A). Planned Program (Summary)

**Program # 4**

**1. Name of the Planned Program**

Effective Water and Watershed Management

### 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 | | | 10% | |
| 102 | Soil, Plant, Water, Nutrient Relationships | | | 10% | |
| 111 | Conservation and Efficient Use of Water | | | 10% | |
| 112 | Watershed Protection and Management | | | 10% | |
| 132 | Weather and Climate | | | 10% | |
| 133 | Pollution Prevention and Mitigation | | | 10% | |
| 403 | Waste Disposal, Recycling, and Reuse | | | 10% | |
| 404 | Instrumentation and Control Systems | | | 10% | |
| 405 | Drainage and Irrigation Systems and Facilities | | | 10% | |
| 902 | Administration of Projects and Programs | | | 10% | |
| | **Total** | | | 100% | |

## V(C). Planned Program (Inputs)

**1. Actual amount of professional FTE/SYs expended this Program**

| Year: 2010 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 0.1 | 0.0 | 0.2 | 0.0 |
| Actual | {NO DATA ENTERED} | {NO DATA ENTERED} | {NO DATA ENTERED} | {NO DATA ENTERED} |

**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 | 68233 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 0 | 0 | 0 | 0 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 0 | 0 | 0 | 0 |

## V(D). Planned Program (Activity)

### 1. Brief description of the Activity

Research is often carried out at field sites which are related to a specific project. Field sites with short- and long-term instrument deployment are located in all four corners of Oregon, as well as Washington State, Kansas and Canada.

We will develop and use novel soil-water instrumentation. Passive measurement of spatially distributed soil temperature can allow for estimation of the energy consumption of evapotranspiration and soil water flux. Beyond passive reporting of temperature, the use of actively heated fiber optics for the observation of subsurface water movement and water content via a heat pulse offer new research opportunities. Continuous temporal and spatial measurement at various scales will be validated and incorporated into new models and measurement tools. Improved spatial statistics is an aspect affecting remote sensing experiments and measurements, particularly related to soil moisture.

We will update and expand the reference evapotranspiration data currently available for Oregon. We expect to develop references for short and tall crops, disease and weed free, shaded and not short of water scenarios. We will compare estimates to recently available data form AGRIMET stations to validate estimating methods. We will consolidate meteorological data and develop a database in support of this effort. Information will be used to update Extension publications (both hard copy and online) to allow better information accessibility and wider range of applications. The effort is also applicable for long term agricultural and water resources planning.

Technological advances have made possible the development of a hydrologic model capable of simulating the interactions and processes between surface water and groundwater. Results of model simulation will help in the decision making process by producing a water budget analysis and an easy visualization of several management scenarios, e.g., no surface recharge from the irrigation canals.

Field observations of physical and biological processes and functions, benthic macroinvertebrate community, numerical and statistical models play critical roles in understanding the driving principles of watershed and river ecosystems and linkages. In addition, the use of laboratory flumes for simulating sediment and channel changes are a "safe" and controlled way to experiment with or predict outcomes of river management activities.

Watershed and river basin scale resource simulation models and decision tools will be used to examine coupled natural and human systems and trajectories of change under alternative future scenarios.

- Conduct Research Experiments.

- Construct Research Facilities.

- Monitor and evaluate

- Conduct Workshops, meetings.

- Deliver Services.

- Develop Products, Curriculum, Resources.

- Provide Training.

- Assessments.

- Partnering.

**2. Brief description of the target audience**

The audience includes typical citizens in urban settings through extension outreach, those responsible for agricultural production through extension outreach and workshops, the engineering profession through publication of results in professional journals, and undergraduate and graduate students through presentation of project descriptions and results in a classroom setting

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

| 2010 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Actual** | 1000 | 5000 | 50 | 100 |

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

**Patent Applications Submitted**

Year: 2010
Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

| 2010 | Extension | Research | Total |
|---|---|---|---|
| **Actual** | 0 | 20 | 20 |

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- EFFECTS ON AND PROTECTION OF ENVIRONMENTAL HEALTH AND ECOLOGY: Indicator Type 1...Document natural processes and responses to anthropogenitically-influenced conditions: a) Understand feedbacks between plants, soil hydraulic processes and atmospheric boundary layer development - Selker b) Evaluate dynamics and variability in fish and benthic macroinvertebrate communities - Tullos c) Investigate biotic-abiotic interactions and responses to disturbance in aquatic environments, both historically and in response to events or management - Tullos

| Year | Actual |
|---|---|
| 2010 | 1 |

**Output #2**

**Output Measure**

- EFFECTS ON AND PROTECTION OF ENVIRONMENTAL HEALTH AND ECOLOGY: Indicator - Type 2...Develop instrumentation and apply instrumentation systems (monitor, survey, collect data) to test hypotheses and events: a) Monitor soil moisture content and soil hydraulic properties at various scales related to 1) landscape subsurface hydrology 2) snow accumulation and ablation 3) upscaling from point to pixel - Selker; b) Monitor response to dam removal - Tullos

| Year | Actual |
|---|---|
| 2010 | 1 |

**Output #3**

**Output Measure**

- EFFECTS ON AND PROTECTION OF ENVIRONMENTAL HEALTH AND ECOLOGY: Indicators - Type 3....Develop models and reference data: (soil) a) Evaluate predictive power soil moisture and soil hydraulic models - Selker b) Evaluate evapotranspiration estimating methods for state-wide water resource management - Cuenca

| Year | Actual |
|---|---|
| 2010 | 1 |

**Output #4**

**Output Measure**

- EFFECTS ON AND PROTECTION OF ENVIRONMENTAL HEALTH AND ECOLOGY: Indicators - Type 3b....Develop models and reference data: (steams/rivers) c) Investigate aquifer recharge project design to enhance stream habitat and increase available water resources, examine management scenarios (5) Cuenca and Selker d) Investigate biotic-abiotic interactions and responses to disturbance in aquatic environments relative to river management strategies (5) - Tullos

| Year | Actual |
|---|---|
| 2010 | 1 |

**Output #5**

**Output Measure**

- EFFECTS ON AND PROTECTION OF ENVIRONMENTAL HEALTH AND ECOLOGY: Indicators - Type 3c....Develop models and reference data: (watershed) e) Examine coupled natural and human systems through watershed scale and river basin scale water resource simulation models and decision tools (whole system, vegetation, ecosystem services models) - Bolte and Cuenca f) Understand human elements in natural resources management (human surveys, analyses of landscape actors and social institutions) and conduct multiagent and adaptive management modeling - Bolte and Cuenca

| Year | Actual |
|---|---|
| 2010 | 1 |

**Output #6**

**Output Measure**

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

| Year | Actual |
|---|---|
| 2010 | 30 |

**V(G). State Defined Outcomes**

## V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Knowledge Indicators - Type 1...People provided information: - Informed decision-makers and citizenry - Better informed extension faculty - Better informed watershed councils and irrigation managers - Better informed agricultural producers - Trained scholars and peers |
| 2 | Knowledge Indicators - Type 2a - better understanding about water resource systems (and soil) * interconnectivity of soil and water resources |
| 3 | Knowledge Indicators - Type 3 Better tools and models, e.g., flumes, continuous data probes, revised models, coupled models |
| 4 | Action/Application Indicators - Type 1 Decision-makers use resource allocation or management tools e.g., Revised Oregon Irrigation Water Requirements Guide, websites |
| 5 | Action/Application Indicators - Type 2 Improved irrigation water management |
| 6 | Condition Indicators - Type 1 - Environmental a) Improved water availability and quality b) Improved watershed hydrology |
| 7 | Knowledge Indicators - Type 2b - better understanding about water resource systems (organisms) * aquatic species habitat and survival, |
| 8 | Knowledge Indicators - Type 2c - better understanding about water resource systems (management) * effects of management strategies |

**Outcome #1**

**1. Outcome Measures**

Knowledge Indicators - Type 1...People provided information: - Informed decision-makers and citizenry - Better informed extension faculty - Better informed watershed councils and irrigation managers - Better informed agricultural producers - Trained scholars and peers

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 20 | 20 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The community needs to have a sound understanding of watershed stewardship and sustainable irrigation and land use practices. The community needs cooperative action to address many watershed stewardship issues including irrigation efficiency, irrigation-induced erosion, contaminated surface and ground water, invasive weeds, etc. Youth in our schools need to develop objective knowledge about watersheds, avoiding the adoption of extreme unbalanced views. Help foster the formation and growth of watershed councils and other associated groups. Conduct research and education programs promoting watershed health complementary to watershed councils' efforts. Build aspects of watershed internet services that provide access to information to educate the public on valuable plants, invasive weeds, and locally adapted technology. Provide a "hands on" experience to all 5th graders in the county (and some surrounding cities) so that they have a notion of the complexities of watersheds.

**What has been done**
Provided and continue to provide technical advice to local leaders when possible. We conducted demonstrations of improved irrigation practices that would reduce erosion. A database was established on the Internet that has thousands of pictures of the vegetation of local watersheds, as well as pictures of outstanding geological/geographic sites of Malheur County. The vegetation database has a special search function so that the public can find the plant of interest using fragmentary information about the plant's name or appearance. With the Owyhee Watershed Council acting as the lead, we initiated annual "Owyhee Watershed 5th Grade Field Days" incorporating water quality, irrigation, aquifers, crop production, energy, energy conservation, range management, fire, wildlife, wild horses, erosion, soils, cattle nutrition, noxious weeds, geology, rafting, etc. The purpose of this field day is to provide a fun, hands-on way for students to learn about the watershed in which they live. Watershed Internet services include a virtual

"Owyhee Field Day" for fifth graders.

**Results**
The Malheur-Owyhee Watershed Council developed effective restoration projects and spawned the Malheur Watershed Council, the Lower Willow Creek Working Group in association with the Malheur Watershed Council, the Owyhee Watershed Council, and the Jordan Creek weed management area in association with the Owyhee Watershed Council. All four groups actively involve growers and ranchers in numerous watershed restoration and improvement projects each year. About 600-700 students participate each year in the Owyhee Watershed 5th Grade Field Day, with each group of 15 students guided by an FFA student as a behavior role model. The field day experience provides students with an introductory conceptual framework of watershed factors and interactions. In 2009 the Owyhee Watershed Council started sponsoring an annual Hydrology Camp to interest high school students in watershed science. Seven local residents working within these watershed groups have received honors from the Oregon governor for environmental leadership during the past decade.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 101 | Appraisal of Soil Resources |
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 111 | Conservation and Efficient Use of Water |
| 112 | Watershed Protection and Management |
| 132 | Weather and Climate |
| 133 | Pollution Prevention and Mitigation |
| 403 | Waste Disposal, Recycling, and Reuse |
| 404 | Instrumentation and Control Systems |
| 405 | Drainage and Irrigation Systems and Facilities |
| 902 | Administration of Projects and Programs |

**Outcome #2**

**1. Outcome Measures**

Knowledge Indicators - Type 2a - better understanding about water resource systems (and soil) * interconnectivity of soil and water resources

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 4 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**

To investigate new methods of monitoring complex agro-hydrologic systems we have developed an entirely new line of methods based on fiber optic temperature sensing. Using this method we can measure temperature, soil moisture, soil water flux, groundwater upwelling in streams and atmospheric turbulence at spatial resolution of 25 cm along transects of up to 2,500m, resulting in up to 10,000 simultaneous measurements. We are also developing wireless networked sensors which can report all micro-meteorological parameters, soil moisture, and other sensor readings (e.g., load cells). We are addressing:

1.Irrigation optimization management in field crops with distributed fiber optics
2.Precision water management in container nurseries with wireless sensors
3.Aquifer recharge and recovery for habitat and agricultural water supply based on simulation and measurement
4.Stream habitat status and restoration efficacy based on continuous distributed temperature sensing.
5.Impact of soil structure and swelling on runoff and infiltration
6.Use of hybrid Poplar trees for waste water treatment
7.Use of wetlands with permeable lower boundaries for hyporheic recharge for stream restoration.

**What has been done**

1.Irrigation optimization management in field crops with distributed fiber optics
Heatable fiber optic cables have been installed in Hermiston Oregon, Madrid, Spain, and Oklahoma City, Oklahoma where we are perfecting the soil moisture measurement for agricultural applications. These efforts are supported by parallel laboratory calibration efforts.
2.Precision water management in container nurseries with wireless sensors
A network of wireless sensing systems was installed in a commercial nursery in Newberg Oregon. These data are being compare to the performance metrics to develop a real-time, low-cost precision irrigation control system for container nurseries.
3.Aquifer recharge and recovery for habitat and agricultural water supply based on simulation and measurement
Three-dimensional unsaturated-saturated modeling (HYDRUS-3D) with analytical models to develop a predictive framework to identify the relationship between size, vadose zone properties, and net recharge for aquifer storage and recovery projects in the Walla Walla basin. These results are being combined with large-scale (100 km^2 three dimensional basin models to provide a planning tool for this community. Results presented December 2010.
4.Stream habitat status and restoration efficacy based on continuous distributed temperature sensing.
Observations have been made in 5 2-km reaches of the Walla Walla, Middle Fork John Day, and Big Boulder rivers using fiber optic temperature sensing. Each reach has been modeled with the stream temperature model ?Heat Source? to provide a validated, comprehensive, physically based representation of these streams for use by collaborating fisheries and wildlife management colleagues.

**Results**

CTEMPS. In water resources management, inability to obtain precise measurement of soil moisture and soil water flux across a landscape have been huge impediment to understanding and managing water resources. The methods we have developed have resulted in the emergence of a new branch of scientific experiments making use of the fiber optic method for observations. We have been overwhelmed by interest in these efforts, and lead us to propose the establishment of a National Center to extend these methods beyond our laboratories. In 2009 we received funds from the National Science Foundation to establish the Center for Transformative Environmental Monitoring Systems (CTEMPS.org), which has now enabled over 20 teams to use this method. We provide instrumentation, technical support, and assistance in the field to help teams to successfully make use of this powerful method.

STREAM MONITORING. We participate in the Middle Fork John Day, Walla Walla, and Big Boulder Creek restoration efforts. We have strongly influenced the approach, location, and kind of restoration undertaken on these sites.

NOVEL METHODS FOR SOIL PHYSICAL MONITORING. We have developed real-time methods of observing the dynamics of crack openings in soils under natural conditions which allows understanding of these complex dynamic systems in varied settings.

NURSERY MANAGEMENT. We have demonstrated the use of wireless sensors providing rich, real-time data on irrigation status of nursery crops. These have traditionally be highly over-irrigated, and with this method should be able to be more exactly managed, reducing both water and nutrient application, as well as reducing pests.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 101 | Appraisal of Soil Resources |
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 111 | Conservation and Efficient Use of Water |
| 112 | Watershed Protection and Management |
| 133 | Pollution Prevention and Mitigation |
| 404 | Instrumentation and Control Systems |
| 405 | Drainage and Irrigation Systems and Facilities |
| 902 | Administration of Projects and Programs |

**Outcome #3**

**1. Outcome Measures**

Knowledge Indicators - Type 3 Better tools and models, e.g., flumes, continuous data probes, revised models, coupled models

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 3 | 4 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
This project focuses on improving our understanding of how biophysical systems, management actions, and socio-economic influences interact to affect sustainability in a variety of landscapes. We highlight two here: understanding dynamics of fire-prone landscapes under climate change, and futures assessments in two urbanizing areas in Puget Sound. The first integrates social and ecological sciences to study a fire-prone landscape in central Oregon that includes private, state, federal, and tribal lands. We are developing a rich representation of social network influences on actor decision-making in this landscape, and coupling that with models of vegetation dynamics, fire, and habitat to identify policies and strategies for achieving landscape management goals. The second involve two effort in Puget Sound. The Envision Skagit 2060 project seeks to develop and implement a broadly-supported, 50-year plan to protect the Skagit and Samish River watersheds' many environmental values, maintain highly productive natural resource industries, and accommodate population growth in livable, walkable, and economically vibrant communities. A similar project is underway in Kitsap County, WA.

**What has been done**
We have implemented a series of simulation models, spatial datasets, and decision tools to assess future trajectories of change in each of these systems. We have implemented a mixed multi-agent/conventional simulation and decision tool, Envision, in these regions and worked with stakeholders to articulate drivers of future scenarios or change, and simulated those future trajectories.

**Results**
1)Inclusion of Envision alternative futures modeling in planning processing in Kitsap County WA and Skagit County WA.
2)Development of new simulation models for fire and land use interactions, vegetative succession, and carbon storage in the Willamette Valley, OR.
3)Development of a new course with 20 undergraduate and graduate students focused on understanding climate change impacts and policies.
4)Training of 3 graduate students and 3 post-doctoral researchers in simulation and analysis of coupled natural/human systems

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|

| | |
|---|---|
| 101 | Appraisal of Soil Resources |
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 111 | Conservation and Efficient Use of Water |
| 112 | Watershed Protection and Management |
| 132 | Weather and Climate |
| 133 | Pollution Prevention and Mitigation |
| 403 | Waste Disposal, Recycling, and Reuse |
| 404 | Instrumentation and Control Systems |
| 405 | Drainage and Irrigation Systems and Facilities |
| 902 | Administration of Projects and Programs |

**Outcome #4**

**1. Outcome Measures**

Action/Application Indicators - Type 1 Decision-makers use resource allocation or management tools e.g., Revised Oregon Irrigation Water Requirements Guide, websites

Not Reporting on this Outcome Measure

**Outcome #5**

**1. Outcome Measures**

Action/Application Indicators - Type 2 Improved irrigation water management

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Current irrigation management in containerized nursery production results in the over-application of water. This increases the leaching fraction resulting in increased leaching of nutrients and pesticides. These practices result in water misuse and threaten water quality.

**What has been done**
Growers were educated on current irrigation scheduling research and practices through workshops, seminars, and a popular article. In addition, we are conducting research to determine impact of irrigation schedules on crop growth and water use efficiency. We are also developing a technique to monitor water use and schedule irrigation on a gravimetric basis. This method has had the added benefit of providing insight into diurnal water use throughout the season.

**Results**
Irrigation scheduling by leaching fraction in container nurseries in the Willamette Valley and in the Midwest has reduced water use by >30%. Ted Bilderback (North Carolina State University) and I have completed 'proof of concept' on a gravimetric irrigation controller, which determines when and how much to irrigate based on water lost between irrigation events. This system is now undergoing further development with Oregon State University Ecological and Agricultural Engineering and Carnegie Mellon University to create a water monitoring system and irrigation controller, respectively. The gravimetric approach could decrease water use by a minimum of 100,000 gal per growing acre per year.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 111 | Conservation and Efficient Use of Water |
| 112 | Watershed Protection and Management |
| 404 | Instrumentation and Control Systems |
| 405 | Drainage and Irrigation Systems and Facilities |

**Outcome #6**

**1. Outcome Measures**

Condition Indicators - Type 1 - Environmental a) Improved water availability and quality b) Improved watershed hydrology

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 3 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

This work investigates responses of abiotic and biotic components of river systems to management actions, with emphasis on dam removal and dam operations. My lab has successfully solicited funding for studying the removal of seven dams and barriers in Oregon.

**What has been done**
We have made observations of the ecology and physical characteristics of the Calapooia River, Rogue River, Sprague River, and Oak Creek to describe responses of the channel to barrier removal. Observations include channel bathymetry, substrate, velocities, streamflow, woody debris, vegetation, benthic macroinvertebrates, and fish. Data have been used to link biotic and abiotic responses, to model system behavior, and to investigate monitoring approaches. While our research on dam operations research is still developing, research assistants are developing operations and hydrodynamic models for the Santiam River, the Sacramento River, and the Willamette River.

**Results**
In short, this project has led to improved understanding of and new models for predicting sediment processing with small and medium barrier removals, new partnerships with agencies and organizations,
support for watershed councils and engineering consultants for project design, and investigation of the adequacy of current and alternative approaches to dam operations. Several additional manuscripts are in preparation, and several more are expected as the dam operations research progresses.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 111 | Conservation and Efficient Use of Water |
| 112 | Watershed Protection and Management |
| 133 | Pollution Prevention and Mitigation |
| 403 | Waste Disposal, Recycling, and Reuse |
| 404 | Instrumentation and Control Systems |
| 405 | Drainage and Irrigation Systems and Facilities |

## Outcome #7

### 1. Outcome Measures

Knowledge Indicators - Type 2b - better understanding about water resource systems (organisms) * aquatic species habitat and survival,

Not Reporting on this Outcome Measure

**Outcome #8**

1. **Outcome Measures**

Knowledge Indicators - Type 2c - better understanding about water resource systems (management) * effects of management strategies

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.)

**Brief Explanation**

{No Data Entered}

**V(I). Planned Program (Evaluation Studies and Data Collection)**

**Evaluation Results**

{No Data Entered}

**Key Items of Evaluation**

{No Data Entered}

## V(A). Planned Program (Summary)

**Program # 5**

**1. Name of the Planned Program**

Global Food Security and Hunger

### V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

| KA Code | Knowledge Area | %1862 Extension | %1890 Extension | %1862 Research | %1890 Research |
|---|---|---|---|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships | | | 5% | |
| 111 | Conservation and Efficient Use of Water | | | 5% | |
| 121 | Management of Range Resources | | | 5% | |
| 202 | Plant Genetic Resources | | | 5% | |
| 204 | Plant Product Quality and Utility (Preharvest) | | | 5% | |
| 205 | Plant Management Systems | | | 5% | |
| 206 | Basic Plant Biology | | | 5% | |
| 216 | Integrated Pest Management Systems | | | 10% | |
| 301 | Reproductive Performance of Animals | | | 5% | |
| 302 | Nutrient Utilization in Animals | | | 5% | |
| 307 | Animal Management Systems | | | 5% | |
| 501 | New and Improved Food Processing Technologies | | | 5% | |
| 502 | New and Improved Food Products | | | 5% | |
| 511 | New and Improved Non-Food Products and Processes | | | 5% | |
| 601 | Economics of Agricultural Production and Farm Management | | | 5% | |
| 602 | Business Management, Finance, and Taxation | | | 5% | |
| 603 | Market Economics | | | 5% | |
| 607 | Consumer Economics | | | 5% | |
| 803 | Sociological and Technological Change Affecting Individuals, Families, and Communities | | | 5% | |
| | **Total** | | | 100% | |

## V(C). Planned Program (Inputs)

**1. Actual amount of professional FTE/SYs expended this Program**

| Extension | Research |
|---|---|

| Year: 2010 | 1862 | 1890 | 1862 | 1890 |
|---|---|---|---|---|
| Plan | 3.0 | 0.0 | 42.9 | 0.0 |
| Actual | {NO DATA ENTERED} | {NO DATA ENTERED} | {NO DATA ENTERED} | {NO DATA ENTERED} |

**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 | 1550024 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 0 | 0 | 0 | 0 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 0 | 0 | 0 | 0 |

## V(D). Planned Program (Activity)

### 1. Brief description of the Activity

Organic, value-added, and technological (bio-based, information-centered, robotic, nanotechnology, etc.) approaches complement conventional agriculture. By utilizing contemporary research tools in agronomy, animal or soil science, plant nutrition and pest management this program will develop improved practices for cropping and animal production systems that will enhance the potential use of alternative crops, reduce soil erosion, reduce the economic, social, and environmental costs of crop pests, and maintain or increase soil biological, chemical and physical properties. Animal systems will reduce wastes and discharges while improving productivity and husbandry techniques.

Research and extension will also look at key areas of various social changes in the marketplace impacting producers, retailers and consumers. The research aims to determine (1) how technology impacts producers/retailers/consumers in the market place, with a special emphasis on rural markets in America; (2) how society impacts consumer demand for goods and services with a goal of improving the well-being of consumers; and (3) how to develop economic linkages among producers, retailers, and consumers for the community development.

In addition, a broad coalition of agricultural, environmental and food groups has coalesced around the need for a single, integrated center for sustainable agriculture and food systems information, research, and education. Over the past decade, the Oregon Agricultural Experiment Station has been building core expertise systematically across the range of agriculture disciplines. The creation of an Oregon Sustainable Agriculture and Food Systems Research, Education and Outreach Center will allow existing and newly acquired expertise from strategic investments to be mobilized in a targeted, coordinated, systematic response tailored to these emerging needs. The center will coordinate its activities with and through the various departments, Extension offices, and Agricultural Research Stations. In addition it will coordinate resources and efforts with the Institute for Natural Resources, the Institute for Water and Watersheds, and the Rural Studies Program. This resource center will be web-based and will draw on contributions from many state and federal agencies, non-profit organizations, certifiers, and others as needed. Outcomes include more economically and ecologically sustainable farms and ranches; a more

resilient rural economy; stronger bonds between rural, urban, and periurban residents; and a healthier environment for all Oregonians.

Conduct Research Experiments
Conduct surveys
Conduct Workshops, Meetings
Deliver Services
Provide Training
Provide Demonstrations
Provide Counseling
Assessments
Work with Media
Partnering
Facilitating

**2. Brief description of the target audience**

- Professional peers and scientific communities, extension faculty, veterinarians, vaccine producers
- State commodity commissions, grower groups, packers, crop consultants
- Natural resource industry clientele &ndash growers, field representatives, grower co-ops and partnerships, processors and handlers, export companies, importing companies
- County, state and federal agencies &ndash USDA-ARS, Oregon Department of Agriculture, Natural Resources Conservation Service, Bureau of Indian Affairs, Confederated Tribes of the Umatilla Indian Reservation, US Forest Service, and Bureau of Land Management
- Policy makers, public health officials, and community leaders
- Teachers and students
- Extension personnel and other educators
- Genetic companies
- Nutritional consultants
- Nonprofit conservation groups and ecologists
- General public and consumers

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

| 2010 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Actual** | 30000 | 80900 | 800 | 1200 |

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

Year: 2010
Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

| 2010 | Extension | Research | Total |
|---|---|---|---|
| Actual | 4 | 148 | 152 |

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- DEVELOP BETTER UNDERSTANDING OF BASIC PHYSIOLOGY OF PLANTS AND ANIMALS...Indicator 1- Environmental response by plants o Evaluate protein supplement of cool versus warm season forage o understand responses to environmental signals, germination, growth and development pathways

| Year | Actual |
|---|---|
| 2010 | 2 |

**Output #2**

**Output Measure**

- DEVELOP BETTER UNDERSTANDING OF BASIC PHYSIOLOGY OF PLANTS AND ANIMALS ...Indicator 2 - Animal reproductive factors o Identify factors affecting reproduction, e.g., physiological constraints limiting gamete viability, differentiation and outgrowth of endodermal cells from the bovine inner cell mass during the formation of extraembryonic endoderm, the relationship and interactions between the immune and reproductive systems with regard to establishment and maintenance of pregnancy.

| Year | Actual |
|---|---|
| 2010 | 3 |

**Output #3**

**Output Measure**

- CARRY OUT STUDIES TO DECIPHER GENOMES, GENETICS AND MECHANISMS...Indicator 1- Bacteria And Viruses And Other Microorganisms o Obtain insights to evolutionary histories of microbes and plants, e.g, nitrifying bacteria within microbial communities and the unique niches of different species of nitrifying bacteria, o Identify differences and similarities among microorganisms in mono- and co-cultures.

| Year | Actual |
|---|---|
| 2010 | 3 |

**Output #4**

**Output Measure**

- CARRY OUT STUDIES TO DECIPHER GENOMES, GENETICS AND MECHANISMS...Indicator 2 - Genetic diversity and function o Identify novel and previously unknown genes, microarray analysis of genes o Determine the role of specific genes and model metabolism o Identify co-regulated gene sets by their function. o Characterize genetic diversity in economically important crop plants, o Further understand the interaction of antagonistic signaling pathways

| Year | Actual |
|---|---|
| 2010 | 3 |

**Output #5**

**Output Measure**

- CARRY OUT STUDIES TO DECIPHER GENOMES, GENETICS AND MECHANISMS...Indicator 3 - Disease resistance and higher tolerances o Carry out molecular breeding in adapted germplasm o Understand disease resistance, defense pathways o Develop transgenic lines of higher tolerances, e.g., freezing, morphology and yields

| Year | Actual |
|---|---|
| 2010 | 2 |

**Output #6**

**Output Measure**

- CARRY OUT STUDIES TO DECIPHER GENOMES, GENETICS AND MECHANISMS...Indicator 4 - Reproduction factors o Know expression patterns and identity of cells expressing suppressors of cytokine signaling genes, and how these genes are regulated in reproductive tissues o Describe effects of the reproductive hormones on gene expression and cell function o Understand genetic load present in economically significant populations of poultry based upon the identification of embryonic failures (e.g., in Coturnix quail)

| Year | Actual |
|---|---|
| 2010 | 3 |

**Output #7**

**Output Measure**

- BREEDING PROGRAMS THAT RESULT IN DESIRABLE TRAITS, CULTIVARS AND VARIETIES...Indicator - improved traits. o Improved breeding lines and new varieties for barley, meadowfoam, potato, wheat (for general public and/or licensed release and special market opportunities) o Improved crop quality including wheat and potato starches and proteins, oil quality and quantity in meadowfoam/canola/mustard/camellina and of glucosinolates o Improved germplasm for year-round marketing. o Alkaline tolerant poplar tree varieties for saw log production on poor and sloping soils with the aid of drip irrigation. o Improved horticultural crops to meet the needs of industry, e.g., hazelnut, beans, snap pea, tomato, apples, broccoli, organic lines

| Year | Actual |
|---|---|
| 2010 | 5 |

**Output #8**

**Output Measure**

- DEVELOP IMPROVED ANIMAL AND PLANT PRODUCTION SYSTEMS...Indicator 1 - animal reproductive success rates o Develop improved, surviving offspring and appropriate calving dates, o Reduce lambing production inputs (e.g., remove those of high mortality risk) and improve weaned lamb weight o Synchronize forage and carcass data for calf and cow management

| Year | Actual |
|---|---|
| 2010 | 2 |

**Output #9**

**Output Measure**

- DEVELOP IMPROVED ANIMAL AND PLANT PRODUCTION SYSTEMS...Indicator 2 - nutrition, feeding and forage relationships. o Evaluate grazing distribution and use of riparian pastures o Analyze forest fuel reduction/burning and stocking rate effects on cattle diets in mixed conifer rangelands o Identify influence of season on cattle resource selection on mixed conifer rangelands o Investigate influence of early weaning on cattle distribution and use of late season mixed conifer forests o Evaluate influence of overstory management on understory forage quality of stocking rates

| Year | Actual |
|---|---|
| 2010 | 1 |

**Output #10**

**Output Measure**

- DEVELOP IMPROVED ANIMAL AND PLANT PRODUCTION SYSTEMS...Indicator 3 - inputs for plant systems. Dryland crops * Strategies for efficient use of soil nitrate and the other available N sources, nitrogen management * Improved crop management recommendations for nutrients, temperature, moisture and other abiotic stresses, plant growth regulators, attack by other organisms * Nutrient management strategies, e.g., for soft white wheat grown in conservation tillage systems * Potential alternative crops for cereal-based crop rotations; best management practices for alternative crops * A comprehensive understanding of the morphological, physiological and/or genetic basis for plant responses in studied management systems Irrigated crops * Efficient irrigations systems, e.g., subsurface drip irrigation or different bed conformation works with potatoes, automated systems that use soil moisture monitoring to override fixed schedule drip irrigation systems when the soil was too wet * Environmental improvements such as avoiding leaching water and nitrate to groundwater. * Improved nutrient applications Horticultural crops * Precision management systems in vineyards, with nutrition component * Improved production efficiency knowledge and practices, such as new berry cultivars, new rootstocks, grafted stock, cold hardiness, disease resistance, chemical control of pests; nutrient budget recommendations, improved weed management, water use, off-season production methods, water conservation and recycling, soil quality parameters, post-harvest management, and identify alternative crops for pest and weed management * Best management practices for new varieties Small farms. * Improved practices in small farms.

| Year | Actual |
|---|---|
| 2010 | 10 |

**Output #11**

**Output Measure**

- UNDERSTANDING FOR PLANT AND ANIMAL PROTECTION FROM DISEASES AND PESTS TO GROWERS AND PEERS, Indicator 1 - pest management systems * Pest management systems * Weed management with improved herbicides and cultural management * Optimum inputs and agronomically compatible weed management in alternate crops * Biology of yellow nutsedge under local conditions * Decay management programs appropriate to various producer objectives, e.g., efficacy of individual treatments for control of postharvest decay of pear fruit, and quantify and compare the efficacy of treatment programs composed of diverse, multiple control tactics. * Decay risk prediction models for use in orchards and packinghouses * Fumigants used at reduced rates in combination with other nematicides * Crop management systems for suppression of CRKN using suppressive rotation crops, green manure crops and reduced nematicide use * Technologies for efficient application of viral vectors in grapevine.

| Year | Actual |
|---|---|
| 2010 | 4 |

**Output #12**

**Output Measure**

- PROVIDE ADDITIONAL UNDERSTANDING FOR PLANT AND ANIMAL PROTECTION FROM DISEASES AND PESTS TO GROWERS AND PEERS, Indicator 2 - disease resistance * Uncover disease resistance gene evolution in plants and compare evolutionary histories * Develop and release wheat cultivars with improved capacity to resist or tolerate infections by plant-pathogenic fungi and plant-parasitic nematodes * Innovations that mitigate the detrimental effect of Verticillium wilt, probably the most limiting disease of potato in the Treasure Valley * Understand physiological basis of plant disease resistance and susceptibility

| Year | Actual |
|---|---|
| 2010 | 2 |

**Output #13**

**Output Measure**

- PROVIDE ADDITIONAL UNDERSTANDING FOR PLANT AND ANIMAL PROTECTION FROM DISEASES AND PESTS TO GROWERS AND PEERS, Indicator 3 - herbicide identification and resistance * Release new crop varieties with herbicide resistance. * Identify herbicides that can be safely and efficaciously used in different crops * Control downy brome and other weeds through extracts from broadleaf plants (natural herbicides) * Evaluate new herbicide candidates and non-chemical cultural practices under field conditions for weed control effectiveness, crop safety, and soil persistence

| Year | Actual |
|---|---|
| 2010 | 5 |

**Output #14**

**Output Measure**

- PROVIDE ADDITIONAL UNDERSTANDING FOR PLANT AND ANIMAL PROTECTION FROM DISEASES AND PESTS TO GROWERS AND PEERS, Indicator 4 - pathogen and pest biology * Develop basic knowledge of pests by conducting pest biology trials at lab, growth chamber, greenhouse, small plot and/or field scale levels; control of slugs, symphilids, crane flies, cereal leaf beetle; native and invasive grassy and broadleaf weeds including wild oat, brome spp., jointed goatgrass, annual bluegrass, and clover broomrape, Sudden oak death, orchardgrass, choke pathogens, cereal leaf beetle * Understand species complex and fungicide sensitivity

| Year | Actual |
|---|---|
| 2010 | 5 |

**Output #15**

**Output Measure**

- Output Measure 6 - EFFECTS ON AND PROTECTION OF ENVIRONMENTAL HEALTH AND ECOLOGY...Indicator 1 - erosion control experiments o Conduct large plot studies in commercial wheat fields to develop season-long chemical fallow management systems and compare chemical fallow treatments with conventional tilled summer.

| Year | Actual |
|---|---|
| 2010 | 1 |

**Output #16**

**Output Measure**

- EFFECTS ON AND PROTECTION OF ENVIRONMENTAL HEALTH AND ECOLOGY Indicator 2 - animal effects o Analyze competition between deer, elk, and cattle in grazing impacts o Develop more economical and environmentally sustainable dairy and beef production systems that meet new environmental requirements

| Year | Actual |
|---|---|
| 2010 | 2 |

**Output #17**

**Output Measure**

- EFFECTS ON AND PROTECTION OF ENVIRONMENTAL HEALTH AND ECOLOGY...Indicator 3 - green management practices for horticultural crops o Develop green or organic practices for industry, such as plants adapted to specific sites and specific environmental purposes, ecological orchard systems, organic cover crops o Model the spread of an invasive species making use of genomics (microarray, sequencing) and ecological (field/greenhouse experiments) data.

| Year | Actual |
|---|---|
| 2010 | 4 |

**Output #18**

**Output Measure**

- Output Measure 7 - PROVIDE ECONOMIC AND MARKETING MODELS AND ANALYSES THAT INFORM DECISION-MAKERS, INDUSTRY, AND PEERS...Indicator 1 - land use management analyses. o Assess land ownership fragmentation and economic impacts o Develop ranch economic models o Develop framework to integrate economic, social, and ecological aspects of rangeland sustainability o Evaluate use of rangeland website o Identify policy alternatives for fire and fire surrogate management

| Year | Actual |
|---|---|
| 2010 | 4 |

**Output #19**

**Output Measure**

- PROVIDE ECONOMIC AND MARKETING MODELS AND ANALYSES THAT INFORM DECISION-MAKERS, INDUSTRY, AND PEERS...Indicator 2 - markets and trade analyses o Provide information to producer groups on factors shaping global markets. o Use model to show key relationships that tie climate change to the distribution of crop yields, comparative advantage, geography, and international trade. o Show productivity-convergence effects resulting from product trade and foreign direct investment (channels of international knowledge flow and rate of productivity convergence)

| Year | Actual |
|---|---|
| 2010 | 2 |

**Output #20**

**Output Measure**

- PROVIDE ECONOMIC AND MARKETING MODELS AND ANALYSES THAT INFORM DECISION-MAKERS, INDUSTRY, AND PEERS...Indicator 3 - profitability and productivity studies o Productivity factors to measure technological strength of U.S. agriculture and processed food industries o Studies of community based micro processing centers for agricultural products

| Year | Actual |
|---|---|
| 2010 | 5 |

**Output #21**

**Output Measure**

- Output Measure 8 - DEVELOP AND ENHANCE VOLUNTEER PROGRAMS FOR BROADER APPLICATION OF RESEARCH AND EXTENSION INFORMATION o Reach Master Gardners (new, past, and current) through MG training programs and materials, websites, and other distance education programs o Refine OSU Urban and Community Horticulture Website to reach new audiences.

| Year | Actual |
|---|---|

| | |
|---|---|
| 2010 | 100 |

**Output #22**

**Output Measure**

- Output Measure 9 - DEVELOP DISTANCE and OTHER EDUCATION OUTLETS TO FURTHER REACH CLIENTELE. o Develop new databases and frequently most asked questions for eXtension o Compare perceptions of science teachers and agriculture teachers on integrating science into the agriculture curriculum

| Year | Actual |
|---|---|
| 2010 | 5 |

**V(G). State Defined Outcomes**

## V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | KNOWLEDGE, Indicator 1a - horticultural plant production management systems. * Growers improve their production systems to remain competitive: precision horticulture, mineral nutrition, new varieties, new cultural practices, innovations, pest control, and organic systems and fundamental aspects of data analysis |
| 2 | KNOWLEDGE, Indicator 2a - animal reproductive biology and management * improved fertility in dairy cattle * reduced uterine infections * management factors that influence loss of potential lambs in commercial ewes |
| 3 | KNOWLEDGE, Indicator 3 - forage and nutrient management * workshops and other forms of teaching provided on issues related to grazing, manure management, and production systems. * Beef industry will understand forage quality dynamics for dominant forage species in Oregon, * Beef industry will understand how management practices can synchronize the relationship between forage nutrient supply and cow nutrient requirements, how pre-weaning and post-weaning calf management practices influence lifetime productivity of the calf and carcass quality and how feedstuffs can influence the health and physiological stress of the calf. |
| 4 | KNOWLEDGE, Indicator 4a - plant breeding for plant attributes. * Growers learn about new cultivars with novel attributes and greatest potential for production in the Pacific Northwest; variety trials published online; Examples: Rotational crop cultivars, Varieties released (with Plant Variety Protection coverage) for general public and/or licensed release * Regulation of embryo maturation in cereals. * Researchers determine sets of genes involved in critical processes, e.g., functions of nitrifiers, including genes involved in mutualistic growth between ammonia and nitrite oxidizers, genes involved in Fe metabolism, and genes involved in autotrophy and lithotrophy. |
| 5 | KNOWLEDGE, Indicator 5b - pest management * Basic pest biology information, * new pesticides registered * Growers become aware of pest management processes, including level of management required, risks associated with this pest as it becomes established, * Fumigants used at reduced rates in combination with other nematicides are likely to be the optimum management strategies for control of CRKN. |
| 6 | KNOWLEDGE, Indicator 6a - economic studies * Producer groups learn about factors shaping global markets and productivity-convergence effects on US agricultural and processed food production and trade. |
| 7 | Action Indicator 1 - Adoption of new varietals o reduce yield losses and expenses, o rejuvenate orchards o achieve better productivity and efficiency: o provide environmental benefits (less fungicide applications, etc.), o effectively compete on world market with new varieties o Commercial processors and fresh market growers, as well as home gardeners, achieve greater production efficiency, more stable productivity, and reduced costs from the use of improved varieties. |
| 8 | Action Indicator 2 - Improved animal fertility and genetic stock o Producers and animal health professionals improve fertility and prevent uterine infections in dairy cattle from implementing every-day on-farm practices. o Industry stores sperm cells with minimal loss of function for use as a commodity and for long-term maintenance of genetic stock |
| 9 | ACTION Indicator 3a - animal management tools used by private sector * Beef producers improve their economic competitive advantage and improve the ecological sustainability of production systems. * manure management |
| 10 | Action Indicator 4 - conservation strategies adopted o Conservation bio-control strategies are implemented differently and active restoration strategies occur. Land owners and managers assess ecosystem services provided by their riparian restorations via a user-friendly web |

| | |
|---|---|
| | tool. o Growers adopt improved, scale-dependent practices selected for various market niches with emphasis on reducing environmental degradation and impact. Commercial small farms will have more diverse and economically viable technologies and production techniques or systems available for their use o Growers implement drip irrigation and produce more marketable yields of onions, potatoes, and poplar trees than with furrow or sprinkler irrigation.and achieve efficient use of soil nitrate and the other available N sources under drip irrigation. o Generation of the viral vectors for grapevine disease control and functional genomics vectors have a potential for replacing current strategies of using chemical fungicides and bactericides with viral biocontrol strategies. |
| 11 | Action Indicator 5 - improved agricultural economies o The knowledge generated about productivity-convergence will be crucial in designing policies to improve the welfare of agricultural producers and food processors and the general public who will be affected by the evolution of these industries (e.g., food quality and safety, resource scarcity and pollution). o Domestic policymaking and multilateral trade negotiations will mitigate effects of climate change in reduction of trade barriers and subsidies. o Climate change will be related to changes in comparative advantage in international crop production, and in turn the pattern and volume of trade. This information will be important in the context of domestic policymaking and multilateral trade negotiations as it pertains to reduction of trade barriers and subsidies. |
| 12 | Change Indicator 1 - Ecological / Environmental o Landscapes will impact the way Oregonians use and manage plants to create beauty, modify environment, and improve health and well-being of individuals and communities. This program will change the way people use plants to modify their environment such as moderating temperature on buildings, improving water infiltration on surfaces, contributing to ecosystem services at landscape or watershed scales, etc. o Food/farm systems reduce surface and/or groundwater or other pollution in the environment, while improving nutrient and water budgets, and organic production systems. o New reduced risk, environmentally safer pest control tools will be available that are target pest specific will facilitate the implementation of IPM programs. o Environmental change will occur from temperature modifications; enhanced water conservation and wildlife; reduced runoff, fire incidence and pests; improved nutrient use and recycling; and other ecosystem services. o Better ecological methodologies will lead to more social, economic, and environmental benefits and cost effective and sustainable restoration. Improved valuation of ecological services associated with restorations will greatly facilitate market-based conservation practices such as mitigation banking and effluent trading. Better conservation bio-control strategies will decrease the costs associated with insect losses and the use of insecticides. o enhance the nation's natural resource base and environment by revealing cost-effective means to control plant diseases and reduce the need for pesticides. o Biocontrols will reduce environmental damage and costs of grape growing and facilitate the development of the table and wine grapes with improved quality and nutritional value and therefore to increase competitiveness of the US grape growers and wine makers at the world markets. o Improved soil, water, and crop management practices and strategies that protect Oregon resources o Management of public and private rangelands will sustain and improve ecological values as desired by the public and the rural communities that depend on the natural resources. o Strategies for avoiding invasive pests will be in place o Plant disease resistance will lower the amount of pesticide use, resulting in a more healthful environment and reduced exposure of humans to hazardous chemicals. |
| 13 | Change Indicator 2 - Societal o Social change will occur through new perceptions of green technologies and social value or capital of horticultural landscapes to enhance human health, therapy, wellness, and social networks. o Social impacts include consumer awareness and appreciation of the abundance of locally grown ornamental plant materials and native species for use in landscapes will increase; also awareness of invasive species. o Social change will enhance quality of life in rural areas by improving economic stability of family farms, wineries, |

| | |
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| | wine tasting, and tourism with new practices and cropping systems and/or livestock management practices/systems. o Social change will improve economic stability of families and quality of life with improved cropping systems. o Worker safety with bio-based pest control and dwarf rootstocks (short ladders) will be improved; farm workers will find other employment with increased mechanization. Local and community markets increase social networking in rural communities. o Increased opportunities for rural community marketers and processors will be developed; o Public health will be improved through the use of crops with improved nutritional value o Sustainable and economically viable wheat and dryland cropping industry for vibrant rural economy in eastern Oregon o The public has access to an ongoing research data base that allows for natural resource/land management decisions to have a fundamental basis in science. |
| 14 | Change Indicator 3 - Economic o The economic value of landscapes will increase. Cost and benefit analyses of plants usage to modify environments with green technologies will reveal positive economic impacts and improved health and wellness from horticultural therapy. o Economic impacts include reduced costs, increased benefits, and production efficiencies from use of water and nutrient budgets in recycled water systems, improved pest management, and diagnosis of plant problems to increase sales of quality products. Costs of regulatory procedures will be reduced with water and nutrient budgets and management systems. o Profitability of berry crops in Oregon is expected to improve as new cropping systems, cultivars, practices, and efficiencies are implemented. Machine harvest technologies will be adapted or developed for Oregon to reduce production costs and improve competitiveness in global markets. o Profitability of vegetable and specialized seed crops is expected to improve as new cropping systems, cover crops, nitrogen management, reduced tillage, and cultivars are adopted by growers. Communication networks will enable timely communication and utilization of technologies to alert growers of weather related pest incidence, educational events, and practices. o Profitability of viticulture in Oregon is expected to improve as new cropping systems, cultivars, practices, and efficiencies are implemented. Niche markets, wine tasting, and tourism are primary outlets for Oregon wines. o Profitability of tree fruits and nut crops in Oregon is expected to improve as new cropping systems, cultivars, practices, and efficiencies are implemented. High density orchards are expected to improve production efficiencies and increase markets. o Agricultural producers will realize greater economic return in their cropping enterprises; Plant nutrient and other production input use will be optimized o Producers maximize the control of postharvest decay within the various production and marketing objectives of producers. o Biocontrols will reduce environmental damage and costs of grape growing and facilitate the development of the table and wine grapes with improved quality and nutritional value and therefore to increase competitiveness of the US grape growers and wine makers at the world markets. o Higher-value niche markets will be established o Beef producers in the Intermountain and Great Basin areas remain completive on a regional, national, and global basis. o Producers greatly improve their reproductive efficiency by removing bad genes thus increasing productivity and economics of the industry. Industry thus has improved resource and economic sustainability through reduced costs and/or increased productivity. o Better understanding of the costs, benefits, and potential impact of legislation on the dairy industry, and thus more economically and environmentally sustainable systems for dairy and beef production. o Intense selection reduces needs for assistance in pasture lambing conditions. o Economic viability of farmers markets will be enhanced o Agricultural producers will realize greater economic return in their enterprises; o Increased potato yield will increase potato farmers' income as well as the stability of potato production of the world. The potential increase from 29,000 acres to as much as 100,000 acres will increase Oregon's market share and economic benefits. |
| 15 | KNOWLEDGE, Indicator 1b - landscape management systems. * Professional turf/landscape managers, nursery retailers, gardeners, and people associated with restoration/conservation projects will learn about sustainable gardening practices (eg. fertilizers, water, and pest |

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|---|---|
| | management including organic), turf management, horticulture and aboriculture principles and practices, streamside gardening, native plants, invasive species, fire prevention, methods to minimize water runoff and use, wildlife enhancement, conservation and stewardship, and add value and beauty. |
| 16 | KNOWLEDGE, Indicator 1c - dryland production management systems. * Producers, NRCS, conservation districts and environmental agencies learn about whole farm nutrient management. * Basic agronomic practices for commercially promising alternative crops under reduced tillage systems. |
| 17 | KNOWLEDGE, Indicator 1d - irrigated production management systems. * Growers and the public sector are made aware that environmentally friendly drip and micro sprinkler irrigation systems produce increased crop yield and crop quality and that less nitrogen is required when crops are irrigated than with furrow and regular sprinkler irrigation |
| 18 | KNOWLEDGE, Indicator 1e - marketing approaches * Improved marketing approaches for local markets and community food systems. |
| 19 | KNOWLEDGE, Indicator 2b - animal reproductive genetics. * genetic causes of early embryonic failures, * developmental biology of the early bovine embryo * factors affecting establishment of extraembryonic endoderm * sire genotype effects on embryonic loss * understanding genetic basis for fertility in male poultry including sperm cell function |
| 20 | KNOWLEDGE, Indicator 4b - plant attributes for health. * Antioxidant effects of various carotenoids and flavonoids, and impact of flavonoids on antioxidant effect * Stakeholders learn about human health benefits, disease resistance, and breeding for organic systems of vegetables. |
| 21 | KNOWLEDGE, Indicator 5a - weed control * factors affecting herbicide activity * herbicides registered, * natural herbicides to control weeds in organic and/or no-till wheat production, * improved weed control in no-till fallow systems, including optimum inputs |
| 22 | KNOWLEDGE, Indicator 5c - disease biology, control and resistance * Facilitate future planned activities in functional genomics and provide a more robust sampling of the Pleosporales for comparative genomic studies by the fungal research community. * Efficacy of various orchard, postharvest, and storage methods for control of postharvest decay of pear * Molecular mechanisms responsible for closterovirus reproduction and transport in plants and develop model to predict risk * Functions of the GLRaV-2 proteases in virus reproduction and spread, as well as characterize mechanisms of BYV Hsp70h interactions with actin cytoskeleton and targeting to plasmodesmata; approaches to engineering GLRaV-2 gene expression vectors. * Elucidate the underlying molecular mechanisms of pathogenicity (virulence) and disease susceptibility (compatibility) and disease development. * Technologies for efficient application of viral vectors in grapevine. * Disease resistance discoveries, including gene evolution, plant lines * Information for the development of resistant wheat germplasm to tan spot. * relationships between disease susceptibility and disease resistance. Characterize genes involved in Victoria Blight Disease susceptibility, and uncovered |
| 23 | KNOWLEDGE, Indicator 6b - trade * We expect to show that international trade will be an important vehicle by which adaptations can be made to global climate change. * Researchers will uncover key relationships that tie climate change to the distribution of crop yields, comparative advantage, geography, and international trade. * Policy makers will understand that climate change will be related to changes in comparative advantage in international crop production, and in turn the pattern and volume of trade. * Numerical estimates will be provided regarding how climate change will affect crop prices, production costs, and the economic welfare of producers, consumers, and society at large. |
| 24 | KNOWLEDGE, Indicator 6c - community education. * Ways to integrate agricultural education into high school curriculums |

| | |
|---|---|
| 25 | 1ACTION Indicator 3b - plant management tools used by private and public sector * Farmers will more strategically plan for crop production * Crop rotation sequences and Green manure crops in combination with reduced or no nematicide use, particularly for short season potato crops to suppress nematode populations. * End users adopt new pesticide and pest management systems and strategies for working with invasive pests * District-specific control programs will reduce usage of fungicides with low efficacy and emphasize integrated control practices. |
| 26 | ACTION Indicator 3c - post harvest tools used by private sector * Growers, packers and extension faculty incorporate practices to lower decay risk, including reduced fungicide usage, and identify high risk fruit lots and to market these before decay has time to develop in storage. * Interaction of program components and the overall efficacy of various combinations of orchard, postharvest, and storage factors will be the guides to the description of programs for implementation in the pear industry. * Determine packinghouse water system contamination by fungal pathogens. Commercial service lab can apply PCR technology to maintain sanitation determine most effective fungicides for each species. * Customized decay control program for each unique pathogen complex. |
| 27 | ACTION Indicator 3d - land and invasive species management tools used by private and public sector * Land management protocols will be used in public land management policy decisions. * Understand pollen flow mechanisms between wheat and its wild relative jointed goatgrass |

**Outcome #1**

**1. Outcome Measures**

KNOWLEDGE, Indicator 1a - horticultural plant production management systems. * Growers improve their production systems to remain competitive: precision horticulture, mineral nutrition, new varieties, new cultural practices, innovations, pest control, and organic systems and fundamental aspects of data analysis

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 5 | 5 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

We are continuing with a long-term study to determine the impact of incorporation of sawdust, use of sawdust mulch, and rate of nitrogen fertilization on the long-term soil and plant health, yield and fruit quality of blueberry. Successful blueberry growers having varying fertilizer practices, particularly with regard to rate of nitrogen (N) application; if research were to document lower

rates of N lead to sustainable production of high-quality fruit, then we may affect change in rates applied influencing grower returns and environmental stewardship.

**What has been done**
In fall 2003, we established a new Elliott blueberry planting on raised beds that were either constructed with the incorporation of fir sawdust amendment, or left un-incorporated. Other treatments were mulching with sawdust or bare soil and N fertilizer rate (20, 60, and 100 lb N/a in 2004-05; 2006-2007: 28, 85, and 137 lb N/a; 2008-2009: 35, 100, and 165 lb N/a; 2010-11: 50, 150, and 240 lb N/a).

**Results**
In our long-term study in Elliott blueberry, N fertilization rate has had no effect on yield or fruit quality to date (low rate is one-half to 1/5 of typical rates used by industry). Organic mulches and pre-plant amendments are having little long-term impact on plant yield or quality, but soil properties are being impacted.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 111 | Conservation and Efficient Use of Water |
| 202 | Plant Genetic Resources |
| 204 | Plant Product Quality and Utility (Preharvest) |
| 205 | Plant Management Systems |
| 216 | Integrated Pest Management Systems |

**Outcome #2**

**1. Outcome Measures**

KNOWLEDGE, Indicator 2a - animal reproductive biology and management * improved fertility in dairy cattle * reduced uterine infections * management factors that influence loss of potential lambs in commercial ewes

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Cystic ovarian disease (COD) is an anovulatory condition afflicting 6-18% of dairy cows in the U.S. Ovulation depends on the PA family for the proteolysis culminating in follicular rupture. Ovulation failure suggests a proteolytic aberration in cystic follicles. Polycystic ovarian syndrome (PCOS) in humans is phenotypically similar to COD and is associated with elevated plasma PA inhibitor-1 (PAI-1). Because PAI-1 regulates PA-induced proteolysis responsible for ovulation, a similar pathophysiology may exist in COD. This laboratory has focused on three research areas in bovine reproduction: 1) the role of the E26 transforming specific (Ets) -1 transcription factor in early embryo development, 2) factors regulating endodermal cell migration and 3) involvement of the plasminogen activator (PA) system in cystic ovarian disease (COD). Nothing is known about the role of Ets-1 in bovine embryos. Ets-1 is involved in development, differentiation and protease regulation in frog and mouse embryos and is a logical candidate to participate in the transition from maternal to embryonic control of development. Determining the role of Ets-1 may provide insight into mechanisms contributing to early embryonic death.

**What has been done**

Three experiments evaluated the role of the PA system in COD. In experiment one, plasma from normal dairy cows and dairy cows diagnosed with follicular cysts was assayed for tissue-type PA (tPA) and PAI-1. No differences were detected between cystic and normal dairy cows. In experiment two, mRNA was isolated from follicular cysts and preovulatory follicles and RT-PCR were performed. Urokinase-type PA expression was reduced and uPA receptor expression was greater in follicular cysts compared to preovulatory follicles. In experiment three, DNA was extracted from whole blood from cystic and normal dairy cows and the promoter region of the PAI-1 gene was sequenced. Although no polymorphisms associated with COD were found in Holstein cows, Jersey cows with COD possessed a four basepair deletion polymorphism. Unlike PCOS in humans, bovine COD is not typified by alterations in plasma PAI-1 or tPA. However, differences in the PA system exist between normal cows and cows with COD at the ovarian and genomic levels.

**Results**

New information has been provided regarding the developmental biology of the early bovine embryo and COD. Research into factors affecting cell division, enzyme production and cell migration in the early embryo may provide valuable insights into mechanisms predisposing the embryo to pregnancy loss due to asynchrony with the uterine environment. Knowledge gained in researching COD may lead to the development of protocols aimed at correcting the aberrant protease-protease inhibitor milieu at the ovarian level and a selection strategy to identify Jersey cows possessing the polymorphism by genotyping.

Expected outcomes include a change in knowledge where the results of this basic research will be published in scientific journals. This information will be included into material used for formal classroom and laboratory instruction and outreach.

## 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 121 | Management of Range Resources |
| 301 | Reproductive Performance of Animals |
| 302 | Nutrient Utilization in Animals |
| 307 | Animal Management Systems |
| 601 | Economics of Agricultural Production and Farm Management |

## Outcome #3

### 1. Outcome Measures

KNOWLEDGE, Indicator 3 - forage and nutrient management * workshops and other forms of teaching provided on issues related to grazing, manure management, and production systems. * Beef industry will understand forage quality dynamics for dominant forage species in Oregon, * Beef industry will understand how management practices can synchronize the relationship between forage nutrient supply and cow nutrient requirements, how pre-weaning and post-weaning calf management practices influence lifetime productivity of the calf and carcass quality and how feedstuffs can influence the health and physiological stress of the calf.

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 3 | 3 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
According to the USDA National Agricultural Statistics Service (2002), the acreages of cropland used only for pasture or grazing were 743,835 (Idaho), 997,717 (Oregon), 525,969 (Washington), and 602,341 (Utah). Many domestic pastures in the Pacific Northwest (PNW) are generally continuously stocked season-long. Pastures grazed longer than 30 days without recovery periods have a harvesting efficiency of 40% or less (Gerrish and Roberts 1999). High stocking rates and low stock densities are common, leading to severe grazing in non-uniform patterns, which limits re-growth potential and overall yield. Pacific Northwest domestic pastures typically produce 50% or less of their potential due to poor production and poor harvesting efficiency.

**What has been done**
A curriculum was developed to educate and train extension, NRCS, and FSA and other USDA and state personnel about forage physiology as it is related to grazing management. Forage specialists from Idaho, Oregon, Washington, and Utah developed curricula, presentations, and demonstrations. As outreach, we presented four workshops which included lecture/discussion and hands-on demonstrations in the field. The seminar/workshop used seven extension, two ARS, two industry, and four producer instructors. A detailed class syllabus and program were drafted and revised based on evaluations and experience with the workshops. Data in the Northwest was desired to develop height-based predictive equations for pasture yield for both pre-graze and post-graze situations for several grass species and mixed pastures. Suitable pastures of each type were identified for sampling. Within each pasture, nine sampling locations were selected based on pasture stand density. Each site was identified based on pasture type,

stand density, species composition, replication, and date. Sward canopy height, with a pasture stick, bulk density with a rising plate meter, and above ground biomass were determined on each plot. In each sampling sequence, data was collected immediately following grazing, at one week intervals following grazing, and immediately prior to grazing. Our goal was to have samples representing a wide array of height conditions in real-world pasture operations to make the predictive equations more robust and applicable across most of the area.

**Results**

Producers who implement managed grazing practices may reduce annual cow production cost by up to $100 per cow. This reduction in costs allows for a major improvement in economic sustainability. Domestic pastures may have increased carrying capacity due to: 1) higher harvesting efficiency and greater photosynthetic capacity due to managed grazing; 2) increased understanding of managed grazing systems; and 3) placing higher value on maximizing pasture productivity. PASTURE AND GRAZING MANAGEMENT IN THE NORTHWEST is a Pacific Northwest Extension Publication PNW 614. There are 17 chapters and a glossary by 36 authors from Cooperative Extension, USDA Agricultural Research Service and Natural Resources Conservation Service, and a private consultant. Authors are located in the states of Washington, Oregon, Idaho, Montana, Utah, and West Virginia. This is the first comprehensive management guide for pastures and grazing in the Northwest.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 111 | Conservation and Efficient Use of Water |
| 121 | Management of Range Resources |
| 302 | Nutrient Utilization in Animals |
| 307 | Animal Management Systems |

**Outcome #4**

**1. Outcome Measures**

KNOWLEDGE, Indicator 4a - plant breeding for plant attributes. * Growers learn about new cultivars with novel attributes and greatest potential for production in the Pacific Northwest; variety trials published online; Examples: Rotational crop cultivars, Varieties released (with Plant Variety Protection coverage) for general public and/or licensed release * Regulation of embryo maturation in cereals. * Researchers determine sets of genes involved in critical processes, e.g., functions of nitrifiers, including genes involved in mutualistic growth between ammonia and nitrite oxidizers, genes involved in Fe metabolism, and genes involved in autotrophy and lithotrophy.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 5 | 5 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**

It is essential that growers have knowledge of and access to the best plant cultivars of key local products: onions, sugarbeets, and other crops. For growers to remain competitive, cultivars must be both productive and of high quality. By cooperating with growers' associations and breeding programs, support for annual cultivar evaluations can be obtained. By testing plant materials using feasible moderate input production methods, experimental results should be immediately applicable by growers.

**What has been done**

Variety evaluations are ongoing for alfalfa, small grains, sugar beets, and onions. Trials look carefully at quality parameters and disease resistance for all of these crops, as well as onion storability after harvest. The aim is to find those varieties most suited to Treasure Valley conditions. Onion growers in Oregon and Idaho along with the seed companies support cultivar trials that evaluate onions for yield, grade, appearance, internal quality, and storability. Sugar beet grower associations in Idaho and Oregon and the seed marketing companies fund commercial and experimental sugar beet variety trials. Sugar beet varieties are evaluated for beet yield, sucrose content, pulp conductivity, pulp nitrate and varietal response to nitrogen rates, sugar yield per acre, and resistance to curly-top virus and rhizomania. The trials are conducted in a similar fashion in Idaho and Oregon, so that the data can be combined for the adoption of variety recommendations. Varieties must attain yield and quality attributes that meet industry standards. Similar trials are conducted for alfalfa and small grains. Varietal results for all these crops are distributed to growers in handouts and publications, as well as being posted on the internet.

**Results**

Growers have rapidly adopted new cultivars of onions and sugarbeets, completely replacing older cultivars several times. The yield per acre and quality of crops grown in the Treasure Valley has continued to increase, while the inputs per acre of fertilizer, water, and labor have declined or stayed nearly the same.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 202 | Plant Genetic Resources |
| 204 | Plant Product Quality and Utility (Preharvest) |
| 205 | Plant Management Systems |
| 206 | Basic Plant Biology |

**Outcome #5**

**1. Outcome Measures**

KNOWLEDGE, Indicator 5b - pest management * Basic pest biology information, * new pesticides registered * Growers become aware of pest management processes, including level of management required, risks associated with this pest as it becomes established, * Fumigants used at reduced rates in combination with other nematicides are likely to be the optimum management strategies for control of CRKN.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 3 | 3 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
White mold (WM, caused by Sclerotinia sclerotiorum, Ss) is a serious foliar and pod disease of snap beans grown for processing in western Oregon. Fields with > 6% infected bean pods are rejected by the processor, resulting in a complete crop failure. Ronilan (vinclozolin), a highly effective fungicide used through 2005 for the control of both white and gray mold (Botrytis cinerea), is no longer available to bean growers.
Topsin/Rovral or Topsin/Endura two-spray tank mix programs effectively control both diseases and growers shifted over to these fungicides in 2006. These fungicide programs are considerably more expensive than single Ronilan applications. Farmers are now seeking lower cost and biologically- and culturally-based WM management strategies that are practical and appropriate in the Willamette Valley.
Coniothyrium minitans (Cm) is a mycoparasite of Ss under natural conditions and was recently developed as a commercial product for WM suppression.

**What has been done**
?Six months after a November Contans (Coniothyrium minitans, Cm) application to diseased bean residues, mean Cm colonization of sclerotia was 47% in Cm-treated fields, compared to 3% in control fields. Mean sclerotial viability in Cm and control fields was 67% and 98%, respectively.
?Ten months after the Contans application, 8.5% of sclerotia (buried or on the surface) were alive in Cm treatment fields compared to 74% in the control fields (almost 9 times more living sclerotia in the control than in the Cm treatment fields).
?Beans were planted in the fields in July 2010. At bean harvest in September, percent foliar white mold necrosis for 91G (white mold susceptible variety) and OR-6230 (moderately white

mold-resistant) was approximately 23 and 7.5%, respectively, in the control fields, and approximately 7 and 1%, respectively, in the Cm treatment fields. The lowest foliar disease severity was observed in the moderately resistant plants grown in Cm-treated fields.
?At harvest, pod white mold incidence in 91G and 6230 was approximately 17 and 11%, respectively, in the control fields, and 7 and 3% in the Cm treatment fields. The lowest pod disease incidence was observed in the 6230 plants grown in Cm treated fields.

**Results**
We have shown that low rate Contans applications, alone or in combination with a moderately resistant bean variety, can reduce white mold incidence on snap beans to a commercially viable level. Farmers and agricultural professionals have learned about Coniothyrium and Sclerotinia sclerotiorum biology and ecology. Seed professionals have been encouraging seed growers to use Contans to control white mold in overwintering seed crops, as they are prone to white mold due to the long wet winter conditions in which they grow. Seed growers are starting to use Contans to control white mold. Gathering Together Farm is now applying Contans to all fields to control white mold in a wide variety of fresh market and seed crops.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 202 | Plant Genetic Resources |
| 205 | Plant Management Systems |
| 206 | Basic Plant Biology |
| 216 | Integrated Pest Management Systems |

**Outcome #6**

**1. Outcome Measures**

KNOWLEDGE, Indicator 6a - economic studies * Producer groups learn about factors shaping global markets and productivity-convergence effects on US agricultural and processed food production and trade.

Not Reporting on this Outcome Measure

**Outcome #7**

**1. Outcome Measures**

Action Indicator 1 - Adoption of new varietals o reduce yield losses and expenses, o rejuvenate orchards o achieve better productivity and efficiency: o provide environmental benefits (less fungicide applications, etc.), o effectively compete on world market with new varieties o Commercial processors and fresh market growers, as well as home gardeners, achieve greater production efficiency, more stable productivity, and reduced costs from the use of improved varieties.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
As of 1985, the predominate potato variety in the Pacific Northwest was Russet Burbank. Russet Burbank stored well but was poorly matched to the environment. Varieties were needed to better meet processing demands and attend fresh market opportunities.

**What has been done**
The Oregon varietal development team, with active programs at four OSU branch experiment stations and in Corvallis, develops improved potato varieties, including typical russet types with high levels of starch, low reducing sugars, and good fry color for the frozen processing industry; round-white chipping types; and fresh market varieties. Developing varieties with pest and disease resistance is an important aspect.
Oregon crosses currently emphasize virus and late blight resistance and gourmet specialty types including colored-flesh clones. Some 30,000 clones from Oregon crosses are produced and field tested annually. Growers and processors are strongly encouraged to attend all field trials and planning meetings and to actively pursue marketing rights to Oregon clones approaching release.

**Results**
Oregon's OSU team in cooperation with colleagues from ARS, WSU, and UI have released 21 varieties during the last ten years (Century Russet, Russet Legend, Umatilla Russet, Klamath Russet, Wallowa Russet, Mazama, Winema, Modoc, Willamette, Premier Russet, Highland Russet, Yukon Gem, Classic Russet, Clearwater Russet, Alpine Russet, Galatin Russet, A84180-8, Red Sunset, Crimson Red, Purple Pelisse, and Owyhee Russet). Additional upcoming releases include POR01PG22-1 (fingerling with red skin and flesh), POR01PG20-12 (oblong with red skin and flesh), AO96164-1 and AO96141-3 (russets) and POR02PG26-5 (yellow flesh). Umatilla Russet, released in 1998, is now among the top 10 U.S. varieties by acreage. Umatilla Russet is grown in more than 10 Oregon counties because of its outstanding processing potential under a wide range of conditions. Wallowa Russet, released in 2001, appears to have even better processing potential than Umatilla but is somewhat more susceptible to late blight tuber decay. Many other promising clones are currently under evaluation in statewide, tri-state and western regional trials.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 202 | Plant Genetic Resources |

| | |
|---|---|
| 204 | Plant Product Quality and Utility (Preharvest) |
| 205 | Plant Management Systems |
| 206 | Basic Plant Biology |
| 216 | Integrated Pest Management Systems |

**Outcome #8**

**1. Outcome Measures**

Action Indicator 2 - Improved animal fertility and genetic stock o Producers and animal health professionals improve fertility and prevent uterine infections in dairy cattle from implementing every-day on-farm practices. o Industry stores sperm cells with minimal loss of function for use as a commodity and for long-term maintenance of genetic stock

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Sperm mobility is a quantitative trait in poultry, and sperm mobility phenotype is a primary determinant of male fertility. Sperm mobility denotes the ability of sperm cells to move against resistance at body temperature. The discovery of this trait and underlying mechanisms affects artificial semen storage in two ways. First, mobility is the sperm cell property that is compromised by artificial semen storage. Second, males characterized by poor sperm mobility have little value as semen donors for artificial storage because sperm mobility is already compromised and this property cannot be restored.

**What has been done**
a preferable buffer to the sodium glutamate-based buffer used by Froman and Feltmann (2010) was identified. The importance of sperm cell calcium depletion was confirmed. In inclusion of several components of Beltsville Poultry Semen Extender (BPSE) was found to be counterproductive. The efficacy of calcium chelators within BPSE was less than that of BAPTA.

**Results**
Two on-going issues were addressed: (1) conditions under which fowl sperm can be rendered immotile and held without loss of function, and (2) the genetic basis for variation in sperm mobility phenotype. These two issues are interrelated. Thus, the first on-going issue pertains to application following discovery. In contrast, the second issue represents the next logical of the

investigator's analysis of sperm mobility; for the investigator has explained phenotype at the level of the sperm cell, the organelle, and the proteome. Consequently, the next step is the characterization of the testicular transcriptome using test subjects from the investigator's experimental lines of chickens bred for either low or high sperm mobility. The second issue is being studied in collaboration with Dr. Douglas Rhoads at the University of Arkansas within the context of S1047, a multi-state project entitled "Enhancing Reproductive Efficiency of Poultry."

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 301 | Reproductive Performance of Animals |
| 302 | Nutrient Utilization in Animals |
| 307 | Animal Management Systems |

**Outcome #9**

**1. Outcome Measures**

ACTION Indicator 3a - animal management tools used by private sector * Beef producers improve their economic competitive advantage and improve the ecological sustainability of production systems. * manure management

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
1) Beekeepers were interested in knowing the prevalence and intensity of various pests and pathogens in Oregon beekeeping operations. 2) Role of honey bee nutrition in honey bee colony losses was evaluated.

**What has been done**
Honey bee hives across the state were randomly sampled during 2010 to evaluate the intensity and prevalence of Varroa, tracheal mites, Nosema and pesticide residues in the comb. Additionally these samples were also analyzed for nutritional status (hypopharyngeal gland protein content). Survival status of the sampled hives is also being monitored throughout the year. To evaluate the role of nutrition in honey bee colony losses we are testing the following three hypotheses: Hypothesis 1: Poor nutrition significantly effects age of first foraging, longevity,

physiology and colony growth in honey bees. Hypothesis 2: Poor nutrition leads to higher incidence of parasites and diseases and negatively impacts immunocompetence in honey bee. Hypothesis 3: Honey bee colonies treated with antibiotics Terramycin and Fumagillin will have negative impact on beneficial microorganisms and proteolytic enzyme activity in the honey bee gut.

**Results**
Change in knowledge outcomes: Beekeepers have better understanding of the colony health and are able to narrow down the factors that might be responsible for their colony losses.
Change in action outcomes: based on the knowledge generated by this project, beekeepers are able to follow timely and appropriate treatments for controlling the pests and pathogens in their respective colonies.
Change in condition outcomes: Beekeepers have been able to reduce one third of their hive medication costs as a result of knowledge gained about their colony health from this project.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 111 | Conservation and Efficient Use of Water |
| 121 | Management of Range Resources |
| 302 | Nutrient Utilization in Animals |
| 307 | Animal Management Systems |
| 601 | Economics of Agricultural Production and Farm Management |

## Outcome #10

### 1. Outcome Measures

Action Indicator 4 - conservation strategies adopted o Conservation bio-control strategies are implemented differently and active restoration strategies occur. Land owners and managers assess ecosystem services provided by their riparian restorations via a user-friendly web tool. o Growers adopt improved, scale-dependent practices selected for various market niches with emphasis on reducing environmental degradation and impact. Commercial small farms will have more diverse and economically viable technologies and production techniques or systems available for their use o Growers implement drip irrigation and produce more marketable yields of onions, potatoes, and poplar trees than with furrow or sprinkler irrigation.and achieve efficient use of soil nitrate and the other available N sources under drip irrigation. o Generation of the viral vectors for grapevine disease control and functional genomics vectors have a potential for replacing current strategies of using chemical fungicides and bactericides with viral biocontrol strategies.

### 2. Associated Institution Types

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2 | 2 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Imprecise irrigation has substantial economic and environmental consequences. Over-irrigation and excessively frequent irrigation wastes water, labor, and energy. Over-irrigation can favor disease and can also result in nutrient leaching and surface water contamination. Deficient irrigation often results in losses of crop yield and crop quality. Precision irrigation scheduling is needed to optimize production under the constraint of minimal environmental impact. We thought that soil moisture sensors could help growers to better schedule irrigation to avoid early irrigation (and unnecessary waste) yet achieve ideal crop yield and quality. We seek irrigation criteria to optimize productivity and quality by minimizing plant stress according to each plant species' needs. We sought to evaluate and calibrate soil moisture sensors so that these sensors could be used by growers as effective tools for irrigation scheduling.

**What has been done**
Extensive field evaluations were conducted with over a dozen types of soil moisture sensors. Tensiometers and neutron probe data were calibrated against other types of devices that might be more amenable to use on family farms. Readings of soil water potential and soil temperature were made for Watermark soil moisture sensor resistance. New meter designs were suggested to manufacturers and new Watermark models were also tested and calibrated.
Research determined the optimal soil water potential readings for sprinkler-irrigated potato, furrow-irrigated potato and onion, and drip-irrigated onion and poplar trees. Irrigation scheduling demonstration plots were established in dozens of growers' fields.

**Results**
Many growers avoided unnecessarily frequent irrigations, saving soil, water, and unnecessary contamination. The use of soil water tension (SWT) criteria for irrigation scheduling expanded. Potato quality improved and sugar-ends could be reduced by 60 to 70% just through irrigation scheduling. US number one tuber yield increased with wetter irrigation criteria. With drip irrigation, criteria wetter than 30 centibars (cb) provided no additional benefit. Small irrigation scheduling errors on onions with 3-6 leaves where avoided, resulting in most bulbs having single centers. Onion yield and quality was increased as the SWT irrigation criteria approached 20cb. Irrigation at 12 cb resulted greater bulb decomposition in storage. Poplar tree growth increased as the SWT irrigation criteria approached 25cb.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |

| | |
|---|---|
| 111 | Conservation and Efficient Use of Water |
| 121 | Management of Range Resources |
| 204 | Plant Product Quality and Utility (Preharvest) |
| 205 | Plant Management Systems |
| 206 | Basic Plant Biology |
| 216 | Integrated Pest Management Systems |
| 511 | New and Improved Non-Food Products and Processes |
| 601 | Economics of Agricultural Production and Farm Management |
| 602 | Business Management, Finance, and Taxation |
| 803 | Sociological and Technological Change Affecting Individuals, Families, and Communities |

**Outcome #11**

**1. Outcome Measures**

Action Indicator 5 - improved agricultural economies o The knowledge generated about productivity-convergence will be crucial in designing policies to improve the welfare of agricultural producers and food processors and the general public who will be affected by the evolution of these industries (e.g., food quality and safety, resource scarcity and pollution). o Domestic policymaking and multilateral trade negotiations will mitigate effects of climate change in reduction of trade barriers and subsidies. o Climate change will be related to changes in comparative advantage in international crop production, and in turn the pattern and volume of trade. This information will be important in the context of domestic policymaking and multilateral trade negotiations as it pertains to reduction of trade barriers and subsidies.

Not Reporting on this Outcome Measure

**Outcome #12**

**1. Outcome Measures**

Change Indicator 1 - Ecological / Environmental o Landscapes will impact the way Oregonians use and manage plants to create beauty, modify environment, and improve health and well-being of individuals and communities. This program will change the way people use plants to modify their environment such as moderating temperature on buildings, improving water infiltration on surfaces, contributing to ecosystem services at landscape or watershed scales, etc. o Food/farm systems reduce surface and/or groundwater or other pollution in the environment, while improving nutrient and water budgets, and organic production systems. o New reduced risk, environmentally safer pest control tools will be available that are target pest specific will facilitate the implementation of IPM programs. o Environmental change will occur from temperature modifications; enhanced water conservation and wildlife; reduced runoff, fire incidence and pests; improved nutrient use and recycling; and other ecosystem services. o Better ecological methodologies will lead to more social, economic, and environmental benefits and cost effective and sustainable restoration. Improved valuation of ecological services associated with restorations will greatly facilitate market-based conservation practices such as mitigation banking and effluent trading. Better conservation bio-control strategies will decrease the costs associated with insect losses and the use of insecticides. o enhance the nation's natural resource base and environment by revealing cost-effective means to

control plant diseases and reduce the need for pesticides. o Biocontrols will reduce environmental damage and costs of grape growing and facilitate the development of the table and wine grapes with improved quality and nutritional value and therefore to increase competitiveness of the US grape growers and wine makers at the world markets. o Improved soil, water, and crop management practices and strategies that protect Oregon resources o Management of public and private rangelands will sustain and improve ecological values as desired by the public and the rural communities that depend on the natural resources. o Strategies for avoiding invasive pests will be in place o Plant disease resistance will lower the amount of pesticide use, resulting in a more healthful environment and reduced exposure of humans to hazardous chemicals.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Kentucky bluegrass seed fields in central Oregon, Hermiston and dryland conditions of eastern Washington use surface applied nitrogen. The areas have diverse characteristics from high elevation of central Oregon, low elevation of the lower Columbia Basin and rolling terrain of eastern Washington. Differences in winter temperatures and production practices make for different risks for nitrogen loss. Soil characteristics and residue management vary between regions, as well as within regions. All three production areas receive their primary N application as topdress in mid to late fall. When ammonium nitrate was available and nitrogen (N) fertilizer cost low, volatile N loss was not a major concern. Recent observations by field representatives raise questions about the amount of N loss from volatilization of ammoniacal fertilizers such as urea.

Volatile N loss as ammonia is an economic and environmental concern. Loss of nitrogen costs Kentucky bluegrass growers and wastes resources. Ammonia is also an environmental concern. Ammonia in the air reacts with nitrous oxides and sulfur dioxide to form an aerosol product that produces smog and is a PM-2.5 particulate. Quantitative measurement of volatile ammonia loss is necessary to define conditions where loss is minimal, put a cost to the loss and account for the nitrogen in fertilizer efficiency.

**What has been done**
Kentucky bluegrass seed fields in central Oregon, Hermiston and dryland conditions of eastern Washington use surface applied nitrogen. Volatile nitrogen loss as ammonia is an economic and environmental concern. The objective of this study was to quantify as pounds per acre ammonia volatilization from urea, Agrotain-coated urea, solution 32, CAN 27 and ammonium nitrate applied to the soil surface in the fall under commercial field conditions. Ammonia volatilization losses were measured with a modified passive flux method (Wood et al., 2000), which consists of a rotating

ten foot tall masts placed at the center of each 100 ft diameter circular plot. Nitrogen loss due to ammonium volatilization was highest with urea followed by solution 32. Agrotain-coated urea, CAN 27 and ammonium nitrate provided similar low levels of volatilization.

**Results**
First year data from the ammonia volatilization project indicate a reduction of 15 to 35 lbs N/acre using Agrotain-coated urea compared to urea in fall-applied, broadcast application in Kentucky bluegrass. Initial conservative calculations indicate a savings in excess of $100K to central Oregon grass growers. Based on the initial results of this study, Agrotain is being added to urea-based fertilizers applied to winter wheat. It was previously thought that temperatures were too low that time of year for any significant volatilization. Estimates related to wheat indicate another $100K savings, for a total savings in excess of $200K annually for these two crops alone.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 111 | Conservation and Efficient Use of Water |
| 121 | Management of Range Resources |
| 202 | Plant Genetic Resources |
| 205 | Plant Management Systems |
| 206 | Basic Plant Biology |
| 216 | Integrated Pest Management Systems |
| 302 | Nutrient Utilization in Animals |
| 307 | Animal Management Systems |
| 601 | Economics of Agricultural Production and Farm Management |

**Outcome #13**

**1. Outcome Measures**

Change Indicator 2 - Societal o Social change will occur through new perceptions of green technologies and social value or capital of horticultural landscapes to enhance human health, therapy, wellness, and social networks. o Social impacts include consumer awareness and appreciation of the abundance of locally grown ornamental plant materials and native species for use in landscapes will increase; also awareness of invasive species. o Social change will enhance quality of life in rural areas by improving economic stability of family farms, wineries, wine tasting, and tourism with new practices and cropping systems and/or livestock management practices/systems. o Social change will improve economic stability of families and quality of life with improved cropping systems. o Worker safety with bio-based pest control and dwarf rootstocks (short ladders) will be improved; farm workers will find other employment with increased mechanization. Local and community markets increase social networking in rural communities. o Increased opportunities for rural community marketers and processors will be developed; o Public health will be improved through the use of crops with improved nutritional value o Sustainable and economically viable wheat and dryland cropping industry for vibrant rural economy in eastern Oregon o The public has access to an ongoing research data base that allows for natural resource/land management decisions to have a fundamental basis in science.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 3 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Variety selection is the most important management decision made by growers. Selecting adapted varieties that combine high yield potential and superior end-use qualities is essential for the economic viability of wheat production in Oregon. Also important in this enterprise is the identification and retention of breeding lines that have superior quality attributes, but which may lack one or more essential attributes related to agronomics or disease resistance. Use of these lines as parental material captures these superior quality attributes and provides a vehicle for having that trait introgressed into material with superior agronomic and disease resistance. In this effort, the exploitation of marker assisted selection (MAS) strategies that can allow the tracking of genes of interest requires more attention from an end-use quality perspective.

**What has been done**
A coordinated set of breeding nurseries are planted each year. These include the multi-location Oregon Winter Elite Yield Trials (OWEYT), and Hard Winter Wheat Elite Yield Trials (HWEYT). Grain from these trials, the preceding replicated and preliminary yield trials, and earlier generation observation nurseries is collected and assessed for end-use suitability. As plant material passes through the generations, more stringency is progressively applied in quality testing. The earliest generations are only screened for a limited set of quality traits (e.g. grain hardness, protein percentage) with the simple aim of eliminating those lines with no probability of meeting market class standards. In contrast, at the elite level, grain is again tested for the same basic quality traits, but is also milled into flour to assess milling potential. The flour is further assessed for absorption capacities of specific components (e.g. fiber and starch), dough mixing properties and finally assessed for its suitability for appropriate end-products (e.g. cookies or sponge cake for soft wheat). Parallel to these activities, selected lines from both wheat and barley breeding efforts are used to create genetic mapping populations. Quality phenotypes are correlated to genetic maps to help identify genes of interest that would permit better genetic screening for quality-related attributes. In the end, released varieties ideally combine improved on-farm performance with superior market class quality.

**Results**
A specific example will be outlined using the soft white winter wheat variety Skiles (ORH010085). After the 2002 harvest, the breeding line ORH010085 was identified as having superior kernel softness, milling performance, test weight, sponge cake volume, and desirably low water absorption. When Skiles was proposed for release in 2008 it showed, across 18 site-years of

data, that it possessed performance in these key traits equal to or significantly superior to the check varieties. In 2007, Skiles was independently evaluated by the Pacific Northwest Wheat Quality Council. It was considered to have good milling and end-use quality attributes for the soft wheat market. Skiles was noted for its softer kernel texture, superior break flour yield, larger cookie diameter, and larger sponge cake volume as compared to the check. Overall the release of Skiles was a positive contribution to the overall quality of the Oregon soft-white wheat crop. Skiles also combined its generally superior quality with high yield potential and appropriate maturity for Oregon production conditions. The Oregon State University wheat variety development team also identified Skiles as possessing very good straw strength, superior winterhardiness, and improved resistance to a specific fungal disease important to Oregon (Cephalosporium stripe). Skiles is an example of how a new variety with superior agronomics and quality can be placed in the hands of farmers. Farmers see the immediate impact of higher yield potential and reduced risk due to improved disease resistance. The cereal industry as a whole has a better product that helps maintain or enhance the export competitiveness of U.S. wheat, in addition to the improved outcomes for individual farms.

The parallel work in applying quality phenotypes to genetic mapping populations has found use in the ability of a specific genetic marker to correctly identify a desired barley starch characteristic. In addition, the research team identified one specific chromosome region that was related to soft-wheat kernel texture in two wheat mapping populations (hard x soft and soft x extra-soft) that had no common parents. That this chromosome region was observed in two independent, bi-parental crosses could be a significant finding in our quest to control kernel texture in soft wheat, with the long-term goal of continual improvement in crop quality.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 216 | Integrated Pest Management Systems |
| 601 | Economics of Agricultural Production and Farm Management |
| 602 | Business Management, Finance, and Taxation |
| 603 | Market Economics |
| 607 | Consumer Economics |
| 803 | Sociological and Technological Change Affecting Individuals, Families, and Communities |

## Outcome #14

### 1. Outcome Measures

Change Indicator 3 - Economic o The economic value of landscapes will increase. Cost and benefit analyses of plants usage to modify environments with green technologies will reveal positive economic impacts and improved health and wellness from horticultural therapy. o Economic impacts include reduced costs, increased benefits, and production efficiencies from use of water and nutrient budgets in recycled water systems, improved pest management, and diagnosis of plant problems to increase sales of quality products. Costs of regulatory procedures will be reduced with water and nutrient budgets and management systems. o Profitability of berry crops in Oregon is expected to improve as new cropping systems, cultivars, practices, and efficiencies are implemented. Machine harvest technologies will be adapted or developed for Oregon to reduce production costs and improve competitiveness in global markets. o Profitability of vegetable and

specialized seed crops is expected to improve as new cropping systems, cover crops, nitrogen management, reduced tillage, and cultivars are adopted by growers. Communication networks will enable timely communication and utilization of technologies to alert growers of weather related pest incidence, educational events, and practices. o Profitability of viticulture in Oregon is expected to improve as new cropping systems, cultivars, practices, and efficiencies are implemented. Niche markets, wine tasting, and tourism are primary outlets for Oregon wines. o Profitability of tree fruits and nut crops in Oregon is expected to improve as new cropping systems, cultivars, practices, and efficiencies are implemented. High density orchards are expected to improve production efficiencies and increase markets. o Agricultural producers will realize greater economic return in their cropping enterprises; Plant nutrient and other production input use will be optimized o Producers maximize the control of postharvest decay within the various production and marketing objectives of producers. o Biocontrols will reduce environmental damage and costs of grape growing and facilitate the development of the table and wine grapes with improved quality and nutritional value and therefore to increase competitiveness of the US grape growers and wine makers at the world markets. o Higher-value niche markets will be established o Beef producers in the Intermountain and Great Basin areas remain completive on a regional, national, and global basis. o Producers greatly improve their reproductive efficiency by removing bad genes thus increasing productivity and economics of the industry. Industry thus has improved resource and economic sustainability through reduced costs and/or increased productivity. o Better understanding of the costs, benefits, and potential impact of legislation on the dairy industry, and thus more economically and environmentally sustainable systems for dairy and beef production. o Intense selection reduces needs for assistance in pasture lambing conditions. o Economic viability of farmers markets will be enhanced o Agricultural producers will realize greater economic return in their enterprises; o Increased potato yield will increase potato farmers' income as well as the stability of potato production of the world. The potential increase from 29,000 acres to as much as 100,000 acres will increase Oregon's market share and economic benefits.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 5 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Variety selection is the most important management decision made by growers. Selecting adapted varieties that combine high yield potential and a high level of pest resistance are essential for the economic viability of wheat production in Oregon.

**What has been done**
A coordinated set of variety trials is conducted each year. These include the Oregon Winter Elite Yield Trials (OWEYT), Hard Winter Wheat Elite Yield Trials (HWEYT), and Oregon Spring Elite

Yield Trials (OSEYT). These are statewide variety trials that are designed to provide clientele with performance information on common and newly released wheat varieties from the public and private breeding programs in the Pacific Northwest. Trials are conducted at 16 (OWEYT), 8 (HWEYT), and 6 (OSEYT) locations in Oregon and northern California. Trial locations are selected to capture the range of environmental conditions in the wheat production areas of Oregon. Trials are located both on-farm in collaboration with growers and on-station in collaboration with Oregon experimental research stations. Northern California trials are a collaborative effort with the California cooperative extension service. Results are reported through email alerts, web publications, as well as delivered to clientele through presentations at grower meetings, crop tours, and field days.

In addition to the statewide variety trials, large scale on-farm variety trials are conducted with local extension agents. Approximately 5 to 7 local extension agents collaborate on the trials yearly. OSU on-campus faculty provide funding, acquire and distribute seed, and provide field support. Field tours are conducted at most trial locations. Results are reported through web publications, presentations at grower meetings, and crop tours.

**Results**

Information on the adaptability, yield, and pest resistance of commonly grown commercial varieties as well as new and/or potential varieties from the PNW breeding programs is collected, analyzed, and delivered to growers through the statewide variety trials. This data are augmented with the large plot on-farm variety trials which provide growers with an opportunity to evaluate varieties under conditions that are more representative of current farming practices. Together these trials improve the grower?s ability to select varieties that are best adapted to their environment and increase farm profitability. The economic impact of the variety testing program is best measured through the adoption of new higher yielding wheat varieties such as ORFC-101, ORCF-102, Tubbs 06, and Goetze. Seventy one percent (71%) of the winter wheat grown in OR is from new varieties introduced to growers through this program over the last 5-6 years. With an average increase of 5 bu/ac on ~560,000 acres this equates to $22.4 million impact in 2010 alone ($8/bu).

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 205 | Plant Management Systems |
| 216 | Integrated Pest Management Systems |
| 601 | Economics of Agricultural Production and Farm Management |
| 602 | Business Management, Finance, and Taxation |
| 603 | Market Economics |
| 607 | Consumer Economics |
| 803 | Sociological and Technological Change Affecting Individuals, Families, and Communities |

## Outcome #15

### 1. Outcome Measures

KNOWLEDGE, Indicator 1b - landscape management systems. * Professional turf/landscape managers, nursery retailers, gardeners, and people associated with restoration/conservation projects will learn about sustainable gardening practices (eg. fertilizers, water, and pest management including organic), turf management, horticulture and aboriculture principles and practices, streamside gardening, native plants, invasive species, fire prevention, methods to minimize water runoff and use, wildlife enhancement, conservation and stewardship, and add value and beauty.

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Following fire in the Great Basin, nonnative species tend to invade many burned areas. Burned areas are being replanted largely with nonnative grass species. There is increasing interest by the public, BLM, and the US Forest Service to replant burned areas with native mixtures of grass, wildflowers, and shrubs. Although native forbs (wildflowers) are components of most native communities, their use in re-vegetation has been limited, largely due to inadequate seed supplies. Develop seed production practices and seeding technology of key native forb species for revegetation. Develop information so that growers will know how to plant, control weeds and pests, irrigate only as necessary, harvest, and clean seed of key forb species.

**What has been done**
Current research in cooperation with US Forest Service and BLM through the "Great Basin Native Plant Selection and Increase Project" seeks to help develop seed production technology focused on weed control and irrigation. We are also mechanizing other operations such as direct planting of seed, harvest, and seed cleaning when possible.

**Results**
Preliminary results are being shared with other researchers and growers through reports, tours, and our web site. Very little irrigation water is needed for maximum seed yield. Irrigation water requirements for consistent seed yields are only 100 to 200 mm, with some species not needing irrigation at al. Deep placement of the drip irrigation tape saves water and discourages weed emergence.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 111 | Conservation and Efficient Use of Water |
| 205 | Plant Management Systems |
| 206 | Basic Plant Biology |
| 216 | Integrated Pest Management Systems |
| 602 | Business Management, Finance, and Taxation |

## Outcome #16

### 1. Outcome Measures

KNOWLEDGE, Indicator 1c - dryland production management systems. * Producers, NRCS, conservation districts and environmental agencies learn about whole farm nutrient management. * Basic agronomic practices for commercially promising alternative crops under reduced tillage systems.

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2 | 2 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Nitrogen (N) availability to winter wheat is the second-most yield limiting factor after water in dryland conditions and N is applied to almost all wheat crops. Recently N fertilizer prices have fluctuated far outside their traditional range, increasing pressure on growers to maximize N efficiency. The appropriate N application rate is based on the yield potential which is driven by the stored soil moisture and crop growing season precipitation. The wheat market class, the soil test N, and the amount of crop residue also affect the optimum N application rate. Application of excessive rates of N fertilizer can increase crop production costs, increase lodging, reduce crop quality, lower profitability, and can lead to groundwater contamination. On the other hand, application of insufficient N can markedly lower yield and quality and reduce profitability. We need to develop more accurate N recommendation strategies that will permit us to minimize input cost, maximize yield and quality, and minimize potential adverse environmental impacts. Applying a pre-plant base rate of N followed by spring N application based on the yield goal may result in more accurate N application.

**What has been done**
Funding was secured from the Oregon Wheat Commission and the Oregon Agricultural Research Foundation to conduct the field research. Trials were established after summer fallow in the 2008-09 and 2009-10 crop years at the Pendleton and Sherman Stations. A base N rate sufficient to supply adequate N for a dry year was applied to all treatments and then supplemental N was applied at two dates in the spring, late March (tillering) and mid April (jointing). Nitrogen sources included solution 32 applied as a broadcast spray, dribbled on the surface, or injected with a spike wheel, and urea broadcast on the soil surface. A standard pre-plant N application was also made. The N rates at each site year varied due to differences in yield potential and soil test N.

Extremely dry conditions in September and October of 2008 resulted in uneven emergence at both sites that affected the yield and N response. Increasing N application rates increased leaf N concentration at both sites, and increased yields slightly at Moro but not at Pendleton where there was little response to N because of the dry conditions. Increasing leaf N was correlated with increased grain yield and grain protein. Soil samples were collected in one foot increments to four feet after harvest at both locations. Soil N levels were low after all treatments but did increase slightly at higher N application rates. Timely fall precipitation in 2009 resulted in good stands and data from the 2009-10 crop are still being analyzed.

**Results**
At both sites, the average yields were reduced at the highest N application rate which resulted in marked reductions in the economic return. Leaf samples were collected to determine if information from plant analysis could be used to guide N fertilizer management. Leaf N concentration at both tillering and jointing was increased as the rate of spring N increased. Leaf N concentration at jointing was a good predictor of both grain yield and grain protein. Grower knowledge regarding improved N management strategies has been increased. The preliminary results from this research have been conveyed to growers at the Pendleton Station Field Day in 2010 (200 attendees), through an article in Oregon Wheat magazine which is distributed to all Oregon wheat growers, and in county agent newsletters. Greater than normal fall and early winter precipitation in the 2010-11 crop year, coupled with normal fallow year moisture, has increased the wheat yield potential, sparking renewed interest in spring topdressing. The preliminary information from this research allowed us to make accurate recommendations for topdressing N.

## 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 111 | Conservation and Efficient Use of Water |
| 202 | Plant Genetic Resources |
| 204 | Plant Product Quality and Utility (Preharvest) |
| 205 | Plant Management Systems |
| 206 | Basic Plant Biology |
| 216 | Integrated Pest Management Systems |
| 601 | Economics of Agricultural Production and Farm Management |

**Outcome #17**

1. **Outcome Measures**

KNOWLEDGE, Indicator 1d - irrigated production management systems. * Growers and the public sector are made aware that environmentally friendly drip and micro sprinkler irrigation systems produce increased crop yield and crop quality and that less nitrogen is required when crops are irrigated than with furrow and regular sprinkler irrigation

Not Reporting on this Outcome Measure

**Outcome #18**

1. **Outcome Measures**

KNOWLEDGE, Indicator 1e - marketing approaches * Improved marketing approaches for local markets and community food systems.

Not Reporting on this Outcome Measure

**Outcome #19**

1. **Outcome Measures**

KNOWLEDGE, Indicator 2b - animal reproductive genetics. * genetic causes of early embryonic failures, * developmental biology of the early bovine embryo * factors affecting establishment of extraembryonic endoderm * sire genotype effects on embryonic loss * understanding genetic basis for fertility in male poultry including sperm cell function

Not Reporting on this Outcome Measure

**Outcome #20**

1. **Outcome Measures**

KNOWLEDGE, Indicator 4b - plant attributes for health. * Antioxidant effects of various carotenoids and flavonoids, and impact of flavonoids on antioxidant effect * Stakeholders learn about human health benefits, disease resistance, and breeding for organic systems of vegetables.

2. **Associated Institution Types**

- 1862 Research

3a. **Outcome Type:**

Change in Knowledge Outcome Measure

3b. **Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|

| | | |
|---|---|---|
| 2010 | 1 | 1 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**

Markets for organic fruit continue to grow and the associated interest from industry in development of sustainable production systems for blueberry and blackberry is high. Prior to our studies, there was little knowledge or published information on optimal organic production systems for berry crops and associated economic costs. In highbush blueberry, the long-term goal of our research is to develop organic production systems that maximize plant growth, yield, and fruit quality; facilitate weed, water, and nutrient management; and provide an economic benefit to growers. In blackberry, our long-term goal is to develop best irrigation, fertilization, and weed management practices in processed and fresh cultivars and the impact of these systems on fruit healthful properties and food safety. These have been indicated as key issues by our advisory groups.

**What has been done**

A 0.4 ha (1 acre) planting of blueberry was established in Oct. 2006 to evaluate the effects of cultivar (Duke and Liberty), bed type (flat versus raised beds), weed management [sawdust mulch and hand-weed control; sawdust+compost mulch with organic herbicides as needed; and weed mat], and type and rate of fertilizer (feather meal and liquid fish emulsion at 29 and 57 kg?ha-1 N, 2007-09; 51 and 102 kg?ha-1 N, 2010) on plant growth, yield, fruit quality, irrigation requirements, and weed presence. The site was certified organic in 2008.

We are developing best irrigation, fertigation, and weed management systems in organic blackberry machine-harvested for processing. In fall, 2009, we prepared the research site, at the North Willamette Research and Extension Center, including a pre-plant cover crop and irrigation system. The planting was established in June, 2010. The first fruit harvest is expected in 2012. Treatments are: cultivar (Marion, Black Diamond); irrigation (with or without post-harvest); weed management (weed mat, hand-hoed, and non-weeded); and primocane training date (Aug. and Feb.). Plants are drip irrigated and fertigated using hydrolyzed fish fertilizer.

**Results**

In our organic blueberry project, plants grown on raised beds are larger than those on flat ground and this has resulted in a 63% higher cumulative yield over two years to date. As a result, we have observed almost no new organic or conventional blueberry plantings established on flat ground in the last few years ? almost all are on raised beds. In the young planting, soil covered with weed mat mulch, particularly on raised beds, required more irrigation than flat ground planting in the first three years. However, in year 4, the differences in irrigation requirements between weed mat and the organic mulches were considerably less, likely a result of the larger plants in the weed mat treatments shading the weed mat and reducing soil temperature. Weed mat mulches had the fewest weeds and the lowest weed management costs while sawdust+compost has had the highest weed presence and weed management costs. Cumulative yield for plants mulched with weed mat and with compost+sawdust have been higher to date than the standard sawdust mulched treatment. The use of weed mat mulch in new plantings in Oregon has increased from an estimated less than 10% of the acreage in 2006 to more than 80% of the new acreage in 2010. We believe that our positive findings have had a significant impact on this new production system in Oregon.

The highest yields were obtained when plants were fertilized with either the low rate of fish

emulsion or the high rate of feather meal. Plants performed better when feather meal application was done in late winter rather than spring, allowing more time for release of nitrogen with rainfall in this drip irrigated field. Planting system had no effect on fruit firmness, but fruit were firmest when fertilized with the high rate of fish emulsion. With weed mat mulch, fruit were less firm in both years, perhaps due to changes in plant water status and irrigation scheduling. Work is underway to determine any treatment impacts on root growth and physiology and soil properties and soil health.

Organic blueberry acreage in the USA increased from 480 acres in 2003 to 1,950 acres in 2008. The information learned in this trial, to date, has been presented at meetings throughout the USA and in western Canada and has been of assistance to growers in making decisions when establishing their new organic acreage.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 204 | Plant Product Quality and Utility (Preharvest) |
| 206 | Basic Plant Biology |

**Outcome #21**

**1. Outcome Measures**

KNOWLEDGE, Indicator 5a - weed control * factors affecting herbicide activity * herbicides registered, * natural herbicides to control weeds in organic and/or no-till wheat production, * improved weed control in no-till fallow systems, including optimum inputs

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2 | 2 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Weeds present major production concerns for crop growers because they often reduce yield, quality, and may possibly serve as alternative hosts for other crop pests. The overarching goal of the weed research program at the Malheur Experiment Station is to develop weed control strategies in onion, corn, sugar beet, alfalfa, pinto beans, wheat, potato, and other minor crops in the Treasure Valley of eastern Oregon.

**What has been done**
Studies are being conducted to develop strategies for weed control using sustainable methods without compromising crop yields. Strategies for yellow nutsedge control are especially important in order to avoid further expansion in the area. Cultural, mechanical, and chemical methods are being evaluated.

**Results**
The weed control program has generated data in support of herbicide registration estimated to reduce labor costs by $100-200/acre on 30,000 acres of onion, sugar beet, and mint; by $50-100/acre on 15,000 acres of alfalfa seed and potato. Thus, total estimated labor savings in the local area amounts to [$150*30,000 acres] + [$75*15,000 acres] - [$25/acre (the estimated cost of herbicide applications)*45,000 acres = $4.5 million/year.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 202 | Plant Genetic Resources |
| 204 | Plant Product Quality and Utility (Preharvest) |
| 205 | Plant Management Systems |
| 206 | Basic Plant Biology |
| 216 | Integrated Pest Management Systems |

**Outcome #22**

**1. Outcome Measures**

KNOWLEDGE, Indicator 5c - disease biology, control and resistance * Facilitate future planned activities in functional genomics and provide a more robust sampling of the Pleosporales for comparative genomic studies by the fungal research community. * Efficacy of various orchard, postharvest, and storage methods for control of postharvest decay of pear * Molecular mechanisms responsible for closterovirus reproduction and transport in plants and develop model to predict risk * Functions of the GLRaV-2 proteases in virus reproduction and spread, as well as characterize mechanisms of BYV Hsp70h interactions with actin cytoskeleton and targeting to plasmodesmata; approaches to engineering GLRaV-2 gene expression vectors. * Elucidate the underlying molecular mechanisms of pathogenicity (virulence) and disease susceptibility (compatibility) and disease development. * Technologies for efficient application of viral vectors in grapevine. * Disease resistance discoveries, including gene evolution, plant lines * Information for the development of resistant wheat germplasm to tan spot. * relationships between disease susceptibility and disease resistance. Characterize genes involved in Victoria Blight Disease susceptibility, and uncovered

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 3 | 3 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**

The ultimate goal of this research project is to enable biological and other novel control approaches to be established for fire blight disease of pear and apple, thereby creating more economically and environmentally reliable and sustainable practices for pome fruit growers in the Pacific Northwest. Specific program objectives included : 1) integration a new material, Kasumin, into blossom blight control programs for conventional orchards; 2) evaluation of the potential for the fire blight pathogen to become resistant to Kasumin.; 3) evaluation of integrated biological/chemical control of fire blight with Kasumin; 4) evaluation of blossom blight control with non-antibiotic programs acceptable for fruit export to the European organic markets; and 5) evaluation of soil drenches of a systemic acquired resistance inducer as a fire blight management tool in diseased pear trees.

**What has been done**

We continued to achieve outstanding control of fire blight with Kasumin (kasugamycin) and with mixtures of Kasumin and Mycoshield (e.g., 80 ppm of each material). We continued to obtained very good suppression of fire blight with the beneficial bacterium P. agglomerans (BlightBan C9-1) followed by one treatment with Kasumin (i.e., integrated biological and chemical control). The high level of suppression was achieved regardless of whether the strain of P. agglomerans was sensitive or resistant to Kasumin. For a second season, the not-yet-registered yeast material, Blossom Protect, provided excellent control of fire blight. With the EU allowable organic materials, BlightBan C9-1 (P. agglomerans) and Serenade Max, doubling the frequency of treatment over a standard two treatment program significantly enhanced fire blight suppression. In the field, a combination of a foliar spray and soil drench of a SAR material (acibenzolar-S methyl) significantly reduced expansion of fire blight cankers in young Bosc pear.

**Results**

We have evaluated Kasumin over the past 4 years. In addition to our results, others states also have ~4 years of efficacy trials with this material, and thus we believe it stands a reasonable chance for a section 3 registration with EPA; this application has been submitted is on track to be issued in spring 2012. Our research (and of others: e.g., Sundin, Michigan State) indicates some potential for E. amylovora to become resistant to Kasumin; this risk is likely intermediate to that observed with streptomycin (high) and oxytetracycline (low). The work on non-antibiotic control has been especially timely because the National Organic Program decided with little warning to remove antibiotics from the approved materials list for organic agriculture. Our research should allow organic growers to transition to non-antibiotic programs for fire blight with a minimum of disease losses. Our results with systemic acquired resistance show promise to further lessen losses to fire blight disease, but the research is still in an investigative phase.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 202 | Plant Genetic Resources |

| | |
|---|---|
| 204 | Plant Product Quality and Utility (Preharvest) |
| 205 | Plant Management Systems |
| 206 | Basic Plant Biology |
| 216 | Integrated Pest Management Systems |

**Outcome #23**

**1. Outcome Measures**

KNOWLEDGE, Indicator 6b - trade * We expect to show that international trade will be an important vehicle by which adaptations can be made to global climate change. * Researchers will uncover key relationships that tie climate change to the distribution of crop yields, comparative advantage, geography, and international trade. * Policy makers will understand that climate change will be related to changes in comparative advantage in international crop production, and in turn the pattern and volume of trade. * Numerical estimates will be provided regarding how climate change will affect crop prices, production costs, and the economic welfare of producers, consumers, and society at large.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The issue Reimer explores is how global climate change will affect the location of agricultural production and patterns of trade. There exists much research regarding how climatic variability and extreme events may affect crop yields and agricultural output in the U.S. and the rest of the world. Current research is directed at linking climate models to large-scale, highly disaggregated, multi-commodity economic models in order to make detailed predictions for individual regions. However, relatively little attention has been given to the role of international trade and comparative advantage as it relates to climate change. This activity will identify the role of international trade in making the transitions and alleviating the costs associated with climate change.

**What has been done**
Reimer developed a large simulation model of world crop markets that is based upon Ricardian comparative advantage. Specialization is determined by productivity, land endowments, and the bilateral costs of trade. Productivity is determined through a random draw from country-specific distributions, which corresponds to crop yields. Each country has a chance of being a low cost

supplier depending on whether it has a bumper crop or crop failure in a given year. Because of the availability of comparable international yield data, we introduced some innovative ways of estimating parameters of the model. The model is applied to 23 countries and provide measures of the degree of globalization in this sector, the gains from trade, and the elasticity of trade volumes to trade costs. Reimer also examined how changes in yield variability affect the welfare of cereal grain and oilseed buyers and producers around the world. Reimer wrote up the research for journals and has presented this material in a variety of venues.

**Results**

Variability in crop yields could get much worse if even the most conservative estimates of climate researchers come true. What does this mean for food prices? It means that they will be much more volatile if we are unable to export crops from regions where they are abundant in a given year, to regions where they are scarce. It seems unlikely that every region of the world will have a crop failure at the same time, or a bumper crop at the same time. Therefore, one would imagine that in a (hypothetical) world with costless international trade, food prices would not be volatile. With international trade, we effectively diversify away from a small set of domestic farmers, to millions of farmers who grow crops in dozens of different agro-climatic zones, and at different times of the year.

The issue that motivates this research project is that international agricultural trade is very far from this ?costless? ideal (Reimer and Li, 2010). Genuine trade liberalization has not occurred for agriculture; market-insulating tariff and non-tariff barriers remain high. For many countries the food and agricultural sector remains far and away the most protected sector of the economy.

This research project shows that world trade volumes would need to increase substantially if there is just a small increase in yield variability, modeled as a general broadening of the probability distribution for yields. As long as the world trading system remains flexible, however, people?s welfare would decline only very modestly in most of the countries in our sample.

If trade barriers are enacted such that trade volumes are restricted to current volumes, however, we find that a great deal of suffering is likely to occur, particularly for lower-income food-importing countries.

While this latter scenario is very troubling, it is also the scenario that may be most realistic. During the food price runup of 2007-2008, a number of exporting countries actually cut off their supply to the rest of the world. This exacerbated the thinness of a world crop market that was already highly insulated, and the result was much suffering and street riots in a number of food-importing countries.

The ultimate implication of this research is that international trade is a low-hanging fruit by which to address climate change. It seems clear that increased variability is here, and that freer international agricultural trade is a straightforward, low-tech way by which we can adapt to it.

## 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 205 | Plant Management Systems |
| 601 | Economics of Agricultural Production and Farm Management |
| 603 | Market Economics |
| 803 | Sociological and Technological Change Affecting Individuals, Families, and Communities |

**Outcome #24**

**1. Outcome Measures**

KNOWLEDGE, Indicator 6c - community education. * Ways to integrate agricultural education into high school curriculums

Not Reporting on this Outcome Measure

**Outcome #25**

**1. Outcome Measures**

1ACTION Indicator 3b - plant management tools used by private and public sector * Farmers will more strategically plan for crop production * Crop rotation sequences and Green manure crops in combination with reduced or no nematicide use, particularly for short season potato crops to suppress nematode populations. * End users adopt new pesticide and pest management systems and strategies for working with invasive pests * District-specific control programs will reduce usage of fungicides with low efficacy and emphasize integrated control practices.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
This project addresses a serious and emerging pest in Oregon, Washington and other major potato states across northeastern U.S. The potato tuberworm (PTW) Phthorimaea operculella (Zeller) (Lepidoptera: Gelechiidae) is one of the most important constraints to potato productivity worldwide. It was first detected in Oregon in 2002. In 2003, several fields were completely lost due to PTW, resulting in an economic loss. This economic loss increased substantially in 2004 and 2005, due to increased PTW densities in areas already infested, range expansion, damage, and the cost contributed to control measures. Potato tuberworm distribution, ecology and population information was incomplete and largely from outside of the region at the beginning of this project.

**What has been done**
Competitive federal and regional grants were obtained to conduct this research. Research has been funded by the Oregon Potato Commission, Washington Potato Commission, Washington

State Commission on Pesticide Registration, USDA-ARS National Potato Council, USDA-CSREES Western IPM Center and Critical Issues, and Agriculture Research Foundation. A region wide trapping program was initiated in 2004 in Oregon and Washington. Growers in Oregon and Washington are informed on a weekly basis of tuberworm counts in their areas. A study to investigate overwintering biology of PTW was conducted in late winter and early spring of 2005 and 2006. A study designed to determine if a relationship exists between number of PTW caught in pheromone traps and foliar damage and tuber damage was conducted. Thousands of PTW larvae were brought into the laboratory and raised. Pesticides or combinations of pesticides were tested in screening trials, including ground application treatments and chemigation treatments.A study examining the effect of desiccant type, with and without a pesticide program, was conducted. Five desiccants, which ranged from acting within hours to weeks, were examined, with and without application of Monitor 4.

**Results**

Potato tuberworm investigations have lead to a good understanding of: 1) temporal and spatial distribution of the PTW; 2) the optimal and extreme cold temperatures for eggs, larval, and pupal development; 3) the relationship between percentage green foliar cover and tuber damage; and 4) the relative efficacy of different pesticide application programs. In addition, data on the overwintering biology of PTW and on the proper timing of pesticide application has been collected and has been important in guiding further research needed in these areas. Potato tuberworm had become well entrenched in Oregon and Washington in a short time and was threatening some 200,000 potato acres in both states. Losses on a per field basis ranged from 100% to 25% at the beginning of the research and educational effort. Using 2006 Oregon data, this would mean that farmer losses would amount to $3.45 million in gross sales. So, in the near future, this project could conservatively be worth $3 million plus in savings to Oregon potato growers in this region alone. Armed with this new information generated by our research, losses have been reduced and/or eliminated. Information from these studies will continue to help growers develop effective management strategies to reduce incidence of PTW in the region.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 111 | Conservation and Efficient Use of Water |
| 205 | Plant Management Systems |
| 216 | Integrated Pest Management Systems |

**Outcome #26**

**1. Outcome Measures**

ACTION Indicator 3c - post harvest tools used by private sector * Growers, packers and extension faculty incorporate practices to lower decay risk, including reduced fungicide usage, and identify high risk fruit lots and to market these before decay has time to develop in storage. * Interaction of program components and the overall efficacy of various combinations of orchard, postharvest, and storage factors will be the guides to the description of programs for implementation in the pear industry. * Determine packinghouse water system contamination by fungal pathogens. Commercial service lab can apply PCR technology to maintain sanitation determine most effective fungicides for each species. * Customized decay control program for each unique pathogen complex.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
While onions are a major source of Treasure Valley income, onions are not available for sale all year from local production. Increasingly processors and retailers require year-round supplies. Onions could be marketed out of prolonged storage through better storage conditions and cultivars adapted to very long term storage. Onions grown from transplants or sets might be harvested earlier in the summer.

**What has been done**
Onion bulb crops have been grown from transplants and sets. Transplants were grown under various environmental conditions. Sets were grown and stored under various storage conditions prior to planting. Onions have been subjected to long term storage.

**Results**
Onions can be harvested up to three weeks early from transplants and up to five weeks early from sets. Sets of certain long-day onion cultivars were successfully grown and the sets grew into excellent bulbs, in spite of conventional wisdom that said that long-day onion sets could not be grown. Several cultivars, including Crocket have excellent long term storage.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 216 | Integrated Pest Management Systems |

**Outcome #27**

**1. Outcome Measures**

ACTION Indicator 3d - land and invasive species management tools used by private and public sector * Land management protocols will be used in public land management policy decisions. * Understand pollen flow mechanisms between wheat and its wild relative jointed goatgrass

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

### Brief Explanation

{No Data Entered}

## V(I). Planned Program (Evaluation Studies and Data Collection)

### Evaluation Results

{No Data Entered}

### Key Items of Evaluation

{No Data Entered}

## V(A). Planned Program (Summary)

**Program # 6**

**1. Name of the Planned Program**

Childhood Obesity

### V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

| KA Code | Knowledge Area | %1862 Extension | %1890 Extension | %1862 Research | %1890 Research |
|---|---|---|---|---|---|
| 610 | Domestic Policy Analysis | | | 40% | |
| 802 | Human Development and Family Well-Being | | | 60% | |
| | **Total** | | | 100% | |

## V(C). Planned Program (Inputs)

**1. Actual amount of professional FTE/SYs expended this Program**

| Year: 2010 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 0.1 | 0.0 | 0.1 | 0.0 |
| Actual | {NO DATA ENTERED} | {NO DATA ENTERED} | {NO DATA ENTERED} | {NO DATA ENTERED} |

**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 | 33310 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 0 | 0 | 0 | 0 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 0 | 0 | 0 | 0 |

## V(D). Planned Program (Activity)

**1. Brief description of the Activity**

We survey rural Oregon communities and carry out statistical analyses using primary and secondary data sources to better understand the barriers and opportunities in rural places for low-income and high-income workers, the migration patterns that flow from their work and location decisions, the implications of these changes for rural community vitality and resident well-being, and the effectiveness of public policies

in strengthening the viability of rural places as well as the health of its residents.

*conduct surveys and assessments
*examine and determine factors that drive decisions
*develop econometric model
*conduct mixed-methods longitudinal reearch
*develop models
*develop products, curriculum, resources
*provide training

**2. Brief description of the target audience**

The primary target audiences are (1) federal, state, and local government officials and their staff members; (2) those working in the media who cover federal, state and local economic and social trends and conditions; (3) state and local community leaders who are involved in local public affairs; (4) social scientists who want to understand economic and social transformation of rural people and places

*extension educators
*youth aged 13-18
*rural residents
*Latino populations
*economists
*policy makers

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

| 2010 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Actual** | 250 | 1000 | 100 | 1000 |

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

**Patent Applications Submitted**

Year: 2010
Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

| 2010 | Extension | Research | Total |
|---|---|---|---|
| **Actual** | 0 | 10 | 10 |

## V(F). State Defined Outputs

### Output Target

**Output #1**

**Output Measure**

- OTHER SCHOLARLY ACHIEVEMENTS: panel, awards, presentations

| Year | Actual |
|---|---|
| 2010 | 20 |

**Output #2**

**Output Measure**

- EFFECTS ON AND PROTECTION OF HUMAN HEALTH AND COMMUNITIES. Examine rural health and communities through development and testing of econometric and other models and the compilation and analysis of data on communities, families and individuals: a) Develop models about human capital in rural places - One model will examine the factors that lead highly educated householders to migrate from rural to urban places. - A second model will investigate the determinants of rural residential choice among householders with low educational attainment. b) Compile most comprehensive data set on low-income rural family well being available in the U.S. and conduct analyses of community contextual data c) Develop conceptual models to promote understanding of the processes that account for physical activity and the associated health outcomes among youth across ethnic and class boundaries in the context changing rural communities

| Year | Actual |
|---|---|
| 2010 | 5 |

**Output #3**

**Output Measure**

- EFFECTS ON AND PROTECTION OF HUMAN HEALTH AND COMMUNITIES. Examine rural health and communities through development and testing of environmentally friendly agricultural products for textiles a) Conduct laboratory experiments to characterize and assess the fibers' chemical, physical and performance properties that are relevant to textile thermal insulation applications.

| Year | Actual |
|---|---|
| 2010 | 5 |

**V(G). State Defined Outcomes**

## V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Improved understanding about rural human capital: a) understand why people are more likely to be poor if they live in a nonmetropolitan than in a metropolitan area - provide evidence on the degree to which the disproportionate poverty in nonmetro areas is explained by low social and economic opportunities in rural communities or a sorting into rural places of people with low human capital. b) inform local and state policy discussion about rural brain drain and outmigration |
| 2 | Models developed and refined: a) Econometric models will explain the sorting of people with low human capital into rural places. b) Conceptual model will promote understanding of the processes that account for physical activity and the associated health outcomes among youth across ethnic and class boundaries in the context changing rural communities |
| 3 | Demonstrate that poplar seed hair fibers possess properties are suitable for textile thermal insulation applications. - high-end bulk thermal insulation material |
| 4 | Trained scholars and extension educators |
| 5 | Improved strategies in rural policies for - rural family and community welfare - local community vitality - anti-poverty - combinations of human-capital and community-strengthening policies that are most likely to reduce nonmetro poverty and its unfavorable consequences. - maximize physical activity and physical and mental health of rural youth and adults |
| 6 | Improved outreach, education, and professional practice in serving the needs of rural low-income families - improved well-being and functioning of rural low-income families - programmatic interventions that reduce the physical inactivity and promotes well-being of lower-income and ethnic minority youth across rural America |
| 7 | Affect governmental decisions about rural areas - service cuts and revenue alternatives - reallocations of service responsibilities among state and local governments - revenue sharing formulas |
| 8 | Value-added use of poplar seed fibers (e.g., for insulating textiles) will benefit the environment and increase total utilization of this resource |
| 9 | Improved well-being of lower-income and ethnic minority youth across rural America |
| 10 | Use of poplar seed fibers will positively impact the poplar industry and provide environmentally friendly textiles |

**Outcome #1**

**1. Outcome Measures**

Improved understanding about rural human capital: a) understand why people are more likely to be poor if they live in a nonmetropolitan than in a metropolitan area - provide evidence on the degree to which the disproportionate poverty in nonmetro areas is explained by low social and economic opportunities in rural communities or a sorting into rural places of people with low human capital. b) inform local and state policy discussion about rural brain drain and outmigration

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Urban and suburban communities evolve differently with changes in local economic fundamentals such as rising income or falling commuting costs. It is important to understand the disparity between urban and suburban areas.

**What has been done**
Developed a spatially explicit model to examine how urban and suburban communities evolve differently with changes in local economic fundamentals such as rising income or falling commuting costs in the metropolitan area. The model highlights the importance of environmental amenities and the economy of scale in the provision of public services as determinants of urban spatial structure.

**Results**
Results suggest that urban sprawl, income segregation, and jurisdictional disparities are driven by the same economic conditions and thus tend to co-exist. Rising incomes or falling commuting costs for high-income households in a metropolitan area tend to increase land prices and public services in every community, while rising incomes or falling commuting costs for low-income households can have the opposite effects.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 610 | Domestic Policy Analysis |

802 Human Development and Family Well-Being

**Outcome #2**

**1. Outcome Measures**

Models developed and refined: a) Econometric models will explain the sorting of people with low human capital into rural places. b) Conceptual model will promote understanding of the processes that account for physical activity and the associated health outcomes among youth across ethnic and class boundaries in the context changing rural communities

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2 | 2 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Weight loss is very difficult for most women to achieve and it is even more difficult to keep the weight off once it is lost. Helping women address weight issues and chronic disease risk factors before they become obese and/or are diagnosed with a chronic disease will aid in improving the health of Oregon families and the US population.

**What has been done**
This research addressed the importance of teaching women to make changes in their own health behaviors that become part of their lifestyle, and then model these healthy behaviors in the home to improve the health of the family. We are also beginning a project in 2011 that focuses on kids, families and communities.

**Results**
Research suggests that changes in both diet composition and level of physical activity are important to reverse risk factors for chronic disease in individuals who are overweight or obese. Over 60% of adult Americans are currently overweight or obese (Body Mass Index [BMI]>25 kg/m2), we must identify ways to slow this trend, especially in our children and youth.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 610 | Domestic Policy Analysis |
| 802 | Human Development and Family Well-Being |

**Outcome #3**

1. **Outcome Measures**

Demonstrate that poplar seed hair fibers possess properties are suitable for textile thermal insulation applications. - high-end bulk thermal insulation material

Not Reporting on this Outcome Measure

**Outcome #4**

1. **Outcome Measures**

Trained scholars and extension educators

Not Reporting on this Outcome Measure

**Outcome #5**

1. **Outcome Measures**

Improved strategies in rural policies for - rural family and community welfare - local community vitality - anti-poverty - combinations of human-capital and community-strengthening policies that are most likely to reduce nonmetro poverty and its unfavorable consequences. - maximize physical activity and physical and mental health of rural youth and adults

2. **Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 0 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The project explores the health benefits of community-based garden programs. Gardening is a great vehicle for healthy eating and physical activity.

**What has been done**
Young adults interested in participating in a garden-based Oregon State University research project that pays a summer stipend can sign up now for limited placements in Corvallis and Sweet

Home, Oregon. Participants will earn a $1,200 stipend for completing the program, and will spend up to 12 hours per week learning basic research skills, working in the gardens and handling produce sales. Low-income young adults ages 18-22 are invited to apply. To qualify, youth must earn less than one-and-a-half times the poverty level. For a single person, this means earning less than $16,245, or for a family of four, less than $33,075.

**Results**
Participants will harvest produce for sale at local farmers' markets. They will learn how to create a small business from the ground up, at the same time, they will also be trained in how to collect research data that documents the successes and challenges of this type of project.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 610 | Domestic Policy Analysis |
| 802 | Human Development and Family Well-Being |

**Outcome #6**

**1. Outcome Measures**

Improved outreach, education, and professional practice in serving the needs of rural low-income families - improved well-being and functioning of rural low-income families - programmatic interventions that reduce the physical inactivity and promotes well-being of lower-income and ethnic minority youth across rural America

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The project has focused on developing research strategies that coax or encourage parents to identify specifically what rewards or positive reinforcement they perceive when they do encourage their adolescent children to make healthy food choices, maintain rules about food consumption, and/or provide healthy and calcium rich foods in the home.

**What has been done**
The research continues to explore the motivations behind parents willingness and concern about teaching children to eat well and to include calcium rich food sources in their diets.

**Results**
Parental motivations to encourage positive habits will be used to develop messages for nutrition education and promotional campaigns to persuade parents to be involved in teaching positive habits and offering healthy food sources in the home. The research also reveals that there are few differences in calcium rich dietary sources among Asian, Hispanic and non-Hispanic White parents and their children. Milk, cheese, yogurt serve as major foods contributing to the calcium intakes among both parents and children. The intake of calcium among all three groups suggests that intakes do not meet current recommendations with the highest calcium intakes found among children of non-Hispanic whites, then Asians and Hispanics, respectively. Research is also underway to determine the extent to which homeless families are able to provide healthy food choices for their children.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 610 | Domestic Policy Analysis |
| 802 | Human Development and Family Well-Being |

**Outcome #7**

**1. Outcome Measures**

Affect governmental decisions about rural areas - service cuts and revenue alternatives - reallocations of service responsibilities among state and local governments - revenue sharing formulas

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Over 500,000 Oregonians do not have enough income, under the federal poverty guidelines, to meet basic needs. Oregon's poverty rate of 13.6 percent is about the same as the nation's. Oregon's hunger rate of 6.6 percent, however, puts it among the five worst states in the country in terms of hunger, with an estimated 95,000 households experiencing at least a month where they were shrinking meal portions, skipping meals, and embracing other strategies to deal with financially driven food shortages in the home. Federal, state and local governments partner with nonprofit organizations to support people in need with assistance and training, and to reduce the

negative consequences of poverty and hunger.

**What has been done**
The Rural Studies Extension Program (RSP)is helping Oregonians to understand both the dimensions and trajectories of poverty and hunger in Oregon and the nation, and the human services/social safety net that supports people in economic hard times. RSP faculty and students worked with a local community action agency to map the location of food pantries and families seeking food assistance in order to better plan new food assistance facilities and coordinate assistance.

**Results**
This program affects those in economic distress by supporting the planning of community action agencies who serve them. Much of the impact of the program is more indirect. The primary impact of much of the work on poverty, hunger, and the social safety net is on people who are not poor or hungry, helping them recognize that these conditions exist and that there are programs that aim to manage them effectively.
RSP faculty members are viewed as a go-to source of information on hunger in the state. When people want to know about rural poverty in the US, they will often seek RSP expertise for information about the extent of poverty and on the workings of the nation's social safety net. During the past year, RSP faculty were asked to make presentations about rural poverty at a seminar sponsored by the Federal Reserve Bank of Cleveland and at the International Comparative Rural Policy Studies Summer School in Inverness Scotland, to review two recent books on rural poverty and human services for academic audiences, and to write a chapter on the US social safety net for an international book on rural welfare policy.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 610 | Domestic Policy Analysis |
| 802 | Human Development and Family Well-Being |

**Outcome #8**

**1. Outcome Measures**

Value-added use of poplar seed fibers (e.g., for insulating textiles) will benefit the environment and increase total utilization of this resource

Not Reporting on this Outcome Measure

**Outcome #9**

**1. Outcome Measures**

Improved well-being of lower-income and ethnic minority youth across rural America

Not Reporting on this Outcome Measure

**Outcome #10**

1. **Outcome Measures**

Use of poplar seed fibers will positively impact the poplar industry and provide environmentally friendly textiles

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.)

**Brief Explanation**

{No Data Entered}

**V(I). Planned Program (Evaluation Studies and Data Collection)**

**Evaluation Results**

{No Data Entered}

**Key Items of Evaluation**

{No Data Entered}