

**Environmental Studies and Resources (ESR SAC)**

**Portland Community College**

**Program/Discipline Review**

**February 18, 2011**

**Contributors:**

**Tom Robertson**

**Kevin Lien**

# 1. The Discipline (Environmental Science and Environmental Studies)

## A. Introduction

**Environmental science** is an interdisciplinary academic field that integrates the physical and biological sciences, (including physics, chemistry, biology, soil science, geology, and geography) to the study of the environment, and the solution of environmental problems. Environmental science provides an integrated, quantitative, and interdisciplinary approach to the study of environmental systems. Environmental science, like other fields of science, involves application of the scientific method in evaluating and solving environmental problems.

**Environmental studies** is the academic field which systematically studies human interaction with the environment. It is a broad interdisciplinary field of study that includes the natural environment, built environment, and the sets of relationships between them. While distinct from ecology and environmental science, the discipline encompasses study in the basic principles of those two fields of learning as well as the associated subjects, such as: policy, politics, law, economics, sociology and other social aspects, planning, pollution control, natural resources, and the interactions of human beings and nature.

The fundamental difference between these two sub-disciplines is not easy for individuals from other fields to differentiate. Students choosing environmental studies or environmental science take several overlapping courses. Both programs to some extent integrate science with social science.

## B. PCC and Environmental Studies/Science

At PCC environmental studies and environmental science are interdisciplinary fields that incorporate social sciences, mathematics, chemistry, biology, and geology in order to examine the interactions between human beings and the natural world. Environmental studies allow scientists and laypersons to understand the complex interaction between various organisms while also equipping policy-makers with important data to make critical decisions. Environmental Studies is important to a broad array of disciplines, from architecture to law to public health. Recent estimates show a growing demand in governmental, commercial, and industrial employment for professionals whose qualifications include environmental analytical skills (US Bureau of Labor Statistics).

The ESR program at PCC supports PCC's values, missions and goals. The ESR SAC's learning outcomes and the manner in which we meet PCC's missions and goals through instruction were developed to support the "college mission" to provide an education of high quality and create a learning environment that allows students to realize their full potential.

**In support of the college's mission statement, PCC has six specific goals. These goals are listed below followed by a discussion of how ESR supports the goals.**

**Goal 1 – Access: *We will improve access to quality lifelong learning opportunities through the effective use of technology, affordable classes and the strategic location of facilities.***

Courses taught district wide (at all three main campuses) include the non-science majors laboratory based sequence 171 (Environmental Science – Biological Perspectives), 172 (Environmental Science – Chemical Perspectives) and 173 (Environmental Science – Geological Perspectives). These three courses count as the science laboratory course requirement for the AAOT degree requirements. Besides the courses being taught at the three main PCC campuses the courses are also offered at Columbia Gorge Community College (CGCC), and the faculty at CGCC are members of the SAC. ESR 171 is also taught at select high schools as part of the dual credit program (based on Oregon dual credit standards). These courses offer an extensive overview of environmental issues for students from all disciplines.

Courses for the ESR transfer program for environmental science and environmental studies are taught at the Rock Creek Campus. These courses include ESR 150 (Environmental Studies Orientation), ESR 160 (Introduction to Environmental Systems), ESR 201 (Applied Environmental Studies – Law and Policy Considerations), ESR 202 (Applied Environmental Studies – Quantitative Considerations). ESR 198/298 – Independent Studies are also offered.

Access is also provided for our students through the use of technology. Most instructors have developed detailed web pages in support of their courses. In addition, most instructors utilize the MyPCC portal and its many useful online course tools. These include announcements, links, a course calendar, message boards, chat, and email, among other things. The course tools feature allows ESR faculty to post files such as syllabi, lecture notes and assignments, so that students may have access to these materials at all times.

**Goal 2 – Student Success: *We will promote success for all students through outstanding teaching, student development programs, and support services in all that we do.***

The faculty that teach ESR courses have expertise in environmental science plus at least one other discipline. The methodologies used for teaching ESR classes include a wide variety of pedagogies such as: lecture – making use of all available technologies, hands-on labs, field trips, quantitative field experiences, student centered learning (inquiry based), lecture/lab demonstrations, service learning, access to advanced instrumentation and internships with environmental based organizations (such as local/state and federal government agencies, summer programs at other colleges and the private sector etc.). Students are given ample opportunity for self expression through oral and written presentations making use of PowerPoint and poster papers etc.

We also have students enrolled in various external student development programs. These include – University of Oregon - Oregon Institute of Marine Biology, Oregon State University Hatfield Marine Science Center, COSEE (Centers for Ocean Sciences Education Excellence),

Siskiyou Field Institute, Oregon Department of Environmental Quality, United States Forest Service, Tualatin Hills Parks and Recreation, City of Portland Bureau of Environmental Services, METRO and Oregon Parks Department,

**Goal 3 – Diversity: *We will enrich the educational experience by committing to the development of diversity in our student body, faculty and staff.***

The ESR SAC is acutely aware of the need to meet this goal. In our current group of transfer students there are two Native American students and we have had several Hispanic students in the past. In addition we have been able to provide accommodations to make our classes accessible to students with varying levels of disability. In the short history of the field of environmental science the gender and ethnicity has been primarily of European ancestry, often with more males than females. However at PCC, ESR has approximately a 50:50 balance of males versus females. The ESR faculty have taken steps to make gains in this ratio:

- Workshops (training) on cultural awareness as part of the new faculty institute
- Faculty encourage students to apply for scholarships and internships, especially research opportunities. We have recently placed a Native American student in an internship at OMSI and a second Native American student is being considered for a USEPA (United States Environmental Protection Agency) scholarship and is enrolled in the PSU Bridges to Baccalaureate Program. We have successfully helped a Hispanic student obtain a research internship with Oregon Institute of Marine Biology.
- ESR faculty have participated in the Teaching Learning Center cultural awareness activities.
- Our teaching methods allow for student expression and attempt to take advantage of different student learning styles.
- Several of our faculty serve on committees to help place students in professional internships.

**Goal 4 – Continuous Improvement: *We will develop, safeguard and allocate our resources (human, financial, capital, and technological) to ensure through planning and assessment the delivery of relevant, quality programs and services.***

The improvement of our faculty is directly linked to the continuous review of the courses and overall student development. The faculty stays current in their specialties by attending workshops that increase the quality of our lecture and labs as well as preparation for improving the curriculum. In addition the faculty stays current by reading literature and maintaining strong communication on recent issues. These discussions lead to improved faculty knowledge.

Many faculty have attended workshops and attended seminars. Among the seminars attended include COSEE (Centers for Ocean Sciences Education Excellence). Three faculty have attended workshops at either the OIMB (Oregon Institute of Marine Biology – University of Oregon) or at OSU Newport (Hatfield Marine Science Center) . Since 2002, the COSEE Network

has grown to 12 thematic and regional Centers located around the United States. The overall mission is “to spark and nurture collaborations among research scientists and educators to advance ocean discovery and make known the vital role of the ocean in our lives.”

Faculty have also attended several workshops at the Northwest Center for Sustainable Resources (NCSR). This is an National Science Foundation (NSF) funded institute. NCSR is a national clearinghouse for natural resource curriculum materials used by college faculty and high school science teachers. Materials cover major subject areas of environmental science and natural resources. They include fisheries, forestry, wildlife, and environmental science topics used in college programs. Professional development institutes covering environmental topics are provided for faculty and teachers. The curriculum modules produced by the NCSR are of top quality. Literally all of the modules produced are made available to full and part-time faculty.

Several faculty have also attended workshops and short courses at the Siskiyou Field Institute. SFI has partnered with Southern Oregon University (SOU) to bring a dedicated education and research facility to the Illinois Valley in southern Oregon. The outcome of attending the SFI seminars was the development of an independent studies course for summer 2010 “Ecology and Natural History of the Siskiyou”. Tom Robertson and Kevin Lien made several trips to Malheur Biological Field Station in Eastern Oregon and subsequently developed field based course offered in summer of 2007.

**Goal 5 – Cultivating Partnerships: We will effectively respond to the educational needs of our students and communities through strategic alliances with business, government agencies and educational institutions.**

The ESR faculty are very interested in establishing partnerships that give students opportunities apart from the subject area curriculum. One partnership that has allowed students to expand their opportunities is with The Centers for Ocean Sciences Education Excellence (COSEE) Network. This partnership has resulted in three students obtaining positions as summer research interns working with faculty at OIMB and OSU Hatfield Marine Science Center.

For our students interested in the physical sciences as they relate to environmental science faculty have been involved with the “Undergraduate Catalytic Outreach and Research Experience” (UCORE).

We have placed students in several agencies for summer internships including:

- Oregon Department of Environmental Quality (ODEQ)
- Oregon State Parks Department.
- Washington County Urban Forester

- University of Wyoming – Wolf Research Project
- OSU Dept. of Forestry
- PSU – Biology Dept.
- PSU – Environmental Science
- Tualatin Hills Parks and Recreation (THPRD)
- METRO (Metropolitan Regional Government)
- Bureau of Environmental Services – City of Portland
- Edmonds Community College – Integrating Research Into undergraduate Curriculum
- PBTB – Portland Bridges to Baccalaureate Program (PCC/PSU)

We are currently part of a PCC team working with the new Vernonia School District which would involve ESR students and service learning with Vernonia students (all grade levels). The first project would be working with 4<sup>th</sup> grade students in the development of a fish hatchery.

We are currently being integrated (along with the biology and Bioscience departments) in the following program:

**Community College Undergraduate Research: Building a Model of Integration:** involves the design, implementation and evaluation of a model for integrating undergraduate research into a community college science curriculum. The project involves the use of scientific principles contained within a portfolio of ongoing research programs to develop inquiry-based educational materials and laboratory activities for freshman biology environmental science courses. These materials would then be expanded into an undergraduate research experience within a for credit, transferable, advanced sophomore-level course. The sophomore-level course curriculum will include training students as peer-leaders to support the development of new student projects emerging from the freshman courses and supports the creation of an educational environment where research and education are integrated. The project originally involved a collaboration of five community colleges (Finger Lakes CC, Monroe CC, Genesee CC, Tompkins-Cortland CC, and Delaware Technical and CC). The next phase of the grant will result in an expansion to an additional 17 colleges, including PCC Rock Creek. Faculty at PCC Rock Creek (ESR, Biology and BIT) will attend a meeting in April to elucidate our planned involvement.

**Goal 6 – Community: We will facilitate growth and development of our district communities by accepting a leadership role and serving as a key educational resource to the community.**

We have discussed above several partnerships that relate to the “extra-curricular” community. We are developing a relationship with the new Vernonia School District, involving Service Learning between ESR students and students in Vernonia. Also we are involved with the PCC Dual Credit Articulation Connections for Biology, Environmental Studies and General Science (PAVTEC). PCC’s ESR 171 course is currently being taught at high schools for dual college credit. Instructors teaching dual credit sections are part of a continuing collegial interaction, through professional development, seminars, site visits, and ongoing

communication with the post-secondary institutions' faculty and dual credit administration. This interaction addresses issues such as course content, course delivery, assessment, evaluation, and professional development in the field of study.

PCC ESR is an important educational resource to the greater PCC community. Many LDT students from other fields take one or more of the ESR 171, 172, 173 sequence classes as their science lab course requirement. The courses cover many local, regional and international problems including global warming, endangered species, urban pollution, rural environmental issues, population issues, ocean issues etc. We have recently offered summer sections of ESR 171 at the Rock Creek campus for students in CTE fields (ThinkBIG). This program is a partnership between Portland Community College and partnering Caterpillar dealerships in the Northwest. It is an industry specific two-year associates degree program with required on-the-job training/internships. The ESR 171 course offers these students a better understanding of the importance of environmental principles to their daily lives once they are in the working environment. One focus of these courses is to have students question how their day to day activities influence our environment and potential future environmental problems. Faculty are often surprised at the relative misunderstandings of students about environmental science, politics and policies. This brings students into the fold to support PCC's sustainability initiatives.

Tom Robertson is an adjunct member of the PSU Graduate Faculty in environmental science. Tom has taught a graduate level class for PSU during several terms. This has resulted in further enriching the partnership with the Environmental Science Program at PSU.

## **2. Curriculum**

### **A. National and Professional Guidelines**

In planning the undergraduate transfer program, PCC Rock Creek was a member of the National Science Foundation grant that involved the following institutions: Portland State University, PCC – Rock Creek Campus, Oregon Institute of Technology – Klamath Falls, Columbia Gorge Community College and Clatsop Community College. The NSF Grant emphasized the establishment of an undergraduate curriculum in environmental science leading to a bachelors degree. Because there are no specific guidelines for environmental studies/science curriculum nationwide, the above institutions developed a undergraduate degree based on comparable national programs plus the needs of government agencies and private consulting firms plus graduate programs in environmental science. Meetings were held with representatives from government agencies and private environmental consulting firms focusing on what they considered good preparation for employment.

As one looks at national undergraduate programs, certain consistencies are apparent. Environmental science tends to prepare the students for graduate school and/or technical programs at local, regional or national agencies as well as private environmental consulting

firms. As a result there are requirements for biology (usually a majors sequence in biology), chemistry (at least 200 level chemistry one year sequence), mathematics through calculus and statistics), physics (200 level), and often a course in 200 level geology. With those sequences for a foundation and in addition the usual foundation classes for the associate of Oregon Transfer Degree, students are prepared to transfer to a bachelors degree granting institution. We emphasize writing and verbal communication skills in the ESR program. Understanding and application of the scientific method is also a major emphasis of the environmental science degree. Four core courses in ESR are required for PCC students in order to transfer to PSU and other four year universities in addition to the basic requirements of the AAOT. These four courses are ESR 150 (Environmental Studies Orientation), ESR 160 (Introduction to Environmental Systems), ESR 201 (Applied Environmental Studies – Law and Policy Considerations) and ESR 202 (Applied Environmental Studies – Quantitative Preparation for Problem Solving).

The Environmental Studies transfer AAOT was developed in 2006 in cooperation with Portland State University. The environmental studies transfer program emphasizes a human based application of environmental science. The core courses in environmental studies are the same as the environmental science option. The major differences are the core science requirements, not requiring majors biology, chemistry, mathematics and physical sciences. The sciences are still required but not at the 200 level. The degree allows students a choice of five areas of emphasis in the Environmental Studies degree at PSU.

**Pedagogy.** Critical thinking is strongly emphasized in all ESR courses. The faculty makes use of recent research in environmental science, up to date evaluation of environmental laws and policies, and laboratories designed for hands-on student involvement. The students also, very early in the ESR transfer program, are introduced to individuals working in the profession. In ESR 150, weekly speakers from regional and federal agencies as well as from the private sector discuss their professions with the students.

Students are involved with writing from the beginning of the transfer program. For example, in ESR 202 the students spend six weeks evaluating an urban watershed, making use of established field sampling techniques, reviewing scientific literature, evaluating field collected data, interpreting collected data, and writing a synopsis of the class study. Students work collaboratively and individually in putting together their final reports. Courses that are taken as a prerequisite to ESR 202, are preparatory for evaluation of the urban watershed. The student's final reports are written based on the Council of Scientific Editors (CSE) format. During the watershed evaluation the students use the Scientific Method plus critical thinking skills to develop their final report. All of our laboratory courses are based on critical thinking coupled with the experimental nature of science. The labs are inquiry based, both field and lab oriented and hands-on.

Lectures are tied to labs, at least in a general sense. The lectures may cover both regional and internationally based environmental issues, while the labs are designed for hands-on inquiry based opportunities for students. The lectures address issues, while the labs address the practical data collection side of problem (or issue) resolution.

Courses are undergoing continual evaluation. Lectures are continually modified based on new environmental issues. Daily media plus the primary literature are also used to modify lectures.

**Transfer opportunities** – All students in the ESR program are transfer students. Most students transfer to Portland State University, though many have transferred to other universities. Other schools where ESR students have transferred to include (not a complete list): Oregon State University, University of Oregon, University of Washington, Southern Oregon University, Willamette University, Western Washington University, University of Idaho, Loyola University of New Orleans.

**Transfer to Portland State University** - The transfer to Portland State University in either environmental science or environmental studies, is a “seamless transfer program”. The students enter Portland State University as juniors and are usually not required to take any additional first or second year courses. This seamless transfer has been in place since 1996 and has been very successful. Faculty from PCC and from Portland State University have also been involved with faculty exchanges. PCC’s ESR 201 (Law and Policy Considerations) has been taught by Portland State University faculty and PCC faculty have taught a graduate course in environmental science at PSU (ESR 426/526 – Stream and River Ecology). Regular meetings between PSU and PCC faculty occurs and a speaker from PSU gives a program over-view as part of the ESR 150 class. Transfer guides (PSU) for both environmental science and environmental studies are available on the PCC intranet.

**Transferrable Skills** – Skills that students transfer to other universities include environmental content plus other skills including:

- **Critical thinking and problem solving:** Students can apply these skills for problem solving at the next educational level as well as in their eventual work position.
- **Cooperative work skills (teamwork):** Students work collaboratively in all courses for the major transfer programs. Both lab and field groups are formed in both labs and lectures allowing students to work in teams. In lab and field students work in groups of 3 – 6 students – to collect data in lab and field. Groups also work together on final projects interacting during data analysis for final reports. Students form long lasting relationships that often extend into their transfer university.
- **Use of lab and field equipment:** Students use sophisticated equipment for measuring microclimates, water quality and soil chemistry. Microscopes are used regularly as is basic field collecting gear for evaluation of animal and plant populations. Equipment is being upgraded on a regular basis as money is available.
- **Communication Skills:** Students in the ESR program develop writing skills in all courses and also prepare oral presentations in other classes. The writing skills follow the scientific format IMRAD (**I**ntroduction, **M**ethods, **R**esults **A**nd **D**iscussion) and cover three major sources of information: a) library research b) project research from files at agencies

e.g. ODEQ etc and c) Interpretation, data analyses and evaluation of data collected by individual students and student groups.

## **B. Course Content and Outcomes -**

Most course outcomes were revised during the 2009-2010 academic years in order for higher education to meet new state guidelines. These have been approved by the Curriculum Committee. The concept of green curriculum has been part of the program since the beginning in 1996. Students are encouraged to participate in campus green programs and one ESR major is currently student representative to the PCC Rock Creek green team.

**Use of Chemicals:** All courses in the ESR program use chemicals as part of the laboratory portion of the courses. Waste chemicals, from field chemistry kits are taken back to the lab and disposed of properly. Students begin to understand the process of how chemicals reach the environment if disposed of improperly. All faculty undergo the required lab and chemical safety programs as required by PCC.

**Participating in the PCC LOOP Food Cycle:** The PCC Rock Creek campus is a leader in the concept of a food loop system. The Loop involves the recycling of food components from the cafeteria through the worm compost system (food scraps) or the new Rocket Composter (materials that are harder to breakdown) to create a soil amendment. The soil is then used in the organic garden (community garden) to grow vegetables that are used in the cafeteria. Excess vegetables are given to local food banks. Students may also utilize vegetables grown in the garden. Other campuses are also developing programs.

**Modern Field Equipment:** In the ESR majors courses the laboratories are designed to take advantage of up to date modes of data collection. The faculty have contacted and met with various environmental based agencies including, but not limited to: Oregon Department of Environmental Quality, United States Environmental Protection Agency and private consulting firms, in an attempt to replicate their data collection methodologies. We have been able to keep our students more or less up to date. We need to continue this, and equipment money is the main controlling factor.

**Technology and ESR Labs:** Our students have access to up to date technology including Geographic Information System (GIS) software, access to computers for use of programs e.g. Microsoft office. Students are required to have some level of expertise in Microsoft Word, Microsoft EXCEL, and Microsoft PowerPoint. Laboratories are also designed to make extensive use of microscopes, bioassay analyses, soil chemistry kits, water quality kits, long term temperature recording devices (field based) , Yellow Springs Instrument Corporation (YSI) chemical multiprobes (water quality data collection), biological field sampling equipment, keys to organisms evaluated, statistical software package, access to data bases from environmental based agencies, ESR faculty attempt to give the students a comprehensive exposure to the latest most up to date field and laboratory experiences.

**PCC Rock Creek Environmental Studies Center (RCESC):** The RCESC website address is <http://www.pcc.edu/resources/rcesc/>

The **Rock Creek Environmental Studies Center (RCESC)** is a natural area within Portland Community College's Rock Creek Campus that is considered to be an important natural history area by both the Portland Audubon Society and the Oregon Department of Fish and Wildlife. The natural area, which comprises the RCESC, includes about 50 acres of woodland, 15 acres of wetland and 44 acres of grasslands. Several smaller unique ecosystems are also present in this site, including several springs and a small pond ecosystem.

The RCESC is completely integrated as a part of the ESR and Biology programs at the Rock Campus. Other schools in the metropolitan area also make use of the RCESC. Field labs in the RCESC include analyses of forest soils, plant ecology, wetland ecology, stormwater runoff, water quality analysis, restoration ecology, forest management, fungal biology, botany and others. The RCESC has become an integrated component of the ESR, Biology and Geology programs as well as getting use from the art department. This unique, at the community college level, environment is a major selling point for the above programs. Students have expressed appreciation to the faculty for being able to make use of the RCESC.

**General Curricular Changes:** Instructors in ESR have modified their pedagogic methodologies to incorporate some aspects of inquiry based learning. Inquiry based learning has as one of the major components the concept of open learning. **“Open learning is when there is no prescribed target or result which students have to achieve. In many conventional traditional science experiments, students are told what the outcome of an experiment will be, or is expected to be, and the student is simply expected to 'confirm' this. In open teaching, on the other hand, the student is either left to discover for themselves what the result of the experiment is, or the teacher guides them to the desired learning goal but without making it explicit what this is. Open teaching is an important but difficult skill for teachers to acquire.”** (U.S. National Science Educational Standards, 1996).

Inquiry-based learning has influenced science education in the United States. It is also known as Inquiry-based science. Though not necessarily the ultimate answer to improving science education, there are some aspects that have proven to be useful at PCC.

### **C. Assessment of Course Outcomes.**

#### **i. Are assessments that address the course outcomes described in the CCOG's?**

Assessments of core outcomes are described in the CCOG's (<http://www.pcc.edu/ccog/default.cfm?fa=course&subject=ESR>). The CCOG's are a guideline that allows some flexibility to individual faculty in assessing students. In general our current assessments include: Examinations, quizzes, homework assignments, laboratory write-ups/interpretation of data, group problem solving, written assignments, oral presentations, and/or laboratory notebooks. The degree to which these are used is somewhat variable and based on the discretion of individual instructors.

## **ii. Describe evidence that students are meeting course outcomes.**

ESR faculty receive immediate feedback from students relative to the CCOG's. Faculty teaching the ESR majors are continually interacting with students, discussing course content and receiving feedback. The ESR majors program is a transfer program. Students who have transferred remain in contact through meetings, e-mail etc. with faculty. Our students have transferred to predominantly Portland State University, but also have transferred to several other universities including but not limited to: Oregon State University, University of Oregon, Southern Oregon University, University of Washington, Western Washington University, Willamette University, Washington State University and others. Using anecdotal information, a high percentage of PCC ESR students attend graduate programs around the country. One student (Tanya McLean) completed her MS at University of Maryland in the Conservation Science Program, another (Adam Kennedy) is completing a Ph.D. in atmospheric science at OSU – as part of the OSU Climate Change Research Team, still another is finishing her Ph.D. in the College of Fisheries and Aquatic Sciences, several (Joel Migliaccio, Jennifer Karps, Matt Lawrence, and others) have completed MS degrees in environmental science at PSU. Another student Leslie Bliss-Ketchum is VP Elect - of the Oregon Chapter of The National Wildlife Society and a PhD student in Environmental Science & Management Program at Portland State University. Former PCC student Jennifer Karps is currently working with the City of Portland, Bureau of Environmental Services.

Many students have gone directly to the workplace after completing their bachelors degree. Places of employment include: private consulting firms, City of Portland Bureau of Environmental Services, METRO, US Environmental Protection Agency and others.

Direct feedback from Portland State University ESR faculty about PCC Rock Creek ESR transfer students had occurred on a continual basis. In short, PSU faculties have been very impressed with our students. One transfer student to PSU ESR program related a comment from the former Chair of ESR at PSU. The student was at a meeting for new transfer students, and when the student mentioned transferring from the PCC Rock Creek campus, the Chair of the PSU program stated – “we never worry about the preparation of students coming from PCC -RC, they are always ready for the next level”. In a conversation with another former chair about our students and the PCC RC program, the individual stated “I think all of our ESR majors should spend their initial two years at PCC-RC, but of course our administrators would never agree to that”. Needless to say I am very pleased by the success of the ESR students in either obtaining graduate degrees and or working in their field of study after receiving their bachelor's degree.

Other ways of assessing our outcomes are through course evaluations. We regularly receive formal evaluations from students and have been very pleased with student feedback. Based on this direct student feedback we are continually modifying our approaches to both lectures and labs. Unfortunately there is a lack of national instruments for feedback in environmental studies programs.

The SAC has limited hard data on whether we are meeting the needs of students in all areas. Many transfer programs are faced with this dilemma, since we often lose contact with the majority of our students after they transfer. We need to develop follow-up studies to track ESR

transfer students. This may require support for faculty release time or hourly salary for part-time faculty to develop a system for quantitatively tracking students after they leave PCC. Perhaps we could elicit the involvement of institutional research in this effort.

Tom Robertson has recently developed a simple survey and sent it by e-mail to a number of former students from the ESR program. **The feedback was constructive and very positive (see Appendix A for student responses).** We will continue to develop this survey system.

**iii. Identify/give examples of assessment-driven changes made towards improving attainment of course level outcomes.**

The SAC has developed a method to evaluate critical thinking relative to the ESR 201 (Environmental Law and Policy Considerations) course. Students select a Pacific Northwest environmental issue and evaluate the problem, look at problem or issue resolution, and determine which of the regional and/or national environmental laws were useful in guiding problem resolution. A matrix was developed for assessing student success. This assessment tool resulted in modifications to the course which enhanced student understanding of environmental problem resolution. Lectures were modified and more student led discussions were incorporated in the course.

The ESR 202 course (Problem Solving: Quantitative Methods) has undergone several changes over the last few years. The instructors (Kevin Lien and Tom Robertson) have modified the course to “fine tune” students expectations and understanding of course requirements. The most important single change has been to move from a single project report due at the end of the term, to a “stepped” series of units or modules. The units or modules are portions of their term long projects with the first unit being written using the scientific format, with limited but “packaged data” to a second unit with more data added to the first units’ data and a third unit which is comprehensive for all data collected. Lectures have been continuously modified to focus on those skills and concepts crucial to a successful final report. Student writing and data comprehension for the final report has noticeably improved; students seem less confused and the faculty feel there was a substantial improvement in the quality of the final reports. This was reflected in a higher overall class grade average.

**D. Assessment of College Core Outcomes.** The updated mapping matrix was completed in 2010. The map includes all currently listed courses in the PCC General catalog. The numbers in the table relate to the mapping level indicator values listed above the table.

## Core Outcomes Mapping- Environmental Science and Resources (ESR)

Mapping Level Indicators: 0- Not Applicable		Core Outcomes:					
1- Limited demonstration or application of knowledge and skills. 2- Basic demonstration and application of knowledge and skills. 3- Demonstrated comprehension and is able to apply essential knowledge and skills 4- Demonstrates thorough, effective and/or sophisticated application of knowledge and skills.		1- Communication 2- Community and Environmental Responsibility 3- Critical Thinking and Problem Solving 4- Cultural Awareness 5- Professional Competence 6- Self-Reflection					
Course #	Course Name	CO1	CO2	CO3	CO4	CO5	CO6
ESR 150	Environmental Studies Orientation	2	3	2	2		4
ESR 160	Introduction to Environmental Systems	3	3	3	3		3
ESR201	Applied Environmental Studies: Science and Policy	4	4	4	3		3
ESR 202	Applied Environmental Studies: Preparation for Problem Solving	4	4	4	2		3
ESR 203	Applied Environmental Studies: Project	4	4	4	2		3
ESR 298	Special Topics: Environmental Studies	4	4	4	2		3
ESR 171	Env. Science: Biol. Perspectives	3	3	3	3		3
ESR 172	Env. Science: Chemical Perspectives	2	3	3	2		3
ESR 173	Env. Science: Geological Perspectives	2	3	3	2		3

Courses in ESR cover a wide range of topics from chemistry as relates to environmental issues, to the functioning of ecosystems, environmental laws and policies (international, federal, and regional), quantitative assessment of ecosystems, human ecosystems (rural and urban), social implications of environmental policy, problem solving in both laboratory and field settings etc. Our courses though predominantly lab based, also include lecture only courses, and independent study courses. All faculty have been encouraged to follow college core outcomes.

**Communication:** ESR courses require that students write lab reports, field trip summaries, keep lab notebooks, write environmental issues papers and end of the term research reports. Students may, depending on the specific assignment, work in groups or individually. All of the laboratory courses, whether field based or lab based, require a written evaluation of data collected. An ESR 202 student recently won a library research award based on their term long evaluation of an urban watershed. Others in the class have also been finalists for the library research award. Oral presentations are an integral part of several ESR classes. An example is ESR 201 (Environmental Problem Solving: Laws and Policy), where students investigated a Northwest environmental issue. They research the problem, discuss how the problem is being or has been mitigated, the processes (both scientific and legal) of mitigation and which specific environmental laws apply to the problem (or issues). They offer their own opinions on the problem resolution. The students then write a report on their findings and make a PowerPoint presentation of their findings as well as write an abstract which is given to all students preceding their presentation. The presentation format is the same as the students may encounter at a professional meeting. Peer evaluation is another component used in many ESR classes. Other instructors have experimented with a variety of oral, written and poster presentations.

**Community and Environmental Responsibility:** This College Core Outcome is emphasized continually in all ESR classes. All ESR courses have this as a major focus. Courses cover issues associated with water quality, water treatment, soil and land quality, watershed issues and management, air pollution issues, solid waste issues, energy issues (alternatives and conservation), agricultural issues, and human cultural issues. Individual responsibility relative to the environment is also emphasized. Service learning is a critical component in many of the ESR courses.

**Critical Thinking and Problem Solving:** Other than environmental responsibility, perhaps critical thinking and problem solving are the most important core outcome for ESR classes. Science requires an understanding of the scientific method. The scientific method is followed and emphasized in all ESR classes. All of our major's laboratory classes involve carrying out lab or field based data collection, examining data (mostly data collected by students) and processing (producing figures and using basic statistics) their data. They make conclusions about their data and answer post-lab questions formulated for applying principles of critical thinking. We have completed a critical thinking and problem solving assessment vehicle as part of the college wide assessment of critical thinking. The assessment module developed for our ESR 201 course will be utilized in Winter 2011.

**Cultural Awareness:** The ESR SAC considers it essential that students become aware of how environmental science not only examines the world around us as in ecosystems analyses, but also how environmental issues impact people. Several of our courses include discussions on topics such as environmental justice. The United States Environmental Protection Agency defines environmental Justice as: “Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.” Environmental justice seeks to ensure that minority and low-income communities have access to public information relating to human health and environmental planning, regulations and enforcement. Though PCC does not offer a course in environmental justice nearly all ESR classes discuss the topic. Topics discussed in ESR 201 include the location of landfills, hazardous waste storage sites etc. and why in the past they have been located in poor neighborhoods. We discuss the NIMBY (not in my back yard) phenomenon as relates to the power of wealthier neighborhoods to resist landfills etc. being placed near them.

**Professional Competence:** Though the ESR program does not end at PCC, but is a transfer program, we still must consider that our students will someday be professionals. Students who complete the transfer requirements will leave PCC with strong preparation in areas such as: critical thinking, vision including a world view, scientific problem solving skills and strong skills in communication.

**Self-Reflection:** Self-reflection is embedded in several ESR classes. In ESR 150 (Environmental Studies Orientation) students may complete a service learning experience, and then write a report discussing the value of this experience. Also in ESR 150 the students write a paper on an environmental career of their choice. In ESR 160 the students keep detailed lab notebooks. The notebook includes post-lab questions that often involve their personal opinions as well as interpreting data collected and applying the lab concepts to situations beyond the lab assignment. Students are also asked to complete lecture based essays relative to their opinions and applications on what they have learned to situations beyond the classroom. In their ESR 201 projects, students are asked to evaluate the resolution of a chosen Pacific Northwest environmental issue. They reflect on what may have been done differently and whether the agencies involved with mitigation took into account the totality of damage to the environment and human health. In ESR 202 the students evaluate the environmental conditions in a heavily urbanized watershed. Part of their final report must include a section where they express their opinions about the watershed and make recommendations for improvements (restoration) within the watershed relative to both environmental and human conditions

## **E. Distance Learning.**

There are no distance learning classes in the ESR transfer program. All classes for transfer majors except ESR 150 and ESR 201 have lab based components. ESR 150 – Environmental Studies Orientation is centered around guest speakers. Because of this the course is not appropriate for distance learning. ESR 201 involves student discussions and student

presentations. This would also not be easily done through distance learning. The other two classes taken for transfer include ESR 160 and ESR 202. Both of these classes have critical lab and field based components. The SAC does not feel that these are appropriate courses for distance learning.

ESR 171 – 173 also have lab components. These courses also involve field trips, field exercises and other labs. The SAC has considered attempting to make these courses “hybrid” courses but the lectures often include student presentations, not easily accomplished in distance learning.

#### **F. Curricular Changes Resulting from PCC Educational Initiatives.**

**Service Learning** – several courses have incorporated some form of service learning. For example in ESR 150, students may complete a service learning component for the class. Students have volunteered with several local and regional environmental based public agencies and non-profit organizations. ESR 160 and ESR 201 courses offer students service learning, much of which is focused on the PCC Rock Creek Environmental Studies Center (RCESC). Students are given the opportunity to volunteer to work in the RCESC. Faculty at Rock Creek, in cooperation with the Rock Creek Green Team, have organized annual Earth Week focusing on exotic vegetation removal and maintenance of structural components of the RCESC. Students in ESR work as team members including students from other disciplines plus PCC RC outside community members for six hours during Earth Week activities as part of the Earth Week program at Rock Creek. Students also volunteer at various times during the year to help with data collection etc. at the RCESC. Several students have volunteered with the Portland Audubon Society, the Oregon Zoo, various non-governmental organizations (NGO’s) and the Tualatin Hills Parks and Recreation District.

ESR faculty at PCC Rock Creek are part of a planning group to work with faculty at the new Vernonia High School as partners for developing environmental curriculum at the high school. The planning is in the initial stages, but a potential component of the process could include ESR students at Rock Creek mentoring high school students in Vernonia on such projects as: salmon/trout hatchery, monitoring habitats in the Vernonia area and teaching students basic field techniques for sampling the diverse environment in the Vernonia area.

**Internationalization** – Most classes in ESR incorporate international environmental issues as a major part of the curriculum. For example in Tom Robertson’s ESR 201 class (Law and Policy), we discuss the process of developing an international treaty. We evaluate the needs for treaties, the participants in treaty formation and enforcement of treaty compliance. The students then are lead in discussion by the faculty member on how several specific treaties (including – Kyoto Protocol, Montreal Protocol, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITIES), Inter-American Convention for the protection of Sea Turtles, and others) have impacted global environmental resources. The

discussion, often led by students, moves beyond the environmental consequences of international law, to include the impacts to human cultures. In other courses, e.g. Tom Robertson's ESR 160 (Introduction to Environmental Systems) a film is viewed on global consequences of over-population, coupled with specific problems associated with clean drinking water, famine and other important global issues. We conclude each film with a follow-up discussion.

One faculty member (Tom Robertson) visited Germany during the Summer of 2009 as part of the Studienforum Berlin along with 3 other PCC faculty. Studienforum Berlin promotes better understanding of the people, society, culture, and institutions of Germany and Europe among national, European and overseas faculty and students. This workshop was focused on the topic "Germany as a Model? Germany's Environmental and Energy Strategy". The faculty seminar, based in Berlin, involved many field trips to German government agencies, political parties and included several lectures. The information gleaned from this trip has been incorporated into several ESR courses. The lecture/discussion on energy for the next century in ESR 160 uses Germany as an example of where the United States needs to proceed with energy policy. The information is also used extensively in ESR 201 (Problem Solving - Law and Policy Considerations).

All ESR courses discuss the issue of "climate change". The perspectives on climate change include local impacts to global impacts. Discussions include individual responsibility (calculation of carbon footprint) to how the United States needs to be a guiding force globally on this issue, rather than a deterrent to progressive international policy.

When evaluating environmental problems, the discussions include not only industrialized countries but also those countries that are emerging through the "Demographic Transition" to becoming industrialized and those nations that have not yet reached the point of "Demographic Transition".

**Inquiry Based Learning.** Inquiry Based Learning is an integral part of all ESR classes. All of the laboratories for ESR majors are hands on labs. Students are given a problem and must use either the laboratory or field based data collection to evaluate the problem. All of the labs begin with asking a basic question. The students then are given the proper equipment to collect data and answer the question. Follow-up quizzes are given weekly in most classes that allow the students to interpret the information from labs. Students work individually, in groups and as a class to evaluate basic environmental questions.

In ESR 202 (Quantitative Studies) students are asked to evaluate an urban watershed (Bronson Creek) and determine the biological, physical and chemical characteristics of the watershed. They make recommendations for improving the watershed through restoration projects. ESR 201 (Law and Policy), though a lecture class only, has a strong inquiry based element. The course includes: daily discussions, question and answer sessions, student's research into a Northwest based environmental problem, followed by writing a paper and giving an oral presentation. This project is discussed above in another section.

**Sustainability.** Sustainability is a key component of every ESR course. Students are engaged in detailed discussions on the meaning of sustainability, and one ESR majors student,

Jeff Christian is the student sustainability coordinator at PCC - RC. Virtually every lab has sustainability as an underlying component. Classes in ESR and other programs have field components that include PCC RC loop system. The Loop at Rock Creek is discussed in detail on page 10. Faculty in ESR are also involved with SPARC (Sustainable Practices and Resources Committee) and have had input on the CELT (PCC Climate Energy Leadership Taskforce).

Students are also shown the wetland restoration for stormwater treatment from runoff from parking areas and building roofs. The treatment system also treats water from the PCC – RC/THPRD parking lots and athletic fields. Discussions take place on the site of stormwater treatment structures focusing on the operation and design of the structures. Faculty are currently designing a sampling strategy for evaluating the effectiveness of the structures that will be incorporated into a lab. The stormwater eventually enters local creeks as a much cleaner in-put. Some students have expressed an interest in making stormwater treatment system design a specialty within their ESR major.

Sustainability is mentioned at many levels, from a student's day to day responsibility for recycling, transportation (many are backers of mass transit and take advantage of PCC inter campus shuttle) and other issues, to the City of Portland's Program in sustainability, to our nation's responsibilities to international issues in sustainability. PCC's efforts at sustainability are college wide and are driven by students, faculty and PCC's sustainability coordinators with the full support of administration.

### **3. Needs of the Community and Students**

#### **A. What is the effect of student demographics on instruction?**

Students enrolled in ESR classes over the 2007 – 2010 period were more likely to be female (58%), tend to be white (85%), and are less than 30 years old (75%). Most students are full-time (69%) and degree seeking (94%). In comparison to overall lower division students (LDT) the % female is 56.5%, less than 30 (68%), white (73%) and degree seeking (83.1%).

ESR student population tends to have slightly more females, be younger and less racially diverse than the overall LCD students and have a larger number of degree seeking students. ESR needs to do more to attract minority students to have a more racially mixed student body. This especially applies to Washington County with its large population of Hispanic students.

#### **B. Changes in curriculum to meet the needs of students and transfer institution needs.**

As discussed earlier ESR is constantly receiving student and transfer institution feedback to best prepare our students for the next level of education. Our students have given very positive feedback and though we continue to make changes, the student feedback suggests our students are well prepared for the next level. Many transfer students have commented on their experience at PSU, with by far the most common statement being “we are

better prepared for the third and fourth year at PSU than are the students that have been at PSU for their first two years”. We have had very good feedback from transfer institutions, especially Portland State University. PSU faculty (including Alan Yeakley, John Reuter, Joe Maser and Yangdong Pan) have given regular positive feedback on the preparation of ESR transfer students. Perhaps the most common statement from PSU faculty is “students cannot stop talking about their experience in the first two years at PCC Rock Creek and it shows in their performance at PSU”. Perhaps the best indicator from PSU faculty is the large number of former PCC students that complete a graduate degree at PSU. Of course one cannot stand on positive feedback and allow our faculty and students to stagnate, so we are continuously modifying the curriculum and seeking feedback on the changes from students.

A survey was sent out to former students that are still at PSU or are currently working in the Portland Metropolitan Area. We purposely kept the statements/questions very brief to give students the freedom to give unconfined answers. The questions asked were:

*Describe your preparation for transfer to a four year school (in other words how well prepared were you to transfer?)*

*What were the highlights of your time at PCC?*

*What are your plans for the near future?*

*Are there any other comments you would like to add?*

**The student responses are found in Appendix A and are based on our initial survey.**

Questions were also sent to PSU to faculty that have mentored PCC students not only in their undergraduate classes but also in their graduate programs. The questions/statements were:

**How well are PCC's transfer students prepared for their next level of education at PSU? (How well have they done at PSU - were they well prepared?)**

**How have our students done at the post-graduate level at PSU? (I know several students have completed or are completing MS degrees (or Ph.D.'s)**

**The responses from two faculty at PSU are given below:**

**Dr. Alan Yeakley:**

Dear Tom,

I'm glad to hear the positives about the UERC. Really busy here because of that and because of several federal grants we've received recently. NSF and USFS dollars are really flowing our way these days.

Also, I'm part of the IMST and we just finished an extensive report on urbanization and salmonid ecology in Oregon. I was thinking you might like to get a copy of that report, and plan to put you on the distribution list (unless you say no!) We have an electronic version (it's really long, book length, more than 250 pages) at:

<http://www.fsl.orst.edu/imst/reports/urban.html>

On your questions, I can answer them in general but I'm not tracking individual students that well these days so I can't mention specific student success stories unless you give me a list of PCC student names who you know have come over here. We have the obvious success stories such as Jennifer Karps, of course.

But, here are some general answers:

Question 1. PCC Rock Creek students who become environmental science majors at PSU consistently excel and are very well prepared. A strong feature of the Rock Creek program is the sophomore field lab course, and that produces students who are both knowledgeable and confident about conducting field work. PCC students also perform well on exams and in classroom discussion.

Question 2. While I cannot answer this question for specific students, I can say that a significant percentage of our students go on to graduate school, including students who are first trained at PCC Rock Creek. PCC Rock Creek students who become environmental science majors at PSU receive a great deal of both theoretical and laboratory based experience at both institutions (PCC, PSU), and as a result are well set up for graduate school.

Sincerely,  
Alan Yeakley

### **Dr. Yangdong Pan:**

**How well are PCC's transfer students prepared for their next level of education at PSU? (How well have they done at PSU - were they well prepared?)**

PCC transferred students are well prepared for our Environmental Science and Management degree programs. When they get transferred to PSU, they take our senior sequence of environmental sciences. The sequence includes 3 lecture courses (ESM 320 Analysis of Environmental Systems I, ESM 321 Analysis of Environmental Systems II, and ESM 322 Environmental risk assessment) and associated 3 lab courses (ESM 323, ESM 324, ESM 325). These are very demanding courses requiring all students to integrate multiple disciplines such as biology, chemistry, physics, and statistics. I have been teaching ESM 322 and 325 for more than 10 years. Based on my own experiences, the most outstanding students in my classes are often these transferred PCC students. They usually have very solid course backgrounds, lab and field experiences, and more importantly they are very motivated.

**How have our students done at the post-graduate level at PSU? (I know several students have completed or are completing MS degrees (or Ph.D.'s))**

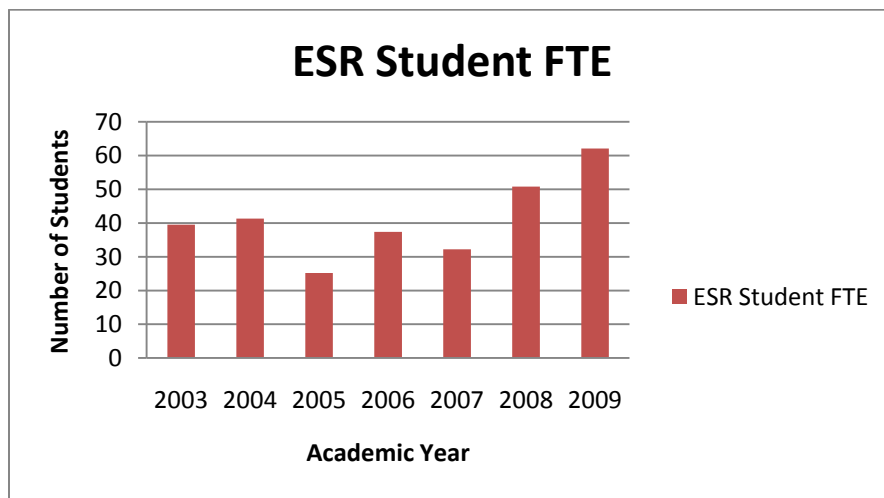
Leslie Bliss-Ketchum, a PCC transferred student, is in our doctoral program. She is working on a road ecology project with Dr. De Rivera and I remember that her

work was reported by Oregonian newspaper a while ago. Paula Hood is in the process to apply for our Master program. I believe that more PCC transferred students are in our graduate programs and are doing very well.

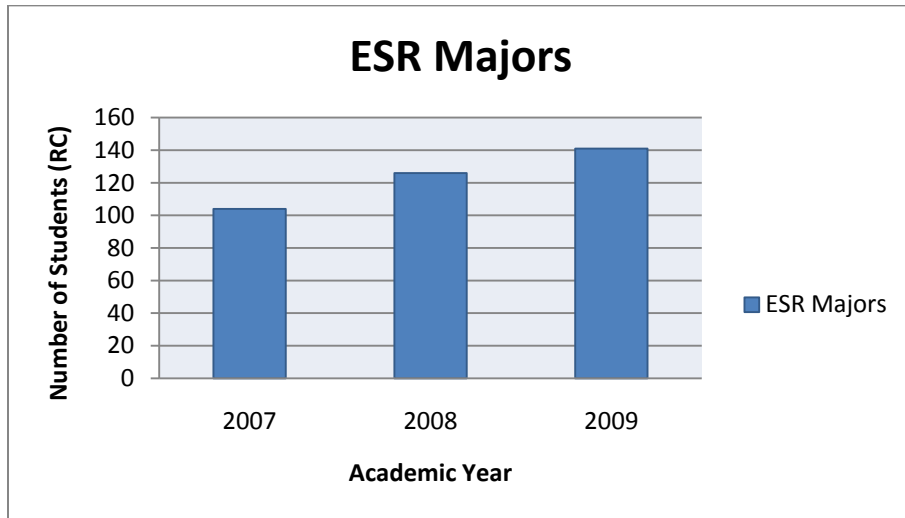
PCC Rock Creek is in the process of developing a natural resources option. The degree will be based in the Landscape Technology Program but ESR is a partner in the development and implementation of the Natural Resources option. ESR will develop a water quality course specifically designed to complement the Natural Resources option in Landscape Technology. ESR is also developing a new course titled Restoration Ecology. There has been a strong interest shown by ESR students for a course that focuses on the basic processes used in ecological restoration. This course would also be an option in the Landscape Technology Natural Resources Option. ESR will continue to offer intensive field based courses. These field classes have been very popular with ESR and biology students.

### C. Patterns in Enrollment

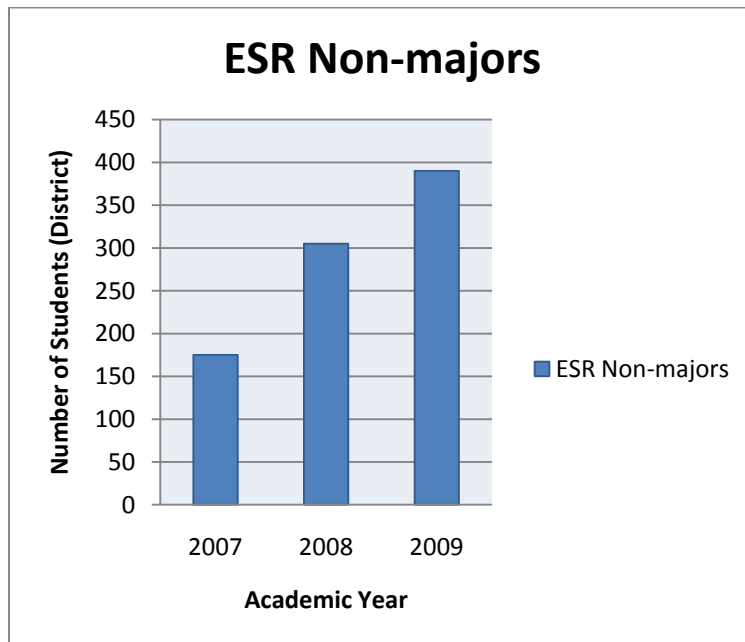
Since 2003, the ESR student FTE has increased 60%. The numbers include both those students majoring in ESR (Rock Creek Campus) and those students taking some or all of the ESR 171 – 173 series courses (Rock Creek, Cascade and Sylvania).



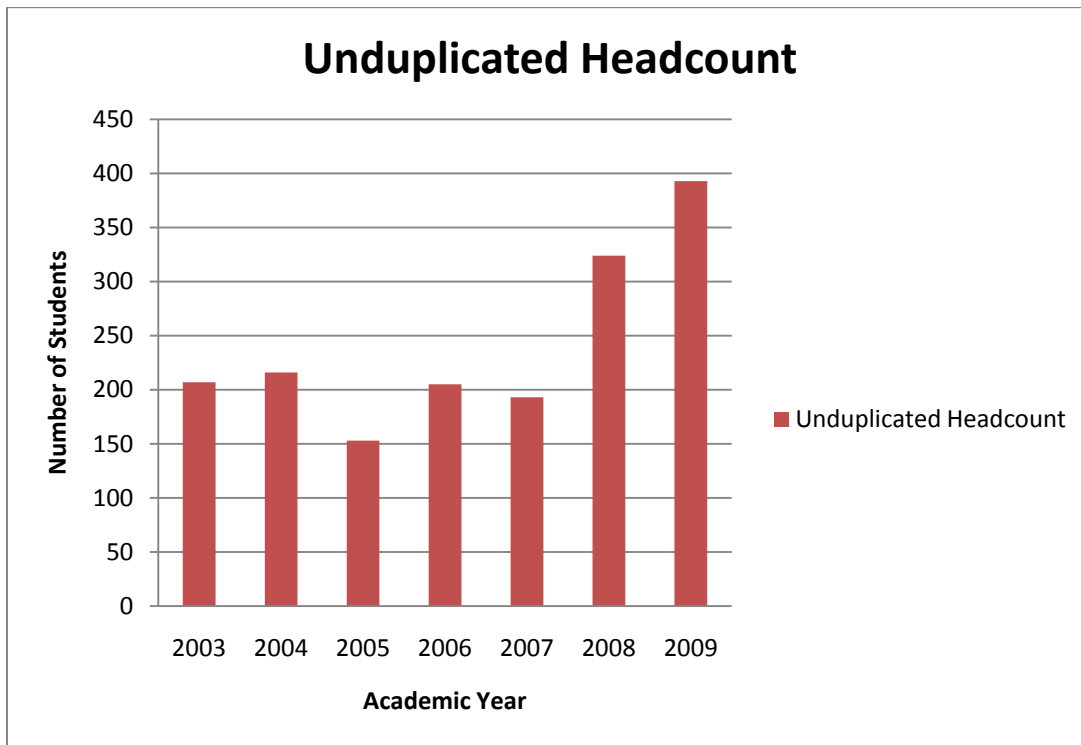
The number of ESR major transfer students has also increased since 2007. The increase has been approximately 32%.



The non-majors courses, ESR 171 – 173 which are a laboratory science option under the AAOT have seen steady increases in enrollment. At PCC Rock Creek we have been offering a section of ESR 171 (Environmental Science: Biological Perspectives) for technical professional programs as part of the **ThinkBig Program**. This course offers students in the ThinkBig Program an opportunity to understand how their chosen professions impact the environment and also gives the students a basic background in environmental science professions.



In the past 2 years PCC has grown by over 20% in total students and almost 40 % in student FTE. Due to a projected growing population in the Portland Metropolitan area over the next 10 years PCC will be serving more students than ever. Though the growth in the ESR majors has been steady, we have been able to handle the growth at this point in time. If the projection for growth in the serviced population proves correct, then ESR may not be able to handle the additional growth. The limits are predominantly based on availability of classroom and laboratory space. The unduplicated head count has nearly doubled since 2003 with 2008-2009 showing dramatic increases.



#### D. Strategies to Facilitate Access and Diversity

To facilitate access ESR has offered more sections of the non-majors sequence. PCC Rock Creek currently offers two sections of ESR 171 in the summer. One of the sections is dedicated to the ThinkBig Program, to offer their students a unique opportunity to understand how their profession impacts the environment. The 171-173 sequence allows students that may otherwise be “fearful” of science an opportunity to learn more about the environment in a science based “user friendly” manner. Many students that start the sequence take at least one additional course in the sequence. Very few are science majors. The students’ feedback to instructors is very positive relative to their experience in taking a “real science class”. Based on discussions with the faculty that teach the special section of ESR 171 for the summer ThinkBig students, the feedback is surprisingly good. Students felt that the course allowed them to better understand the impacts their profession and individual lives may be having on the environment.

The majors' courses have not had the issues of access that the non-majors courses have had. Though the numbers are growing, we have so far been able to absorb the increasing population. Four years ago, PSU and PCC implemented a new transfer program in Environmental Studies to complement the Environmental Science transfer program. The Environmental Studies option allows students to major in an environmental field that emphasizes a planning approach without having to take majors level biology, physics, chemistry and math through calculus. Five options for emphasis are available at PSU for environmental studies students including: Environmental Systems (a more technical option), Resource Management, Environmental Education, Nature/Society Interactions and Urban Issues. The program has been very popular both at PCC Rock Creek and PSU.

We currently have two Native American students in the ESR program. We have encouraged both of them to apply for grants given through the US Environmental Protection Agency for undergraduate funding for minority students majoring in Environmental Science or Environmental Studies. Faculty in ESR are involved with the Bridges to Baccalaureate Program. This program provides access to all students to work with PSU faculty on research projects. One of the Native American students is applying for the Bridges to Baccalaureate Program.

#### **4. Faculty**

##### **A. Current Faculty**

###### **i. Size distribution and composition of faculty:**

Currently there are no fulltime faculty dedicated to the ESR transfer program. Tom Robertson is 50% in the ESR program and 50% in biology. Tom coordinates the majors program. Kevin Lien teaches part of the majors ESR 202 course and the 1 credit ESR 150 – Environmental Studies Orientation. April Fong teaches ESR 171 Fall term at the Sylvania campus. The remainder of the ESR 171-173 sequence is taught by part-time faculty. Tom Robertson has a Ph.D. in environmental biology, Kevin Lien has an MS in biology and April Fong has an MS in biology. The part-time faculty have various levels of education but all have a minimum of an MS degree in an appropriate field of study.

All ESR majors transfer courses are taught by full-time faculty. The ESR 171-173 sequence is taught by a combination of both full-time and part-time faculty. Part-time faculty are quite diverse in their experience. Some have been teaching at PCC for many years and have been involved with various aspects of the sustainability program while others are fairly new. All part-time faculty have been at PCC for at least 1 year. We are privileged to have high quality part-time faculty that bring their own perspectives to teaching and their own experience outside of teaching. All are a valuable addition to the ESR program. The number of part-time faculty is dependent upon student demands based on enrollment. For example, during fall term 2010-2011 academic year ESR had three part-time faculty during fall 2009, four part-time faculty during the

winter term, two part-time faculty during spring and 2 part-time faculty during summer. This pattern has been consistent over the last few years.

**ii. Quantity and quality of faculty needed to meet needs of the department:**

Our SAC could use the addition of a faculty member to teach and coordinate the ESR 171-173 non-majors sequence. This individual would be involved with teaching but would also coordinate the course sequences at other campuses. This would allow several of the 171-173 courses to be taught by a full-time faculty member and help with consistency between campuses. This individual could also be involved with the individual campus green teams as well as other college wide initiatives.

**iii. Faculty turnover and future changes:**

We have been able to maintain continuity in our part-time faculty at Rock Creek, Sylvania and Cascade relative to the non-majors courses. The majors' sequence, taught at Rock Creek has had the same instructor (Tom Robertson) for 15 years.

The full-time faculty at Rock Creek have led extended field trips to the Malheur Wildlife area (summer 2007) and the high desert as well as to the Siskiyou Mountains in Southwest Oregon (summer 2010). Though the course was intended for ESR majors, students in biology and geology have also participated. Last year's course was taught as an independent studies course and the faculty were not compensated. However the same course is planned for summer 2011 and will be taught as a standard format class. These longer term field based classes will be continued indefinitely.

The full-time faculty that teach the majors sequence at Rock Creek have been at PCC for over 15 years. Though there has been some turnover over the years for the non-majors sequence, the current part-time faculty at all campuses have been stable for several years. It is hard to anticipate when and if any of the part-time faculty may leave for a full-time position. Several have done so in the past.

**iv. Reliance upon and quality (background) of part-time faculty:**

The ESR SAC relies almost entirely upon part-time faculty to teach the ESR 171-173 sequence. The exception is ESR 171 at Sylvania which is currently taught by a full-time faculty member in biology (April Fong). All of the ESR majors courses for transfer are taught by full-time faculty at the Rock Creek campus.

Often part-time faculty arrive at PCC with limited teaching experience. They have performed very well over the years. Currently all have MS degrees, none have a Ph.D. Though they are dedicated individuals, their time at PCC is often just a "stopover" before moving on to advanced degrees or obtaining full-time positions in either academic institutions or the government or private consulting firms. Several examples of part-time faculty leaving PCC

include: one with a Ph.D. left to work for the state of Washington, another left for a position with the US Fish and Wildlife Service, several left for full-time teaching positions. We currently have a good core of part-time faculty, some of which have been with us for several years.

**v. How the faculty currently reflect the cultural and diversity goals of the institution:**

Science based programs across the country have faced this issue for many years. Unfortunately science programs have predominantly produced graduates from advanced degree programs that are of European ancestry. The faculty mix at PCC in ESR is more or less gender neutral. Our faculty teaching part-time include three female faculty, one of which is Hispanic. Because ESR is a small program by comparison to other LDT programs, it is difficult to have a diverse faculty. The ESR SAC has only limited ability to alter the ethnic diversity of its faculty because of the small pool of applicants that apply.

**B. Instructor qualifications**

In Spring of 2010 the ESR SAC put together a new set of instructor qualifications. They were sent out for signature on May 20, 2010. Because of the nature of the ESR courses, the instructor qualifications have blended together specialties in biology, geology and chemistry for the ESR non-majors sequence. ESR 171 emphasizes biological aspects of environmental science, ESR 172 emphasizes chemical aspects of environmental sciences, and ESR 173 emphasizes geological aspects of environmental science. So the instructor qualifications must be both specific and general at the same time. The majors' sequence also has some diversity in requirements, with ESR 160 being an overview of environmental systems, ESR 201 requiring knowledge of environmental law and policy and ESR 202 requiring strong background in environmental systems plus strong quantitative skills and a knowledge of collecting environmental data. The key is to blend both specialties and keep them general enough to allow a diversity of applicants especially for the ESR 171-173 sequences. Below is a summary of the instructor qualifications submitted in February 2011:

**Instructor Qualifications**

Subject Area Prefix: ESR

Courses included (specify ALL, or list courses): ESR 150, 160, 171,172,173,201,202, 203, 298

Proposed Instructor Qualifications:

- For **ESR 150, 160, 171, 203 and 298** - Master's degree or above, in biology, environmental science, or environmental studies **OR**
  - documentation of 30 hours of graduate course work - relating to environmental science (including related fields of botany, zoology, entomology, fisheries and wildlife, natural resources management, forests science, marine science, environmental science.).

- For **ESR 172** – Master’s degree or above in chemistry, environmental science, or environmental studies, biology **OR**
  - documentation of 30 hours of graduate course work - relating to chemistry, environmental chemistry, geochemistry, biochemistry or environmental engineering.
- For **ESR 173** - Master’s degree or above in geology, environmental science, or environmental studies, soil science, geochemistry, earth science **OR**
  - documentation of 30 hours of graduate course work - relating to geology or environmental geology or related areas (including: soil science, geochemistry, geophysics, geology or earth science)
- For **ESR 201** - Master’s degree or above in environmental science, environmental studies, environmental biology or environmental management with experience and course work in environmental policy **OR**
  - documentation of 30 hours of graduate course work - relating to environmental studies, environmental science, environmental management and equivalent work experience in environmental law and/or environmental policy, 2 years experience in environmental law and/or policy.
- **For ESR 202** – Master’s degree or above in environmental science or environmental biology

### **C. Faculty professional development activities and curricular changes**

Faculty in ESR have maintained a consistent program of professional development. Tom Robertson has been very active in summer institutes including:

- Attending six Faculty Summer Institutes offered by the NCSR (Northwest Center for Sustainable Resources). NCSR is a National Resource Center focused on creating, disseminating, and supporting adaptation of natural resource and environmental curriculum materials. These materials feature topics including environmental monitoring, habitat preservation and restoration, mapping, instrumentation, and other related skills woven within the context of managing complex ecosystems.
- Studienforum Berlin, the 2010 Summer Faculty Seminar “Germany as a Model? Germany’s Environmental and Energy Strategy” Faculty and Expert Seminar in Berlin, Dessau, Wolfen 26 June to 6 July 2009. The intensive faculty seminar was a synopsis of Germany’s approach to dealing with environmental issues related to energy.
- Travel in Australia – Tom has been going to Australia every other year for the last many years. Also Tom took a sabbatical to Australia in 2001. During my sabbatical I emphasized the ecological and geological variability of watersheds in the state of Tasmania, Australia. My goals during other summer visits focus on continuing studies on the natural history of Australia, emphasizing geology and ecology. I have incorporated information from my travels/studies in Australia into both my ESR and biology classes.

- Tom taught two summer courses in Costa Rica on the Natural History of Costa Rica. We (mostly PCC students) spent 16 days touring Costa Rica and interacting with researchers in field studies. I have incorporated information from my teaching in Costa Rica into both my ESR and biology classes.

April Fong (Summer 2009), Kevin Lien (summer2010), and Tom Robertson (summer 2009) have attended faculty summer workshops through COSEE (Centers for Ocean Sciences Education Excellence).

Kevin Lien and Tom Robertson have spent several summers planning a course in the Malheur Wildlife Refuge, Steens Mountain and Oregon High Desert area. The culmination of the planning resulted in a very successful course for ESR/Biology students titled “Ecology and Natural History of the Malheur and Oregon High Desert” in summer of 2007.

Kevin Lien and Tom Robertson spent several summers at the Siskiyou Field Institute sponsored by SFI and Southern Oregon University. We participated in several workshops/seminars on the environmental biology of the Siskiyou Mountains. The culmination of several summers of studies was a field course for ESR and biology students in the summer of 2010 titled “Ecology, Geology and Natural History of the Siskiyou Mountains”.

Tom Robertson has maintained memberships in the American Association of Biological Scientists (AIBS), Oregon Academy of Sciences (OAS), Society of Wetland Scientists (SWS), The Australian Geographical Society and the Society for Conservation Biology.

All of these experiences by the faculty have been incorporated into the ESR curriculum. The examples are too numerous to list individually, however the courses that have benefitted the most are ESR 160, ESR 201 and ESR 202 and the non-majors ESR 171-173 series.

## **5. Facilities and Support**

### **A. Classroom and Laboratory Space**

ESR classes are currently taught at Rock Creek, Sylvania and Cascade. All courses for ESR transfer majors are taught at the Rock Creek campus.

**Rock Creek Campus:** Classroom space at the Rock Creek campus is acceptable but in the last few years ESR lectures have had to be taught in the physical science laboratories. For long lectures of 90 minutes, this space tends to be uncomfortable for the students. Lecture space has been at a premium on the campus as a whole. Labs for ESR are currently in biology labs at Rock Creek. Though the labs are in good shape and well equipped, on occasion the labs have been so over-scheduled that ESR classes have had very limited lab space. For example in Fall 2010, the ESR 160 lab space for prepped materials was confined to a small space near one of the sinks. Materials for the lab had to be left on a lab cart during most of the term. When a lab goes over a two week period, leaving lab materials on a cart forces students from other classes to move the

carts to gain access to their class materials. This resulted in some labs being of sub-standard quality. Because many of the labs for ESR are field oriented, this problem was not common. It would be nice to have dedicated lab space for ESR classes at least during the Fall term, which is the busiest term for ESR labs. The Rock Creek Environmental Studies Center (RCESC) has been used literally every term by multiple classes. Classes in ESR, biology, landscape technology, earth sciences and even the arts department have made extensive use of the facility. The only issue with the RCESC is that students who smoke tend to use the forest in order to avoid detection and to avoid the PCC non-smoking policy. This needs to be prevented for safety reasons.

**Cascade and Sylvania Campuses:** The ESR non majors courses are taught in biology and/or chemistry labs at these campuses. Once gain both lecture and lab space is usually at a premium. At the Sylvania campus the major problem is space for teaching the non-majors courses. To quote one faculty member at Sylvania “the demand for ESR 171 and 172 (not sure about 173) are high, but we don't have the staff, facilities, etc. to regularly offer these courses over here.”

## **B. Library and other Sources of Information**

Students emphasizing the transfer option in environmental science and environmental studies are required to make use of the library facilities. In ESR 150 (Environmental Studies Orientation), the students, early in the course, have a session at the library where a research librarian demonstrates how to use the relevant data bases at the library. This is the first step in preparation for research assignments given later in the transfer course sequence. Students in later courses are required to use the library for research requiring presentation of information in PowerPoint reports, written reports and field trip reports. In 2009 Paula Hood, a student in ESR 202 with Tom Robertson, won the library prize competition for best research paper. Her paper is currently on line in the library data base. Another student in ESR 202, Tamara Seymour, was in the final selection for the library prize in 2010. All ESR courses for transfer students make extensive use of the library and the faculty feel it is critical to their future success in the field.

Students in ESR 201 (Law and Policy Considerations) make use of data-bases, files and personal at local agencies and consulting firms as a component of their Pacific Northwest environmental issues paper. They are required to obtain unpublished information from files at agencies e.g. Oregon Department of Environmental Quality, US Environmental Protection Agency, Oregon Fish and Wildlife plus others. Lectures and labs in ESR make use of literally up to the minute information on issues in environmental science. Data-bases at Oregon Department of Environmental Quality, US Environmental Protection Agency and others are consulted daily by the lead faculty.

## C. Support Services

**Clerical Support.** Clerical support at the Rock Creek campus is good. The ESR program is in the Division of Science and Technology and housed in building 7. Clerical support are usually very supportive and helpful.

**Technical support.** Laboratory support is adequate at Rock Creek Campus. The support is given within the technical group that also supports other programs including: Bioscience, biology and some additional support to Landscape Technology. The support staff, comprised of two fulltime technicians (one day shift and one afternoon/evening shift) and several student workers. The staff is sometimes overwhelmed with the workload coming from such a diverse set of programs. ESR could use a student hourly position which would be dedicated to ESR. This would involve maintenance of field equipment, setting up labs and maintaining specimen storage area.

**Computer services support.** The Instructional Technology Department has been responsive in supporting both the faculty and the classroom computer facilities. Of course they are often found running between buildings on campus, responding to requests. They are over worked and sometimes over looked.

## D. Student services

**Advising, OSD and others.** The advising office is able to offer ESR majors minimal assistance except with very general questions regarding the program. There have been situations where the advising office has given the wrong information to transfer students in ESR. Tom Robertson has been the main student advisor for ESR. Though this takes some time, the outcomes are generally better for the students. Students are advised by ESR faculty on requirements at PCC, transfer opportunities to all four year institutions, information on internships, service learning, career opportunities and opportunities for post-graduate study.

There has been some confusion over requirements associated with OSD. Some of the requirements are hard to meet for some students, though the faculties do everything possible to support students.

**Tutoring Support.** Since ESR students have lots of class contact time with the lead instructor, students are given support whenever requested. ESR faculty do not tutor in the tutoring center on campus, usually the tutoring takes place one-on one in either the faculty office or a conference room.

## E. Scheduling

ESR majors classes (ESR 150, 160, 201, 202) are taught only at PCC Rock Creek Campus. These four classes are required for transfer to PSU, and the courses are offered during multiple terms. Class sizes for the laboratory based classes are limited by the number of students the lab can legally handle. At this point in time, lab size has not been an issue, though the labs in the introductory course have been near capacity. Lectures on the other hand, are often taught in the physical sciences lab. Though this does work, the seating positions for some students influence their ability to remain comfortable throughout the lectures. The majors transfer courses have had the same instructor teaching them for an extended period of time. The students appreciate the continuity and the opportunity to see each class in the sequence as being directly related to the previous class. The long term consistency of the scheduling for the majors classes has allowed students to plan their schedules accordingly.

Cascade, Sylvania and Rock Creek all teach the non-majors ESR 171-173 sequence. The classes are offered in both the evening and day giving students the opportunity to take them at their convenience. Since the courses are offered at all three campuses, students can take them at any of the campuses. These three classes all have the same prerequisites and can therefore be taken out of sequence.

## 6. Recommendations for Improvement

### A. Strengths

The faculty in the ESR majors transfer sequence are committed to giving the PCC transfer majors the best educational experience and opportunities possible. When students were asked for feedback through written evaluations, their responses were very good. Faculty at PSU, the recipients of most of the transfer students acknowledge the excellent preparation of our students. Several past student e-mails and written evaluations are found in Appendix A. Portland State University Faculty evaluations are found in Appendix B. We must maintain this excellence by continuing to modify the course work and offer the students the learning environment they deserve. In order to maintain this high level we must continue to strengthen the program by:

- **Science education that is dynamic.** The faculty must continue to incorporate into their courses up to date and relevant information in an ever changing field.
- **Offering students unique experiences beyond the traditional classroom environment.** We need to continue to offer students field trips that allow hands-on learning. Student feedback on extended field classes has convinced the faculty of the importance of moving beyond the traditional educational environment. Students have given very positive feedback about the RCESC (Rock Creek Environmental Studies Center). The field labs have been a highlight of their time at PCC.

- **Science education that improves learning skills.** We must continue to incorporate within the courses critical thinking. Improving the skills of students by asking questions that force the students to make observations, formulate questions, make predictions and collect and evaluate information to evaluate hypotheses.
- **Continuing to prepare students for the next level.** Many ESR transfer students go on to complete their four year degrees. Many of these go on to graduate school and complete advanced degrees. We must continue to place students in internships, undergraduate research programs (e.g. COSEE, Bridges to Baccalaureate etc.) and encourage service learning.
- **Responding to assessments.** We have to continue responding and modifying the program based on assessments. We need to improve how we teach based on these assessments. Assessments are partially based on student responses to both written and oral communication.
- **Continuing to respond to technological improvements.** We need to continue to implement new technologies. These are not just technologies that allow improved teaching, but also technologies that students need to allow them to succeed at the next level.

## **B. Improvements in program.**

### **The ESR program at PCC could improve with the following:**

- **Need for long term student tracking.** We have remained in contact with many students, but we need a better way to track more students after they transfer from PCC.
- **Better coordination of the 171-173 sequence.** The non-majors sequence is taught at three campuses. The courses are mostly taught by part-time faculty. We need a faculty member dedicated to coordinating the 171-173 sequence at the three campuses. This would be a halftime position with the other halftime based in one of the science programs.
- **Faculty development funds.** Though there is some money available to attend workshops, if the workshop is out of state, the money available is often insufficient to cover expenses. Faculty in ESR have often supplemented their travel with their own funds. The cost of 1-2 week long summer workshops is usually more than the current available funds.
- **Dedicated lab space for ESR.** We need dedicated lab space for both the majors courses and the non-majors sequence.
- **Improved and up to date equipment for labs and for RCESC.** Currently the ESR program has some money in a PCC Foundation account for maintaining and purchasing equipment for teaching and for maintaining the Rock Creek Environmental Studies Center. This money was obtained from grants written by the faculty. Outside funding is

very difficult to obtain and is more and more competitive. Dedicated funds for the RCESC and for maintaining equipment is critical.

- **Improved intercampus communication.** This is an issue especially with regards to the transfer courses. Part-time faculty availability for meetings is an issue.
- **Improved communication with other Oregon colleges.** Though faculty have attended state wide workshops (e.g. COSEE, NCSR etc.) we need a better mechanism for coordination between other community colleges and four year schools.
- **Funds for assessment and evaluation of program.** Additional resources for assessment and student tracking. Also teaching effectiveness and core outcomes evaluations take a great amount faculty time.

### **C. Recommendations**

**1. Addition of a half-time position (other half-time based in a science department):** This position would teach and coordinate the ESR 171-173 courses college wide.

**2. Dedicated section of teaching lab for ESR:** This may force the addition of another lab at Rock Creek. This lab would serve both the ESR majors courses and the non-majors courses. It would allow labs to be set up and maintained for all sections. Other field/lab based courses could also make use of the lab (Biology 141-143 and Biology 160).

**3. Dedicated funds for maintaining the RCESC and teaching monitoring equipment.** These funds would be dedicated to maintaining boardwalks, vegetation planting, restoration, trail maintenance etc. as well as maintaining the ESR equipment. Current funds only allow for purchase of supplies.

**4. Additional lab tech support:** Dedicated lab support for the ESR and other field based courses in biology. This could be funded student support for the ESR classes.

**5. Additional funds dedicated to faculty development:** The annual dedicated travel funds need to be around \$1,500 to \$2,000 dollars per faculty member across the district. This would allow:

- Travel to conferences associated with professional organizations
- Attendance at workshops – dedicated to professional development

## Appendix A – Former PCC Student - Responses to Questions

A survey was sent out to former students that are still at PSU or are currently working in the Portland Metropolitan Area. We purposely kept the statements/questions very brief (and general) to give students the freedom to give open ended answers. The statements asked were:

*Describe your preparation for transfer to a four year school (in other words how well prepared were you to transfer?)*

*What were the highlights of your time at PCC?*

*What are your plans for the near future?*

*Are there any other comments you would like to add?*

**Anthony Hair.** Transfer student to PSU – Environmental Studies – winter 2009. Anthony graduated from PSU Fall 2011 and is currently a graduate student in GIS at PSU.

Tom,

I am not sure if you completely remember me, I am Anthony Hair, one of your former students. I took almost every course you offered at PCC (except Botany) and loved each and every one. Joe forwarded me your survey questions to complete. I just graduated from Portland State with my Bachelors in Environmental Studies and am now in the GIS Graduate Certificate Program there. I ended up with a 3.95 GPA and graduated Summa Cum Laude. I feel a lot of my academic success can be attributed to my time as your student at PCC.

Here goes –

***Preparation for transfer to a four year school (how well prepared were you to transfer)***

I felt completely prepared for my transfer from PCC to PSU. In fact, I took 122 credits at PCC so that I could make the most of my time there and still be able to transfer over all the credits to PSU that I needed to use towards my degree. I felt like PCC gave me a head start not only into completing my degree at a four year school but also for the real world outside of academia. Leaving PCC, I was coming from an atmosphere of greater one-on-one communication not only from instructors to students but also between students as well. I had been able to learn through hands-on experience, group discussions, lectures, and independent work at PCC. This was to be a unique experience I was to find out. Once at PSU, I was more limited about the type of educational experiences I could have. Lectures in front of large classrooms of nameless students seemed to be the predominant way in which I was to be instructed. I feel like PCC afforded me the better education to be completely honest. I was able to learn in an open atmosphere of encouragement and be instructed on a more personal level.

### ***Highlights of your time at PCC***

I am not trying to win brownie points or extra credit at this point, but one of my biggest highlights at PCC was Dr. Tom Robertson. I felt like Tom imparted not only as much knowledge about the environment to his students as possible, but that he also gave us a little bit of his passion for the natural world too. A professor like Tom is rare. Having now graduated with my Bachelors, I can honestly say that I have had a number of instructors at this point and none of them as of yet has been able to rival him in both ability and attitude. In addition to Tom, I have had a number of other instructors at PCC that I have thought were actually of a higher caliber than I was to experience post-PCC. One of PCC biggest resources is their instructors. Overall, the staff at PCC is rather terrific from within the ESR program and without. The RCESC is also another big highlight for me. The experience I gained having that land at my disposal was invaluable. I have come to find this out relatively recently since I now attend school on an extremely urban campus. Being able to learn in the lab or classroom and then experience in the field is incredible. The final highlight I would have to mention would be the other students I met at PCC. Many of them have followed me to PSU or remained in touch and it was nice having a small group of us together as we transitioned. We had shared a lot of the same experiences in the program at PCC – Rock Creek and seemed to be able to assist each other as we moved on with our education.

### ***What are you plans for the near future?***

My current plans are to get my Graduate Certificate in GIS. I just received my Bachelors of Arts in Environmental Studies. I have focused mostly on freshwater systems and would love to find something focusing in on that area. I have also been looking into some internship possibilities. With the job market the way that it is now, I might seriously consider pursuing my Masters degree rather than trying to join the workforce. However, I would like to find some avenue where I can use what I have learned so far and also get some more real world experience.

### ***Any other comments you would like to give.***

I have a hard time not raving so much about my experience at PCC. I felt like the first two years of my education were like the beginning of a romantic relationship. You tend to only see the good that is there. I can't really offer up any constructive criticisms of program. I would just say that having the field experience that is offered at PCC is so important. I guess if I had to say there was one part of the program that was of the utmost value and importance that would be it. At PSU, I can only think of one class that I have taken that even incorporated any field experience at all. (That is not counting trips to the Park Blocks in my Field Methods of Geography class to measure or use a compass).

Tom – I hope all is well on your end. I am doing good. I am taking two 500-level GIS courses right now and actually a little sick of making maps but other than that I am good. Maybe if you get the chance sometime you can write me a letter of recommendation. I know you always seemed to appreciate my work (even keeping my final project for ESR 221 as an example for your future classes), and it could be helpful in trying to land a job or internship down the road. I hope my comments help you in your review and presentation.

Cheers,

Anthony Hair

**Paula Hood.** Paula left PCC and enrolled at PSU in Environmental Science for fall 2009 term. Paula will graduate from PSU at the end of spring term 2011 and has been accepted to a graduate program at PSU in environmental science.

### **Paula Hood – My ESR experience at PCC**

I attended the Environmental Science and Resources program at PCC from Winter of 2007 to Spring of 2009. The ESR department has my whole-hearted praise and gratitude. I can say from experience that the professors in this department are dedicated to making sure that their students get the best education possible, and they take great pains to ensure that they are giving students the knowledge and tools necessary for a successful academic career. The warm support, personalized attention, excellent education, hands-on field training, advice, and sheer inspiration provided at PCC were instrumental to my success as a student, and opened many doors for me that had previously seemed inaccessible. It was not until after I began attending PCC that I realized, for the first time, that a career in the sciences was truly possible. My experiences in the ESR program gave me the opportunity to discover and pursue my goal of contributing scientific research in order to further forest conservation efforts.

The ESR program gave me a solid background in the sciences, as well as a deep and lasting enthusiasm for studying the natural world, which has continued to sustain me through the most rigorous and exhausting hours of school work. The curriculum of the ESR program was excellent preparation for transfer to PSU, and provided me with a competitive edge academically. The ESR program at PCC has a uniquely strong field component that distinguishes it from other colleges and universities in this area. I quickly discovered that I had a more complete understanding of and familiarity with field techniques and equipment, ecological concepts, and environmental law than did most of my peers who had not taken classes through the ESR program at PCC. The scientific background I gained at PCC allowed me to engage in more technical, focused, and ambitious projects than many of my peers at PSU because I was already more familiar the necessary background concepts.

Dr. Tom Robertson's environmental science series provides a particularly outstanding learning experience to students at PCC. The issues covered in the ESR classes are engaging, challenging, pertinent to scientific issues today, and relevant to the job market. From these classes I received hands-on field experience in studying water quality, data gathering and analysis, ecosystem study, survey techniques, and species identification. The 111 acre environmental studies center on the Rock Creek campus which contains forests, wetlands, and meadows is a wonderful and hugely useful outdoor classroom for the ESR students, and Dr. Robertson takes full advantage of this resource. Dr. Robertson's classes also offer field trips and off-campus trips, such as visiting intertidal areas on the Oregon coast for Marine Biology, sampling invertebrates and assessing stream health in Forest Park for Fresh Water Ecology, and weekly visits to Bronson Creek for ESR 202. The ESR 202 class monitors a nearby urban stream in the Beaverton

neighborhood and shows students on-the-job style techniques in chemical water quality sampling, vegetation surveys, invertebrate analysis, data analysis, and scientific writing, with guidance geared to professional caliber of quality and style.

Another highlight of my academic career at PCC was an independent study which I designed and conducted under the guidance of Dr. Tom Robertson. I did an observational study of 3 neighboring streams in the Clackamas River Ranger district in Mt. Hood National Forest for 2 years. This study provided an invaluable opportunity to learn about how to design and conduct my own project, and I was able to gain a level of scientific understanding of these ecosystems that would not otherwise have been possible. This experience gave me an enduring and life-transforming level of appreciation for the strange and beautiful organisms that inhabit these streams, and for the preciousness of their habitats. I am particularly grateful to Dr. Robertson for taking on the role of an advising professor for my independent study, and putting in extra time and work in order to help me with my project. He has served as an enthusiastic and never-ending encyclopedia of knowledge and experience for many students over the years, and he never hesitates to help and guide students with their scientific endeavors.

Since my transfer to PSU, I have continued to be a strong student with a high GPA, and I have continued to sharpen my scientific interests and academic focus. The ESR program at PCC gave me the necessary background to continue to study the effects of land management on natural systems in more depth once I transferred to PSU. I have completed several undergraduate projects concentrated on forest and stream issues such as: turbidity in relation to road density, total suspended solids and macros in relation to logging, soil compaction in old-growth compared to plantation forest stands, and how soil compaction relates to erosion. The skills and concepts I learned in the ESR program at PCC made it possible for me to formulate concise and well-defined scientific questions, and to design and conduct studies to investigate those questions. My experiences in the ESR program at PCC have been instrumental to my success as an undergraduate at PSU, and continue to provide fundamental scientific background as I apply to graduate programs and contemplate designing a graduate project.

I am currently applying for admission to graduate schools to pursue a Master of Science degree. I am considering conducting a thesis project on large scale forest thinning practices and how those practices may affect erosion and runoff into nearby streams. The idea for this project was inspired by the independent study I did while in the ESR program at PCC. If I am accepted into the Environmental Science graduate program at PSU, I have an advising professor who is excited to help me work on this project. After graduate school, my ultimate objective is to find employment in a research or conservation-based position, hopefully with a strong field component.

The ESR program at the Rock Creek Campus has inspired whole waves of future environmental scientists. I often see fellow transfer students from the PCC ESR department in the ESR classes at PSU. The high standards of achievement and deep love of the natural world that were instilled in us by the ESR professors at PCC are reflected in the dedication and focus of the students that have come out of the ESR program. I am glad to have the opportunity to praise the ESR department and the professors within the department, and to give them at least a small portion of the recognition they deserve. I feel that they are all unsung heroes. I am deeply grateful to all the people who have worked to make the ESR

department a success, and to all of the professors in the department, particularly Dr. Robertson, as they have all been enormously supportive. It is obvious that they genuinely care about their students, and about passing on their knowledge and enthusiasm. The inspiration generated by the ESR professors at PCC, their genuine love of science and the natural world, their willingness to go above and beyond the call of duty for their students, and their unending patience and professionalism, help to give PCC the outstanding reputation it deserves.

**Jeff Christian.** Jeff has nearly completed requirements for PCC. He will be transferring to a four year school next fall. He is currently student sustainability representative at PCC Rock Creek.

To Whom It May Concern:

My name is Jeff Christian, and I am a student at Portland Community College. I have been taking courses at PCC Rock Creek since the summer of 2009. During that time I have completed the Environmental Science transfer program core classes including ESR 150: Environmental Studies Orientation, ESR 160: Intro to Environmental Systems, ESR 201: Applied Environmental Studies; Science/Policy Consideration and ESR 202: Applied Environmental Studies: Prep for Problem Solving. Currently, I am considering transfer options to Portland State, Southern Oregon and Alaska Pacific. Although I will not know how prepared I am for any of these school's curriculum until I am there, I feel that my time in the Environmental Science program has given me a solid foundation to build from in my field of chosen specialization.

In ESR 150, students were exposed to a variety of professionals from industries and organizations that may be possible employers after graduation. It was beneficial to learn from these individuals to help students begin thinking about which type of field they may want to pursue, or at least explore academically. ESR 160 was my first exposure to fieldwork and some of the most common methodology utilized in environmental and biological science. ESR 160 comes with a heavy workload, and allows students to determine whether this is something they truly have an interest in. ESR 201 gave me a clear understanding of U.S. environmental laws, and the responsibilities of the associated departments of state. Dr. Tom Robertson added an extra component of social understanding when students saw obvious problems with existing legislation. ESR 201 also explained the strengths and weaknesses of international environmental policy; overall the class was an excellent learning opportunity for students with even the most minimal environmental policy and law understanding. ESR 202 exposes the student to an impacted watershed and through the term students' study; collect data from the stream and progressively working on an evaluation of the health of this stream. Data is collected in the form of water chemistry, invertebrate sampling, water flow/discharge, soil quality, stream

sinuosity, long term temperature recording, vegetation and mapping techniques both digital (ESRI ARCGIS) and manual. ESR 202 has been my greatest challenge during my time at PCC. The culmination of an entire term of study is a comprehensive (relative to the data collected) evaluation of the study stream and its wetland. Students are expected to write a professional report with extra attention paid to an issue related to the study of the individuals choosing. Once complete, I realized all that I had through all I had learned during the term had been applied in a basic professional analysis of an impacted watershed with my own special focus on salmonid health. This project is also designed to be used as an example of our level of capability when pursuing internships. Tom Robertson and Kevin Lien work together phenomenally to ensure that all students have the necessary resources to be successful and keep everyone engaged. My only critique of the class is that it could easily be expanded to 15-20 weeks. Certain sections feel slightly rushed such as the final ARCGIS component, and the watershed overview. These opinions are nothing but a result of the length of the term, no other sections were too long, and none were unimportant.

While at PCC I have enjoyed many experiences, most very good and only a few frustrating. The ESR program has undoubtedly been a great experience and I have no regrets about taking these courses at PCC instead of PSU. I've also not encountered a professor who is more engaged and dedicated to exciting students about environmental and biological sciences than Dr. Robertson. With dedicated, knowledgeable and good spirited professors such as Kevin and Tom I hope PCC continues offering the Environmental Studies/Science programs to future generations of students. After I complete my undergraduate degree I hope to begin my career in habitat and ecosystem restoration, mitigation land planning or possibly water science. Though I have not experienced quite enough of specific fields to have a clear idea of my specialization. Which brings me to my final thought. I am not sure whether this is a possibility; but it would have been extremely attractive if students in the ESR program were able to substitute additional related general studies classes for more specific specialty courses to help prepare them for choosing a more specific field before they prepare for transfer to a 4 year university.

If you have any questions feel free to contact me.

Regards,

Jeff Christian

Sustainability Representative

RC ASPCC

[Jeff.Christian@pcc.edu](mailto:Jeff.Christian@pcc.edu)

503-577-1417

**John Dugger.** John was a student at PCC from fall 2008 through fall 2009. John was co-enrolled at PCC and PSU during the fall 2009. He recently graduated from PSU in environmental studies and is now doing advanced work in environmental education.

To Whom It May Concern;

This letter is intended to highlight my experience while attending the Environmental Studies program at PCC Rock Creek.

I began studying at PCC in the Fall of 08 and transferred to Portland State University for the 2009 Fall quarter. I took all of the required classes for the transfer degree while at PCC, most were taught by Tom Robertson.

I noticed after transferring to PSU that I, along with other PCC transfer students, and was ahead of most of the PSU undergrad students. ESM classes at PSU are split with half the student's undergrad and half graduate students. The PCC students were able to engage in discussion and ask questions regarding more advanced topics. I feel the reason for this drastic difference is due to the PCC experience; most notably the amount of time devoted to labs and actual hands on experience in the field.

I highlight of my time at PCC would be the ESR 202 class that completes an entire workup of the Bronson Creek watershed and essentially acts as a capstone, incorporating all of the prerequisite classes into one field intensive experience. Dr. Robertson allowed me to conduct a wetland survey on the Rock Creek campus of an ephemeral wetland. I sampled both biological data and water chemistry information. This experience and the course work allowed me the experience to get a great summer field job working with Ponderay County Public Utility District working on a large Bull Trout restoration project. The experience gained has recently allowed me to be accepted into Portland Metro's Nature University which I am currently attending.

I feel the education I received from PCC and the passion and direction of Dr. Robertson and the other ESR staff will stay with me throughout my career and am very grateful for the experience. I wish PCC could turn the ESR program into a 4 year program or beyond, I know I would have loved to stay at PCC for more advanced topics.

Thanks for your time.

Regards

John Dugger

**Tonya Mclean.** Tonya was in the PCC transfer program during fall of 2000 through spring 2002. Tonya completed her B.S. at PSU in environmental science. She completed an M.S. in Conservation and Environmental Biology at University of Maryland. Tonya is now the Hazardous Waste Reduction Education Specialist with the Sustainability Center, METRO in Portland.

Hi Tom,

Sorry for the delay in getting back to you. I was unexpectedly relegated to my home all last week, nursing a sick child and myself. Hopefully my comments will still be useful to you. I had also forwarded your email to Laila, Lawrence, Matt and Adam.

*My time in the ESR program at PCC provided me with a strong academic foundation that uniquely prepared me for success at the four year college I transferred to. The classes at PCC were small and I spent a lot of time learning by “doing” through hands-on field exploration. This arrangement helped to foster close ties with other students in my cohort so that during the remainder of my undergraduate years I learned from and sought support from these peers. As a post graduate I still have ties with students from the ESR program who are now my professional colleagues.*

*The field study portion of the PCC ESR program was the key to my deeper understanding of the natural processes I studied. I not only learned how to use basic field study methods and tools, but I also learned firsthand how environmental systems are impacted by human activities. I focused on watershed studies at PCC and found that my knowledge of the watershed as a system helped me do well in later aquatic studies courses. The four year university I transferred to did not have the benefit of a nearby outdoor area to study and I felt lucky to have spent my first years at the Rock Creek Campus.*

*My field study experience also helped me find work as a freshwater biologist intern with the state, and I was still drawing on my ESR experiences as a graduate student where I focused on environmental policy and sustainable development.*

*It has now been a decade since I was a student in PCC’s ESR program. I have an academic foundation in sciences and policy. I am committed to fostering more sustainable interactions with the natural environment and continue to think of solutions with a watershed scope. Moving forward in my career I plan to continue working on sustainability issues with a focus on toxics reduction and water quality protection at the urban watershed scale.*

Let me know if there is something more I can add. I could go on and on and I never mentioned that the STAR of my undergraduate experience was YOU and your infectious enthusiasm for the subjects you taught. I also really loved the course that introduced us to professionals in the field (and helped to replicate it at UMD) and the portfolio making exercise.

All the best,

Tonya

**Leslie Bliss-Ketchum.** Leslie was at PCC from the winter 2003 to spring of 2005. She is a PhD Student in the Environmental Science & Management Program at PSU and is currently Vice President Elect of the Oregon Chapter of the Wildlife Society.

Hi Dr. Tom - Good to hear from you and I'm happy to give input on my PCC experiences (below)

***Preparation for transfer to a four year school (how well prepared were you to transfer)***

Very prepared! I was well aware of the specific classes I needed to complete and all of my courses transferred exactly (very important!). I was academically challenged at PCC and believe the extent of information provided in the ESR program gave me a distinct advantage over other students. Also when comparing the class size, depth of assignments and instructor assistance provided at PCC it was clear to me after transferring that the quality of my first two years of education was much better than many of my fellow students.

***Highlights of your time at PCC***

In the ESR program I was given extremely valuable experiences, particularly in participating in a long term field study while also gaining skills in aquatic monitoring and field work. Also I was exposed to and able to practice scientific writing - an experience that other students I encountered after transferring did not have.

***What are you plans for the near future –?***

Currently I am pursuing a PhD in the Environmental Science & Management Program (part of the newly formed School of the Environment) at Portland State University. My research is focused on wildlife habitat connectivity and the impact of roads on wildlife in particular. I am currently funded through the NSF GK-12 program and as result have been working with middle school science students developing science inquiry projects that include issues of habitat connectivity. I am also currently serving as the Vice President for the Oregon Chapter of The Wildlife Society.

***Any other comments you would like to give. A photograph of you in the field or lab would be great.***

Overall I would say that my PCC experience was excellent. Ironically - the two pictures you have on the program main page are ones I took during my lab days in your class! I'm sure I have more somewhere, but it would take a while to dig them out.

Well, I hope this helps and if you need any more info just let me know.

Take care!

-Leslie

**Ryan Johnson.** Ryan is a returning student who worked in marketing for several years. He was at PCC majoring in environmental studies from fall 2008 through spring 2010. He is currently finishing his B.S. degree at Portland State University. He will soon be applying to graduate school.

Dr. Tom, below is feedback regarding the ESR program. Please let me know if you would like me to elaborate on anything, or if I can be of any other assistance.

I fully enjoyed my experience with the ESR program at PCC, from the lectures to the lab work. I strongly believe that the ESR program was well-planned, thorough, and helped prepare me for coursework at Portland State University. With practically every course that I've taken at PSU over the past year, I've been able to draw significantly from knowledge obtained through the PCC ESR program. I have a much better understanding of environmental impacts and issues (such as climate change and point/non-point source pollution), the laws and agencies addressing those impacts, and what potential issues we may see in the future.

Several of the skills that I've learned in the program have also served me well in my courses at PSU. These skills include scientific report writing, giving PowerPoint presentations, and understanding fundamental processes such as the Biogeochemical cycle. The hands-on learning will better prepare me for work both in and outside the university, such as the ability to correctly use water and soil testing equipment, and interpreting data.

After PSU, I hope to secure a position that will allow me at least some time out in the field, where I can continue to use the skills that I have acquired.

Ryan Johnson

**Joseph Cain.** Joseph is now at PSU in Environmental science and will complete his B.S. in spring 2011. He was at PCC from winter 2008 to spring 2009.

Tom,

I apologize that this has taken me so long. My whole house has been sick for the last week. Thank you for writing the recommendation for me.

**Preparation for transfer to a four year school (how well  
> prepared were you to transfer)**

As a transfer student from PCC, more importantly the Environmental Studies program, I was very well prepared for classes at PSU. The courses offered at PCC gave me a great foundation for my continuing education at PSU. I have yet to take a class here at PSU that I did not receive a foundation for from Dr. Tom. He covers so many areas in great detail that the information that I have received here either covers it again or builds upon it. I have talked to many Environmental studies majors, from PCC and PSU, and have found that the education that I received while at PCC was extraordinary. I believe that the program at PCC gives me an advantage over those students who start at PSU.

**> Highlights of your time at PCC**

> The labs at PCC are an essential tool to develop a deep understanding of subject related to Environmental Studies. The labs offered at PCC are in depth, focused and give students experiences that are not offered at PSU. I enjoyed the labs that Dr. Tom offered, although tough, I felt very rewarded when finished with them.

**> What are your plans for the near future?**

> I am still in school and will be done March of next year. When I am finished I am going to try and work in environmental education. I believe that the key to the future is to inspire the kids of today. I want to work with elementary to high school kids, possibly as a Naturalist with the Parks department.

**> Any other comments you would like to give.**

PCC has given me an education that I am only beginning to realize. The hands on labs and well structured coursework, all played a huge part in my education.

Thanks Tom.

Let me know how it goes.

Joe