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ERE MESSENGER

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Eileen Cashman Joins ERE Faculty

by
Eileen Cashman
ERE Assistant Professor

Greetings Engineering Stu dents! My name is Eileen Cashman and I am very pleased to be joining the ERE faculty this semester. I'm looking forward to getting to know you in classes or on campus as the semester proceeds. I'm writing this short piece to give you a chance to know a little about me. First the technical stuff; I completed a Ph.D. in Civil and Environmental Engineering in 1997 at the University of Wisconsin-Madison. The majority of my Ph.D. coursework included surface and subsurface hydraulics and hydrology. I have an M.S. in Land Resources (with certificate in Energy Analysis and Policy), also from UW-Madison. My undergraduate degree is in Environmental Resource Engineering from Humboldt State University. That was some time ago;I was here for the grand opening of the Engineering Laboratoty Building, Science-D. I took statics and dynamics in trailers that leaked when it rained and some of the professors I took classes from are still here!

During and between my degree programs, I have worked as a civil engineer for Pacific Gas and Electric Company in San Francisco, as a consultant for both an engineering firm and an energy conservation firm and as a research fellow for the U.S. Geological Survey.

For the past 2 1/2 years, I have been teaching at James Madison University in Virginia. At JMU, I was able to teach at all levels, freshmen through seniors, and I found that I thoroughly enjoy teaching in an undergraduate program. As a professor, my goal is to develop students' understanding of fundamental scientific and engineering principles, to provide them with opportunities to think critically about course material, and to generate active student participation in class. I strongly believe that learning should be an active endeavor for students as well as the teacher.

My research interests are related to nonpoint source runoff and the evaluation of agricultural and urban best management practices (BMP's). Thus far I have focused on sediment and nutrient transport and my main focus has been on research that incorporates undergraduate students.

Although I really enjoyed teaching at JMU, I have always entertained the notion of returning to Northern California. I credit Brad Finney with putting that notion in my head by telling me just before I graduated from HSU that if I ever got my Ph.D., I should consider coming back to HSU. Little did he know that comment would come back to haunt him! I was very satisfied with my undergraduate experience at HSU and the uniqueness of the engineering program has served me well throughout my career. The opportunity to contribute to this program is an exciting and welcome challenge to me. I'm looking forward to working with all of you in the future. ERESA

In This Issue

Alumni Profile

Duane Ono
BS ERE 1979
Deputy Director
Great Basin Unified APCD
Bishop, CA

After graduating from Humboldt State University with BS degrees in ERE and Physics in 1979, I worked in R&D on air pollution controls. In 1983, I earned an MS in Mechanical Engineering from UC Davis and began work for the US EPA becoming the regional expert on particulate air pollution. Since 1989, I've served as the Deputy Air Pollution Control Officer for the Great Basin Air Pollution Control District in Bishop, California. I helped develop an air quality plan for Mammoth Lakes, which resulted in reducing air pollution from wood smoke and road dust to levels that now comply with federal standards.

In 1993, I testified at the State Water Board hearings on Mono Lake about air pollution violations from dust storms off the exposed lakebed. This significantly contributed to the decision to set the final lake level at 6,392 feet and to reduce the amount of water the City of Los Angeles could divert from the Mono Basin.

I am currently involved in a plan to control particulate air pollution at Owens Lake, again caused by LA's water diversions. After a lengthy battle, LA agreed in 1998 to take responsibility for the air pollution caused by the diversion of the Owens River in 1913 to the LA Aqueduct. This agreement will result in controlling the largest source of air pollution in the US by 2006.

In resolving environmental problems, try to retain the positive environmental values instilled by the faculty at HSU and shared by many of your fellow ERE students – sometimes the outcome will surprise you.

I live in Bishop California with my loving wife Shirley and our two boys, Ben (6-yrs) and Matt (4-yrs). I spend my free time fly fishing the creeks and rivers of the Eastern Sierra as much as possible. ERESA

Ecological Approaches to Remediation and Restoration

by
Bob Gearheart
ERE Professor

The two projects I describe here are associated with historic mineral extractive processes in the west. Mineral and gravel mining in the west have seriously disrupted watersheds and riverine environments which has lead to a loss of aquatic communities, aesthetic amenities, and riparian habitats. These restoration projects have taken the ERE department north to the Canadian border (Idaho) and south to the Mexican border (Arizona). In the south, Apache Nitrogen Products (previously called Apache Powder Company) made dynamite for the copper mines of Arizona and later made gunpowder for war efforts. The project to the north in Idaho involved extensive mineral extraction and smeltering in a pristine Northern Rocky Mountain headwater streams.

The last decade has seen a resurgence in basic ecological engineering approaches applied to watershed and groundwater systems. The ERE Department has been involved with several of these types of projects. Here I describe two Superfund projects, one in Arizona (Region 9 EPA) and one in Idaho (Region 10 EPA) involving ecological approaches to remediation and restoration. Along with several undergraduate and graduate students in the ERE and IDT programs I have had the opportunity to assist in problem formulation, technology assessment, and technology development for these projects. As a more or less " seasoned" faculty member it never ceases to amaze me what I still need to learn, combined with what I learned eons ago and I thought I would never use, to be able to do the job. These two projects run the gamut from the microbial (micro) level to the watershed (macro) level, in terms of ecological restoration. Both of these examples are CERCLA projects which require specific approaches and are well immersed in legal and administrative requirements. My experience in both of these projects has reinforced the role of the environmental engineers as a facilitator for solving problems i.e.: to "communicate" the science, the technologies, the implications, the impacts, and the net benefit of ecological restoration options to all of the stakeholders.

The Arizona Project

The "micro project" is at a site in Arizona located on the San Pedro River just north of the Mexican border. This industrial facility historically manufactured dynamite and fertilizers. The company has operated more than 90 years and has allowed their waste nitrogen products to percolate from a perched aquifer into a shallow aquifer used as a water supply. The groundwater exceeded the nitrate MCL (10 mg/l NO_3-N) by a factor of (200-500 mg/ NO_3-N). I originally worked with EPA in assessing options for treatment, and after the wetland technology was selected JSU contracted with the consultant for the company, Hargis and Associates, to design the wetland. The option selected was a constructed wetland (natural denitrification)

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S T A F F

EDITORS
Monica Martin
Cort Pryor

FACULTY ADVISOR
Mike Anderson

PRINTING
University Graphic Services

For comments or subscriptions:
ERESA@axe.humboldt.edu

Subdivision Development: Doing It Right

by
Steve Salzman, P.E.
Project Manager
Winzler & Kelly

Most of the places we call home were made possible by the subdivision and development of land. The forests and pastures were scraped away and the wetlands were filled. In most cases the ecological and hydrologic consequences were not well understood or adequately addressed. This article illustrates an "environmental resources engineering" approach to subdivision development by describing a project that is currently underway, in Arcata.

Project Setting

The 20-acre parcel being subdivided is owned by our very own Cliff Sorensen. The parcel has been in the Sorensen family since the early 1920's. utility easements. There was a total of nine developable acres. From an economic perspective we needed to expand the developable area. To do this we needed to reroute the tributary and fill the wetland then create a mitigation wetland area. We knew that this would require involvement with various regulatory agencies so we organized a scoping session to get their input. The ACE was invited as well as the National Marine Fisheries Service (NMFS), the California Department of Fish and Game (CDFG) and the U.S. Fish and Wildlife Service, City of Arcata's Environmental Services, Public Works, and Community Development Departments.

Our proposal was well received and it was agreed that the wetland mitigation area would provide a 2:1 replacement for the filled wetlands. The revised constraints map allowed 13 acres of developable area at the project site.

A Preliminary Geotechnical Soils Report was completed by a subcontractor. The report considered numerous topics including in-situ soil conditions, expansive soils, slope stability, existing fills, groundwater conditions, surface drainage hazards, flooding, seismic hazards, and liquefaction hazard. Based on a literature review, a subsurface investigation, and laboratory analysis; the report concludes that the site is suitable for the proposed development and would not contribute to or be subject to geologic or soils engineering hazards.

CALENDAR

Spring 2000 ERESA Activities

JANUARY
Eileen Cashman Welcome Party
ERESA Spring Tutoring Begins

FEBRUARY
MathCOUNTS
ASCE Nat'l Engineering Week

MARCH
Comedy Night
ASCE Mock Interviews
ASCE Water Treatment Competition

APRIL
ERESA Annual Rafting Trip
ASCE/ERESA Awards Banquet

MAY
Good Luck Grads!

Wetland and Fisheries Issues

We developed a channel modification and grading plan that rerouted the tributary and widened the main channel. Widening created in-channel wetlands and a riparian zone on both sides of the creek. The in-channel wetlands and the riparian zone will provide significantly better habitats than what currently exists. A wetland mitigation and monitoring plan was developed with and was approved by the CDFG and the ACOE. The monitoring plan requires that the modified channel area be planted and monitored for at least three years to ensure that the wetlands and riparian zone were established. The filling of the wetlands and widening of the channel required permits from the ACOE and the CDFG.

Because Janes Creek is considered prime Coho salmon habitat and because they have been "listed" as endangered, a Section 7 consultation was initiated between the various involved agencies to determine if the proposed project would adversely affect the listed species. Additional information was needed to make that determination. A field study was completed by a subcontractor to determine the habitat quality and the presence or absence of Coho in the affected section of Janes Creek. This section of Janes Creek is choked with blackberry and canary grass, has a very low gradient, and a "cemented" silty bottom. The report concluded that this reach lacked spawning and rearing habitat, that no Coho were present or were likely to be utilizing the reach, under the present conditions. The ACOE issued an opinion that the project was "not likely to result in adverse impacts," to the Coho. The NMFS has issued a letter concurring with the ACE opinion. Before any in-channel work can be started we will have to file for, and receive, a 1604 (Streambed Alteration Permit) from CDFG.

Flooding and Storm Water Issues

The channel modifications have been modeled using HEC 2. The limits of the 100-yr floodplain will be at the top of bank and not 300 feet out into the meadow. The water surface elevation upstream and downstream of the project will remain the same as the pre-project levels indicating that the project will not affect off-site floodplains. We requested a Condi-

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Students in the Workplace

by
Matt Kennedy
ERE Undergraduate

During the summer of 1999 Tully McCarthy and I were given fellowships to work with the Hydrology Group at the Battelle operated Pacific Northwest National Laboratory in Richland, Washington. The fellowship, which was awarded through an organization called the Associated Western Universities, involved a significant amount of programming and other computer related work. Those of you who aren't too keen on becoming good friends with UNIX might be frightened off by this summer job.

Tully and I were forced to quickly establish a much more intimate relationship with the UNIX operating system. We were handed a stack of books and manuals on UNIX and Fortran 90 and stuffed in a dimly lit basement, where our only window to the outside world was through Netscape Navigator. Even worse, while the ambient outside temperature often reached a balmy 95ϗ our dungeon home was always a frigid 60ϗ forcing us to bring sweatshirts to work even on the hottest days. Nevertheless, Tully and I quickly adapted to this hostile environment, and completed virtually every task laid before us with stunning efficiency.

I'm not trying to paint an ugly picture at all. Working at PNNL was probably one of the best learning experiences I've had outside HSU. Tully and I both became much more at ease with UNIX and Fortran 90. We learned a lot of cool short cuts and tricks that we can use right here in our own beloved UNIXLAB. And crazy as it may seem, I left Washington that summer with the feeling that UNIX is a very superior operating system. Needless to say, I felt a little closer to Finney and Willis (and I'm not trying to be flippant).

Although Tully and I were given different tasks, they were all related to the extensive network of hydroelectric dams on the Columbia/Snake River system. My work included the creation of a statistical program that analyzes and compares hydrologic and water quality data collected on the Columbia River with results generated from a computer model. I also spent a lot of time carrying out the "calibration/verification" processes on one of the Hydrology Group's computer models (I think I just had a flashback of Systems Analysis).

One of the coolest parts about being in Eastern Washington was there was a lot of places to go on the weekends. Tully and I went camping, fishing, and hiking a lot. We visited Full Sail Brewery in Hood River, OR, we went to a brew festival in Portland, and visited Mt. Rainier. Within a two hour radius of Richland there is amazing desert landscapes, rivers, lakes, forests, mountains, volcanoes, caves, hot springs, waterfalls, and of course the mighty Columbia River. Right outside Richland is Rattlesnake Mountain, the tallest treeless mountain in North America. And just up the street is Hanford site, currently the location of one of the largest nuclear clean-up efforts in the U.S. Hanford was a plutonium refinement site during the "Cold War", and it is where the plutonium was refined for the WWII nukes. Because of this unsettling fact the Tri-Cities (Richland, Pasco, and Kennewick) has one of the highest densities of PhD's in the country.

If you haven't been scared off by what I've written and you're interested in applying for a summer fellowship at Battelle, visit the Associated Western University web site at www.awu.org. For more information check out PNNL web site at www.pnl.gov. ERESA

Brown Bag Lunches

by
Monica Martin
ERE Undergraduate

In Fall 1999, Dr. Beth Eschenbach and the Society of Women Engineers (SWE) initiated the Brown Bag Lunch Seminars. The weekly event offers an informal time for faculty and students to exchange academic and professional experiences.

Brown Bag Lunches feature faculty and students presenting current research, senior projects, internships, etc. Last semester activities varied from Dr. Margaret Lang discussing her fish passage research to Stacy Matthews, a recent ERE graduate, sharing her internship experience with the California State Water Quality Control Board. Another successful lunch, presented by Dr. Brad Finney and Dr. Robert Willis, gave students helpful information about applying for and getting into graduate school. We are planning to include this as a topic again since this triggered the interest of many ERE students.

For continued success, students and faculty need to be involved. Please help by selecting weekly topics. volunteering to make a presentation or simply attending the meetings.

E-mail us with your ideas at swe@axe.humboldt.edu or eae1@axe.humboldt.edu.

The Brown Bag Lunch Seminars will be held every Thursday at Noon in Science D, Room 5. These gatherings are intended to be casual, so please don't hesitate to come late or leave early. Come join us while we eat lunch and get acquainted with other students and faculty! ERESA

1999 Awards and Recognitions

by
Katie Bowman & Monica Martin
ERE Undergraduates

Throughout the 1998-99 school year many ERE students received recognition and awards for their activities. This article discusses awards that were given to students by the ERE faculty, the Environmental Resources Engineering Student Association (ERESA) and by professional societies.

In 1998-1999, the ERE Faculty recognized three ERE students: Joelle Geppert, Tully McCarthy and Antonio Reis. ERE Senior Joelle Geppert received Outstanding Engineering Graduate of the year. Joelle demonstrated excellent academic achievement and professional potential in Environmental Resources Engineering. Tully McCarthy received the Roscoe-Schenler Scholarship, which is given to ERE students who demonstrate outstanding potential in Environmental Resources Engineering. ERE Senior Antonio Reis received the Homer Arnold Scholarship Award which is awarded to ERE students who demonstrate outstanding achievement in the application of Environmental Resources Engineering. The last two awards are given each year in honor of former HSU Engineering professors Homer Arnold, Jim Roscoe and Bill Schenler.

The Environmental Resources Engineering Student Association (ERESA) granted two service awards to students who volunteered a great deal of their time to student activities. Joe Burke received an ERESA Outstanding Service Award for his assistance with the annual comedy night and his on-going support of club activities. Katie Hopper was also a recipient of a service award for heading the club coffee table and participating in various other club activities.

The local branch of the American Society of Engineers (ASCE) recognized three groups of students with prize money awards for participating in the local ASCE design competition. The objective of the competition was to design a Hammond Trail Bridge to replace the existing bridge. The winning design was submitted by Julia King and Ryan Walton. They proposed a glued-laminated wooden parallel chord warren truss bridge to replace the current deteriorating steel truss bridge. The estimated cost of the new aesthetically pleasing bridge would cost just under one million dollars. Matt Kennedy & Nino Fiorentino received second prize for the alternative they submitted. Adrian Brokshire, Marc Leisenring, Robert Janadia and Carson Wollert earned third place for their efforts.

ERE Students Bonnie Smith, John Rupp and Kevin Goodheart received Designated Meritorious status in the 1999 Mathematical Contest in Modeling. Margaret Lang was the faculty advisor for the team. The three built a mathematical model to determine if there were pollutants introduced into a groundwater aquifer between 1990-1997. The contest was administered by the Consortium for Mathematics and its Applications.

The newly formed HSU student section of the Society of Women Engineers (SWE) received the National and Regional Best New Student Section (BNSS) award in 1999 based on the section's accomplishments in the areas of leadership, education, visibility, resources and diversity. Have you seen the 22 year old National SWE Best New Student Section trophy displayed in HS 18? These awards were accomplished under the student leadership of Melissa Clark, Heidi Gehlhaar, Jennifer Johnston, Monica Martin, Jennifer McGregor and Anne Shatara, with Beth Eschenbach as faculty advisor. ERESA

Remediation

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which would take pumped shallow aquifer water, reduce the nitrate to nitrogen gas in a constructed wetland and re-inject the treated water back into the aquifer. This alternative was approximately 1/10 the cost of the next most effective technology, in-vessel denitrification. This system has been constructed and slated to go into partial operation the summer of 2000. Several undergraduates and graduates worked on this project over the past four years: Vince Christian, Michiko Mares, Mick Allen, Joe Chavez, Darla Elswick, Brian Voss, and Margaret Forbes. This is an innovative system utilizing natural systems to clean up a Superfund site. While denitrification in a wetland is accepted practice, no one had attempted to denitrify at the levels we found at the Arizona site. This required many studies to determine carbon content and carbon production of decaying aquatic macrophytes. We had to learn about cattail predators that nearly wiped out our carbon supply the first year. We had to learn about Integrated Pest Management to take care of cattail moth. We had to learn about the environmental conditions necessary to support a necessary plant in the system, Sago Pondweed. We learned that the cultivation of Sago Pondweed appears to be affected by turbidity and small particles that coat the leaves. These factors shut down the plant by reducing photosynthesis. We had to determine a way to minimize turbidity during the start-up period to allow this submergent plant an opportunity to take hold. About six months ago a new and much more dangerous contaminate was found in the perched and shallow aquifer. Perchlorate, a known human toxicant affecting the thyroid gland, was found at levels 20 to 30 times the suggested health advisory levels for drinking water. Perchlorate is a known anthropogenic contaminate of missile fuel sites but was never a reactant used at this site. An interesting mystery evolved

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Fish Habitat and Watershed Health in Eastern Oregon

by
John Kelley
ERE Undergraduate

I am an "older" student pursuing a second degree in Environmental Resources Engineering. I have a previous degree and professional background in Natural Resources. This background includes work on salmon habitat issues in upper watersheds for a Tribe in eastern Oregon. Issues included correcting or mitigating anadromous salmon habitat damage caused by grazing, streamside roads, logging, and mining in upper watersheds.

Problems with the main-stem Columbia have forced northwest power companies, fish agencies, and Tribes to look at improving migration and spawning. One such "damaged" river is the John Day in central Oregon which experiences 50% juvenile mortality due to lethal instream temperatures, simplified habitat, and increased sediment loads. Habitat decline is created by human resource extraction through beaver trapping, grazing, placer mining, logging, and channelization. Further, hydrographs show higher spring flows and much lower summer flows. These changed flows, caused by increased overland flow, loss of wet meadows, incised channels, and lowered water tables, start in the upper stream systems and disrupt adult salmon migration, juvenile rearing and spawning gravels. In addition, vegetation removal occurs through cattle grazing, logging or silvicultural treatments, and placer mining. All of these activities lead to decreased shade, which with inland stream systems allows increased solar input leading to increased stream temperatures. Temperatures over 70½F will kill cold water fish.

There are a number of possible solutions. Removal or change of grazing methods along streams is desirable. The use of more fencing is one possibility. Fencing options include; barbed wire fencing, high-tension fences, temporary electrical fencing and electrical shocking ear tags. However, barbed wire fencing is expensive to maintain and disrupts wildlife movement.

Native streamside roads and ditch systems were evaluated regarding their contribution of overland flow and sediment loading. Roads were "be to put to bed" particular those in flood plains. Blockage of fish migration due to poor culvert placement or were evaluated. One of the challenges to this is that different species and ages of fish have different swimming and jumping capabilities. Logging systems with minimal roads should be used and various types new and current logging systems that are economical need to be assessed. For example, small cable versus large cable systems or helicopter logging versus roaded methods.

Bank stability, LWD, and pool presence can be engineered to a degree. Placed LWD can provide bank stability, sediment differentiation, and pools. However, costs are as high as 100,000 dollars per river mile. Further, rivers and streams at high flows will usually rearrange any LWD/rock placement. In the long term native streamside vegetation is needed to create stabile banks and LWD. Beaver could be used to created wetlands, ponds and stabile banks at very low cost and they tend to repropagate willows and cottonwood. However, beavers work best at low gradients, with available woody stems for food, and with cattle removed.

Correction of low water tables due to incised channels in upper and mainstream systems challenges biologists and hydrologists. Beavers are used in some small systems. However, streams deeply cut with high flows are problematic to solve with beavers. Further, in the main John Day River, irrigators created "push up dams" due to low late season flows and stream incision. These homemade dams blocked salmon migration. Interestingly, these low structures with fish passage are rarely used.

In the Hood River basin near Portland, engineering design has been used to create supplementary hatcheries. These hatcheries are small on site, temporary, and use to supplement small basins, which have experienced basin wide extinction of a salmon species. These hatcheries need sites with good water quality and quantity, high in the basin but close to roads, and designed for easy removal and setup.

On the Dechutes River in central Oregon, adult and juvenile migratory traps and short transportation systems are being looked at to reintroduce salmon and steelhead above dams. One problem in reintroducing these stocks back to streams above reservoirs is the capture of the out migrating juveniles before they enter reservoirs. Capture will need to be designed to not stress small fish, not allow predication, deal with debris and sediment, and allow passage of stream flow.

As a Tribal employee assigned to salmon habitat, I worked with many agencies and individuals on the above problems and projects. This included significant amount of communication in meetings and in the field. These meetings included representation from the environmental, timber, and cattle communities. Which led to many difficult consultations. Given what is known in correcting fish habitat and watershed dilemmas, it was impressive to see how challenging the human connection was to deal with. Of course the primarily challenge seem to be short-term economics versus conservation. ERESA

Remediation

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around the history of perchlorate at this site. In the early 1950's this company imported Chilean saltpeter to be used in making dynamite and fertilizers. This Chilean nitrate played an important role in modern agriculture and industrial process supplying nitrate nitrogen from 1830 to 1930. It also was the only source of iodine from 1870 to 1950. The Chilean Nitrate Company still operates in Los Angeles today. This material is mined in the arid rain shadow of the Andes at 4,000 meters. This region has only one millimeter of rainfall a year, 50 milliliters a century. Some of the native uplifted Andes Mountain material is marine in origin, which could explain the occurrence of nitrates but does not explain the occurrence of perchlorates. Perchlorates have only been produced at high temperatures and high pressures. Nature never ceases to amaze you. Somehow in this condition perchlorate is produced and is co-mingled with nitrate mineralogy, a naturally formed listed Superfund contaminate. In Arizona this mineral was stocked piled on the ground for several years in the catchment of the perched aquifer. All other perchlorate sites in the U.S. are associated with missile fuel storage, launching and or production.

Now the story gets interesting. The question naturally arose about what is going to happen in the denitrifying constructed wetland if perchlorate is potentially in the mix. We had to go back to the literature on microbial ecology and enzyme kinetics. It turns out that the literature had several citations of bacteria that can reduce perchlorate to chlorides, perclace is the enzyme.

The ERE Department has had a Toxicity Testing Laboratory at the Marine Lab for more than 14 years. Mike Ives, one of the original Arcata Pilot Project research assistants, heads up the lab. We designed and implemented a study to determine the effect of perchlorate on nitrate reduction in the newly denitrifying constructed wetland. We isolated and concentrated an inoculate of sediment loving bacteria to use in the study. The results of the study showed no perchlorate effect on denitrification; in fact, it showed a nitrate reduction enhancement. The next obvious question dealt with perchlorate reduction potential in the same environment as the nitrate reduction. We designed an experiment to determine the conditions that would support perchlorate reduction. To our surprise we found a set of conditions that removed perchlorate from the 100 mg/l to less than 0.1 mg/l in a matter of days. Levels in Arizona were as high as 0.65 mg/l in the perched groundwater.

An interesting thing happened on the way to the marsh. The organisms we isolated and concentrated from the pilot marshes turns out to be facultative anaerobe that reduces perchlorate to chlorides. The new technology for identifying and classifying bacteria uses DNA sequence matches. For a modest cost a lab will perform various levels of genetic material sequencing analysis to determine the unknown organism. The results are given in terms of probability. The sequence of DNA material is unique for each species. The analysis on the Arcata bug showed a 90% match with a known organism. This is a good match for a bacteria and gave us a name for this little perchlorate reducer. The only problem was that the reference organism was an obligate (cannot live in the presence of oxygen) anaerobe and has a different shape. While the jury is still out on whether we have isolated a unique organism we have stumbled on to way to remove nitrates and perchlorates in the same groundwater source. We have initiated the process to patent the process, not the organism. It appears that the organism that denitrifies also reduces perchlorate sequentially. This would explain why the organism is found in the Arcata system

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SWE Activities

by
Katie Bowman and Monica Martin
ERE Undergraduate

Last year the Society of Women Engineers (SWE) participated in the Expanding Your Horizons conference for junior high school girls and in the HSU Day of Caring, and they coordinated social events such as potlucks and the Senior Luau. This year SWE is sponsoring the Thursday Brown Bag Lunch Seminar Series. The lunch is held every Thursday from 12-1 in SCID 5. It is a casual setting where students and faculty discuss current events and professional activities such as summer internships and research projects.

SWE's most significant project has been the flume project. In the fall of 1998, Mac McKee's fluid mechanics class designed a flume for demonstrating basic fundamentals of fluid dynamics to children. About 10 designs were submitted, and a final design was chosen which combined the best ideas from a number of the student designs. To build the flume, SWE members raised more than $1000 this past year. Now that the funds are secured, the transportable flume will be built this year with the help of ERE students and Cliff Sorensen. The home of the flume will be the Redwood Discovery Museum at the Eureka mall. SWE has an agreement with the Discovery Museum that ERE students can use the flume in the future. It will be transported to schools and events for educational outreach efforts. Be sure to watch for announcements if you are interested in helping with the flume. ERESA

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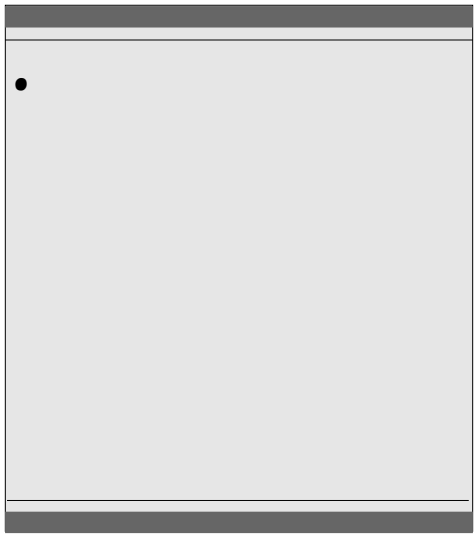
that has never seen any perchlorates. It also suggest that the organism is umbiquious and readily available anyplace they have wastewater treatment plants. So it appears the anaerobes come to our rescue again and demonstrated their utility and effectiveness in moderating anthropogenic and natural impacts to the environment. Sometimes you just can't say enough about decomposition.

The Idaho Project

At the other end of the Great Basin from Arizona and just south of the Canadian border is the second project we have been involved with over the past threeyears. The Couer d'Alene river flows off the Continental divide to the west eventually flowing into the Spokane River, which flows into the Columbia River. The upper reaches of the South Fork of the Couer d'Alene is referred to as Silver Valley. More than 90% of the silver extracted in the U.S. came from this area; most of it was extracted from 1890 to 1980. Later, significant amounts of lead and cadmium was extracted from mines in this watershed. Mining activities coupled with lead smeltering resulted in massive air, soil, and water contamination of the watershed. The magnitude and extent of the contamination placed the problem at the top of many lists. This was a macro level problem which potentially involved 180 square miles of a watershed. An ERE graduate, Mary Jane Nearman, Region 10 EPA Remedial Program Manager, oversees this project which involves two State agencies, several companies, mining cleanup consortia, scores of consultants, several Native American tribes, and several Department of Justice expert witnesses. My involvement has been as an expert witness for the Department of Justice. Several students have been involved in aspects of the project. For example, Heather Holbrook, Kurt Jannke and Dagan Short worked on the use of constructed wetlands to remove heavy metals. Several heavy metal studies previously done in freshwater conditions served as a data source for evaluating the use of constructed wetlands to remove heavy metals from the aqueous phase. Studies by Louise Finger and Amy Luers, Jeff Hendricks on the fate and transport of heavy metals in natural wetlands at Berletson Slough in Eugene, Oregon and Santa Rosa Creek proved useful in that regard. As it turns out, microbes are again at work in this process. Under anaerobic conditions and a sufficient supply of sulfates, acid and volatile acid sulfides are produced which tie up most of the dissolved metals of concern. We are back to wetlands and microbial process again but in this case we are not dealing with microbes that change



toxic materials to non-toxic material but we are dealing processes which reduce the bioavailability of the metals. A mass balance model was developed to account for sources, sinks, and transport processes in the watershed. This was similar to work done at Klamath Lake in Oregon six years ago in attempting to strategize a solution to the hypereutrophic conditions of the lake due to phosphorus loading. In both cases large watersheds, endangered species, Native American tribes, many Federal and State Agencies, and local land owners were involved. Work done by Jeff Anderson and Margaret Forbes was used to formulate an interactive computer model to assist decision makers in siting technologies and methodologies to clean-up and restore Klamath watershed. Jeff Anderson's thesis developed an interactive conjunctive watershed-lake model which optimized management options to control phosphorus loading to Klamath Lake (PSOUP-Phosphorus System Optimization Utility Program). Several models have now been developed and are being used in developing the RI/FS for the Coeur d Alene watershed. Initial work by Greg Gearheart (CLAM -Contaminate Loading Assessment Model) followed by an ongoing Master's thesis on an interactive watershed mass balance by Sophie Lagace (SLIME-Source Loading Inventory Metal Evaluation) are assisting in this regard.

One of the most interesting aspects of my career as an Environmental Engineer has been the range of issues and facets of the problems I have been involved. After 35 years in the business I believe that the Environmental Engineer has the education, professional responsibility, and experience to manage the majority of our major environmental problems. I have had to attempt to learn heavy metal chemistry, geomorphology, riparian ecology, ecotoxicology, mining techniques, fertilizer/ammunition chemistry, etc, in the last six years to actively participate in these projects. The tools I use in every project, which are inherent in the education of our environmental engineer education, continue to be the systems approach, fate and transport of contaminants, hydrology, treatment processes, ecology, toxicology, environmental monitoring, evaluation of alternatives, impact assessment, and the role of the public in ecological and community health restoration. I feel very fortunate to have had the pleasure to work with highly motivated and intellectually challenged students along with faculty colleagues on these projects and other similar ones over the years. Collaborative research with young engineers is keeping my drained batteries charged these days. ERESA

ERE Students Filter the Competition

by
Katie Bowman and Monica Martin
ERE Undergraduates

The HSU ERE program received national recognition last year when a team of six ERE students won first place at the American Society of Civil Engineers' Environmental Engineering "Water Treatment From Your Kitchen" Design Competition. The competition, held last spring at the University of Nevada-Reno, required designs to treat 10 gallons of water containing 15 contaminants ranging from chopped leaves and leather to oyster sauce and molasses using only items found in the kitchen. "The Wastewater Warriors," (Matt Kennedy, Marc Leisenring, Eric Lim, Rick Macala, James Van Bonn and Dave Wolstenberg) designed and built a treatment system and transported it to UNR. "The Wastewater Warriors" and their treatment system design overwhelmed the competition (Best Output Water Quality, Best Aesthetics, and Best Presentation). Along with winning first place in the 1999 competition, ERE will host the competition this spring.

> HSU ERE Department to host 2000 ASCE Environmental Engineering "Water Treatment From Your Kitchen" Design Competition on April 22.

The ERE Department is excited about hosting the competition this year and needs as many students involved as possible, regardless of class level. The competition provides an opportunity to show the strengths of the ERE program. Much needs to be accomplished by April. More info can be obtained from last year's competition at the website <http://www.scsr.nevada. edu/~asce/>.

So, give a big hand of applause to the Wastewater Warriors for their achievement last year, and come join us in hosting the 2000 Competition. ERESA

ERE Student Supports Purchase of Environmentally Sound Paper

by
Michael Winkler
ERE Undergraduate

I have initiated a campaign asking HSU to begin using more environmentally sound types of paper. This paper will use fewer trees and save electricity and water, and will help reduce air and water pollution. The groups participating in this project are the Campus Recycling Program (CRP), Associated Students (AS), and the Sustainable Campus course. Professors supporting the project are Bob Gearheart and Peter Lehman, both ERE faculty members. Bob Gearheart, Roger Herick and I have made substantial financial commitments to see this project through. We are planning to have a ballot initiative in Spring 2000 to raise student fees in order to pay for most of the additional cost. An article describing the project ran in HSU's Lumberjack and is available online at:
http://lumberjack.humboldt.edu/9-22-99/campus/campus_ecopaper.html

The primary purpose of using paper is communication. So, can we communicate effectively while minimizing the use of materials and energy, thereby reducing pollution and protecting natural resources and the environment, all at a reasonable cost?

We can reduce the depletion of natural resources by reducing the number of wasted copies, developing more environmentally sound ways of growing and harvesting trees, using more environmentally sound paper production processes and recycling paper as many times as possible. We can also do more communication electronically and less on paper. I chose to focus my efforts on using more environmentally sound paper, primarily because I hate seeing trees cut down unnecessarily when alternatives are available. We all use paper every day and paper production has a very high environmental impact.

The use of paper in the U.S. is symptomatic of our use of natural resources. Per capita paper use is approximately 1500 pounds per year, much higher than any other country in the world. Our use of oil is similarly high, 1900 gallons (45 barrels) per person, per year, much higher than any other large country and much more than is produced in the U.S., itself. Overall the U.S. with 5% of the world's population uses 30% of the world's resources.

Technology can to some degree help us use resources more efficiently. More benign energy sources such as solar and wind can help, but are inherently more expensive and are produced in smaller quantities than current demand requires.

As engineers we need to create systems that rely on sustainable natural processes. We must reuse waste materials act more as partners with nature. Our technical skills will still be valuable, but must be applied with increasing wisdom and understanding. Switching to environmentally sound paper is a step in the right direction. ERESA

Subdivision

• *continued from page 3*

tional Letter of Map Revision (CLOMR) from the Federal Emergency Management Agency (FEMA). This letter allows us to make the modifications and, after submitting the as-built plans, receive a revised flood insurance rate map (FIRM).

In addition to modifying the creek and tributary channels the project includes the development of a storm water detention basin. The detention basin will be located in the southeast corner of the property. Approximately 90% of the developed area will be routed through this basin. The remaining 10% will flow directly into Janes Creek. The basin will be outlet controlled. The outlet flow volume will be restricted so as to not increase the 100-year flood hydrograph for the tributary.

Tentative Map

As part of the application process we developed and submitted a tentative map to the City of Arcata. The map (see Figure 1) shows all the physical details of the subdivision including roads, lots, utilities, easements, parks, etc. A total of 61 lots were laid out. All of the utilities will be underground. The wetland/creek protection zone and neighborhood park ended up being approximately 7 acres and will be deeded over to the City.

Cultural Resources

A cultural resources report was prepared for the project site by a subcontractor. Although there were Native American village sites nearby; no prehistoric cultural resources had been documented to exist at the project site. Historic cultural resources noted at the project site include the Old Janes Creek School House (currently a residential unit), the single family resident at the corner, and the old hay barn. The historical structures will all be preserved and be located on two of the subdivision lots.

CEQA Process

An EIR is now being prepared for the project. The California Environmental Quality Act (CEQA) requires that an independent evaluation be made of the project and that all environmental impacts associated with the project be identified and mitigated to the fullest extent possible. We have supplied reams of data to the consultant that is under contract with the City to prepare the EIR. Our data and their evaluation will be subject to agency and public scrutiny over the next few months and will culminate in public hearings sometime next June.

The resource agencies that have been involved with the design process concur that the project will create additional wetlands and will enhance the diversity and biological value of this section of Janes Creek. The City also appreciated the amount of extra effort that went into designing and that will go into construction. We are confident that the planning Commission and the City Council will also approve of the project. ERESA

Figure 1. Tentative Map of Sorensen Subdivision

ERE Faculty Offices in Karshner

by
Monica Martin and Mike anderson
ERE Undergrad and ERE Professor

More than half the professors in the ERE Department now have offices in Karshner House (HS-47). We hope Professor Robert Willis will feel less isolated now that Professors Eileen Chashman, Ron Chaney, Beth Eschenbach, Brad Finney and Margaret Lang have joined him. Professors Mike Anderson, Al Burrows, Charles Chamberlin, Bob Gearheart and Peter Lehman maintain their offices in Brookins House (HS-18) along with the ERE Department Office.

Karshner House is located between CCAT and the Forestry Building; reach it from the top of the Union Street parking lot located between 16th Street and 17th Street. Figure 2 shows faculty office locations in Karshner. Note that Brad Finney and Margaret Lang have exterior entrances; you must enter their offices from outside. (See Figure 3). ERESA

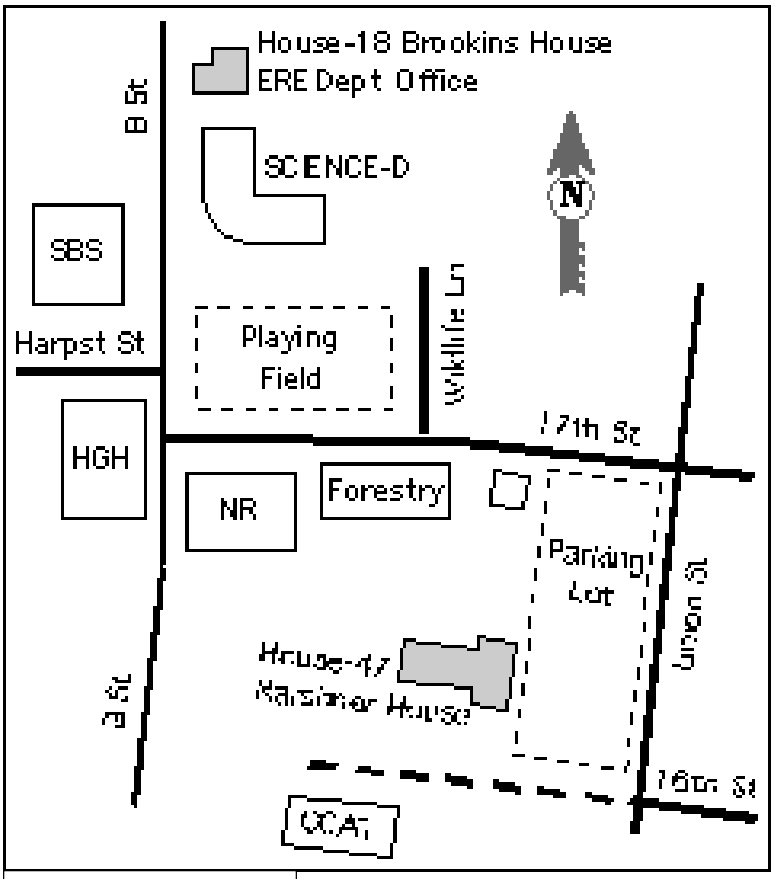


Figure 2. Karshner House Location Map

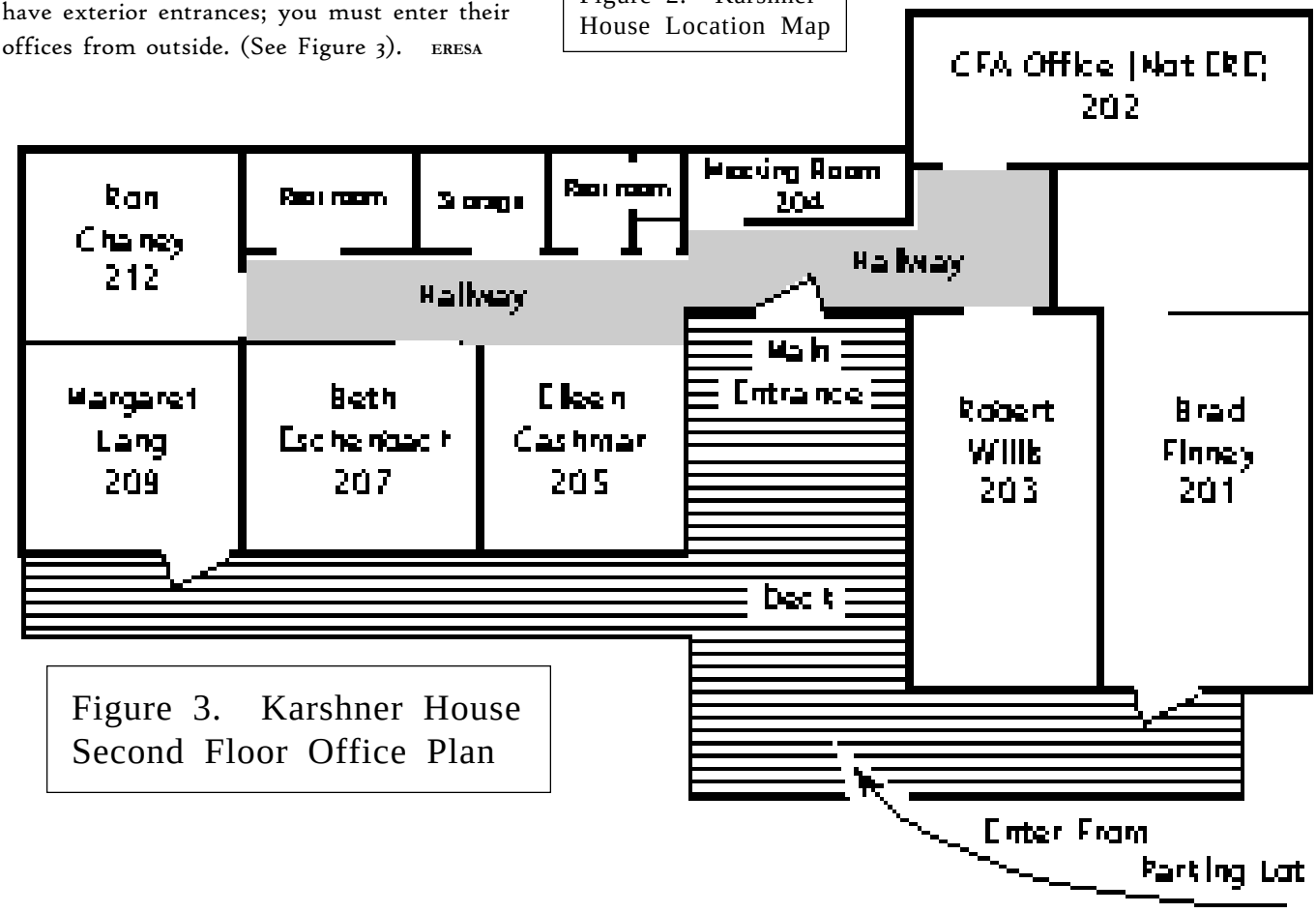


Figure 3. Karshner House Second Floor Office Plan

Thanks for Making It Possible...

ERE Student Association, ASCE Student Chapter
Department of Environmental Resources Engineering
Humboldt State University
Arcata, CA 95521-8299
eresa@axe.humboldt.edu

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