Professors Dean Wendt and Chris Kitts have both built student-fueled research programs based on local ecological needs. Their results may pay off at the state or national level.

Anglers have long disagreed with the state and federal governments over how many fish are in the sea. With the state’s establishment of marine protected areas (MPAs) — marine reserves where fishing is not allowed — the possibilities for conflict increased.

Wendt, who also serves as associate dean for the College of Science and Mathematics, saw instead an opportunity for collaboration. When he began monitoring fish populations inside and outside of the Central Coast MPAs, Wendt involved representatives from the national and state governments as well as the local fishing community in his research design.

“I advocate information,” Wendt said. “The data are going to say what the data are going to say. If people participate from the outset, it’s less likely they’ll argue.”

In addition, each party adds its own area of expertise, which leads to better results. Anglers know the local waters, government representatives know the policies, and Cal Poly scientists know experiments and data analysis.

All of this knowledge benefits Cal Poly students, who contribute to every step of the process.

“We want to engage our students in these kinds of real-world projects,” Wendt said. “Fisheries management involves the community. It involves the government. It involves real, serious science — all of those elements.”

Students accompany volunteer anglers on sport fishing boats whose captains helped design the project. The research team tracks information that indi-

CONTINUED…
Professors Dean Wendt and Chris Kitts have both built student-fueled research programs based on local ecological needs. Their results may pay off at the state or national level.

Anglers have long disagreed with the state and federal governments over how many fish are in the sea. With the state’s establishment of marine protected areas (MPAs) — marine reserves where fishing is not allowed — the possibilities for conflict increased.

Wendt, who also serves as associate dean for the College of Science and Mathematics, saw instead an opportunity for collaboration. When he began monitoring fish populations inside and outside of the Central Coast MPAs, Wendt involved representatives from the national and state governments as well as the local fishing community in his research design.

“I advocate information,” Wendt said. “The data are going to say what the data are going to say. If people participate from the outset, it’s less likely they’ll argue.”

In addition, each party adds its own area of expertise, which leads to better results. Anglers know the local waters, government representatives know the policies, and Cal Poly scientists know experiments and data analysis.

All of this knowledge benefits Cal Poly students, who contribute to every step of the process.

“We want to engage our students in these kinds of real-world projects,” Wendt said. “Fisheries management involves the community. It involves the government. It involves real, serious science — all of those elements.”

Students accompany volunteer anglers on sport fishing boats whose captains helped design the project. The research team tracks information that indi-

CONTINUED...
It involves real, serious science — all of those elements."

Mireles also praised the collaborative nature of the project. "It helped me to work with a wide range of stakeholders," he said. "It demonstrated what we can do by working together."

Because the California Department of Fish and Game and the National Oceanic and Atmospheric Administration (NOAA) were both involved in setting up the project, those student-produced data could end up affecting public policy.

Jason Cope, a research fishery biologist with NOAA, is excited about the data. "There isn’t anything like it," he said. "They’re gathering population abundance information where we just don’t have it. They’re gathering it over time so we can look at trends and how those populations change, which is very valuable."

The study is in its sixth year. Wendt hopes that future data will be used to evaluate proposals that might affect the health of the ocean. Meanwhile, he remains enthusiastic about the Learn by Doing opportunities for students.

“This project actually embeds the student in society. It shows them how their work is connected to managing public trust and a natural resource.”

Community Benefit

Far upstream, a student team working with Professors Chris Kitts and Michael Black is interested in a much smaller inhabitant of local waters. They’re helping the city of San Luis Obispo identify the source of the E. coli in San Luis Obispo Creek.

In 2004, the Central Coast Regional Water Quality Control Board found high levels of E. coli in the stream, which they attributed to a leaking sewer pipe. But when the pipe was repaired, the E. coli didn’t go away.

"We needed a way to get an idea of where the pathogens were coming from," said Aaron Floyd, the city’s environmental programs manager.

Enter Kitts, one of Cal Poly’s 2012 Distinguished Scholars, who has been working on E. coli fingerprinting since 2000, when he was called on to help determine the sources of fecal contamination affecting oyster farming in Morro Bay.

San Luis Obispo, Kitts said, “needed to know who was pooping in the creek.” Prime suspects included pigs, bats and humans.

Different animal feces contain different strains of E. coli. The problem is, there’s relatively little available information about which strain belongs to which animal. So Kitts’ and Black’s student research team collected and analyzed bat and pigeon guano over the summer.

Senior biological sciences major Mira Samara worked on the whole research process, from design through analysis. “It’s interesting to come up with everything on our own. If something was wrong, we had to come up with a solution and see if it worked.”

Emily Neal, a graduate student, agreed. “What’s been most interesting has been learning what it takes to truly create a method that is something you can trust, something that is reliable science."

San Luis Obispo isn’t the only city faced with fecal contamination. Kitts recognized that others could benefit from the students’ work if Cal Poly created a database of E. coli fingerprints.

Along the way, students receive a unique education in “what it takes to actually do research,” Kitts said. “How do you collect data in a functional way? How do you track it and analyze it?”

With a $250,000 Keck Foundation grant in 2010, Kitts and his colleagues purchased the equipment needed for relatively fast and inexpensive E. coli typing. Then they developed a multidisciplinary, in-class collaboration that spans three colleges, six majors, and all four years of a student’s academic career.

Students begin with E. coli collection and fingerprinting in their introductory biology classes and end with senior projects on anything from analyzing the data the freshmen have collected to programming the database itself.

“Students get a different experience at each level,” Kitts said. “They get to know that what they’re doing in class is actually contributing to an on-going, real-life research project that benefits the community.”

Neal said the work’s multidisciplinary nature has helped her develop as a scientist. “More and more it seems biology is moving into incorporating the computer world into our research. So learning how to convey what you need to computer scientists is an important skill.”

Kitts hopes that in the long term, the database will become a statewide resource for tracking water contamination. It’s already helping San Luis Obispo. “It really is beneficial to all the residents, visitors and the community,” Floyd said.

Carlos Mireles (B.S. Biological Sciences, 2005) now a marine biologist with the California Department of Fish and Game, was one of the first students on the project. “I’ve been able to employ all the different field research experience I gained at Cal Poly,” Mireles said. “It wasn’t just going out there and tagging fish. It was collecting data and analyzing it as well, which is extremely important for anyone in this field.”

Senior biological sciences major Caitlyn Webster has been working on the project for two years. She spent her summer unhooking, measuring, species-typing, tagg­ing and releasing fish from Point Buchon to Piedras Blancas.

“It’s provided me price­less field work experience,” Webster said. “It’s a really demanding yet extremely rewarding experience to have the opportunity to practice effective research management and get to analyze the data and see it in real time after you’ve been on the project for so long.”

Biological Sciences students collect water samples and scarpings from San Luis Obispo Creek to try to determine the sources of water contamination.
Fisheries management involves the community. It involves the government. It involves real, serious science — all of those elements."

Carlos Mireles also praised the collaborative nature of the process. "It helped me to work with a wide range of stakeholders," he said. "It demonstrated what we can do by working together."

Because the California Department of Fish and Game and the National Oceanic and Atmospheric Administration (NOAA) were both involved in setting up the project, those student-produced data could end up affecting public policy.

Jason Cope, a research fishery biologist with NOAA, is excited about the data. "There isn't anything like it," he said. "They're gathering population abundance information where we just don't have it. They're gathering it over time so we can look at trends and how those populations change, which is very valuable."

The study is in its sixth year. Wendt hopes that future data will be used to evaluate proposals that might affect the health of the ocean. Meanwhile, he remains enthusiastic about the Learn by Doing opportunities for students.

"This project actually embeds the student in society. It shows them how their work is connected to managing public trust and a natural resource."

Community Benefit

Far upstream, a student team working with Professors Chris Kitts and Michael Black is interested in a much smaller inhabitant of local waters. They're helping the city of San Luis Obispo identify the source of the E. coli in San Luis Obispo Creek.

In 2004, the Central Coast Regional Water Quality Control Board found high levels of E. coli in the stream, which they attributed to a leaking sewer pipe. But when the pipe was repaired, the E. coli didn't go away. Because the California Department of Fish and Game, and the National Oceanic and Atmospheric Administration (NOAA) were both involved in setting up the project, those student-produced data could end up affecting public policy.

Emily Neal, a graduate student, agreed. "What's been most interesting has been learning what it takes to truly create a method that is something you can trust, something that is reliable science."

San Luis Obispo isn't the only city faced with fecal contamination. Kitts recognized that others could benefit from the students' work if Cal Poly created a database of E. coli fingerprints.

Along the way, students receive a unique education in "what it takes to actually do research," Kitts said. "How do you collect data in a functional way? How do you track it and analyze it?"

With a $250,000 Keck Foundation grant in 2010, Kitts and his colleagues purchased the equipment needed for relatively fast and inexpensive E. coli typing. Then they developed a multidisciplinary, in-class collaboration that spans three colleges, six majors, and all four years of a student's academic career.

Students begin with E. coli collection and fingerprinting in their introductory biology classes and end with senior projects on anything from analyzing the data the freshmen have collected to programming the database itself.

"Students get a different experience at each level," Kitts said. "They get to know that what they're doing in class is actually contributing to an on-going, real-life research project that benefits the community."

Neal said the work's multidisciplinary nature has helped her develop as a scientist. "More and more it seems biology is moving into incorporating the computer world into our research. So learning how to convey what you need to computer scientists is an important skill."

Kitts hopes that in the long term, the database will become a statewide resource for tracking water contamination.

It's already helping San Luis Obispo. "It really is beneficial to all the residents, visitors and the community," Floyd said.

Biological Science: Students collect water samples and scampings from San Luis Obispo Creek to try to determine the sources of water contamination.