

WESTERN REGIONAL PANEL: ANNUAL MEETING MINUTES

September 13 and 14, 2006
Smith Memorial Student Union
Portland State University, Portland, OR

The Western Regional Panel (WRP) of the Aquatic Nuisance Species Task Force (ANSTF) held its annual meeting September 13 and 14, 2006, at Portland State University (PSU), Portland, OR. Training on working effectively with tribal governments was conducted on September 12, and people could attend a guided field trip to the Columbia River Gorge on September 15.

Participants heard reports on WRP-funded projects, member state ANS efforts, economic issues related to zebra mussels in the West, a newly discovered parasite, and the 100th Meridian Initiative website. Two panels also discussed issues relating to the biology curricula pathway and specific eradication projects.

In the afternoon of September 13, participants could attend several presentations regarding introduced species held jointly with the Pacific Northwest Region of the North American Lake Management Society. Afterwards, the Native American Student and Community Center at PSU hosted a salmon bake and featured Native American dancing.

DECISIONS

- The WRP approved adding the USFS as a member and accepting Kay Wallace as the new at-large member representing Alaska Natives.
- John Wullschleger, Lynn Schlueter, Jason Goeckler, and Billie Kerans were elected to the Executive Committee.
- Two projects were chosen for available WRP funding of \$30,000: Sara Pelleteri's expansion of Habitattitude to the outer main Hawaiian Islands (\$13,810, with an added evaluation component) and Catherine de Rivera's *Sphaeroma quoianum* surveys and outreach (\$14,658, contingent on Tim Davidson's enrollment at PSU). The remaining amount of \$1,532 will be distributed equally between the two projects.
- The next WRP annual meeting will be held in Hawaii in mid-September 2007.

ACTIONS ITEMS

- Tina Proctor will work on finding representatives from the Western Aquatic Plant Management Society and The Nature Conservancy.
- Tina will solicit input on enhancing Bob McMahon's proposal on water body thermal regimes and funding it through the 100th Meridian Initiative.
- Tina will coordinate conference calls regarding the WRP's perspective on rapid response. Those volunteering to participate included John Chapman, Tony Montgomery, Susan Ellis, Stephen Phillips, Paul Heimowitz, John Wullschleger, Eileen Ryce, and Larry Riley. Tina will then forward results to Scott Newsham to incorporate into the ANSTF agenda.
- Paul Heimowitz will chair a biological supply house workgroup. Those interested included Pam Meacham, Kevin Anderson, Jeff Herod, and Joan Cabreza. Tina will email others asking if they're interested as well.

WELCOME

Co-chair Kevin Anderson, Puget Sound Action Team, welcomed participants to the 10th meeting of the WRP. Of the 49 members of the WRP, 33 were in attendance; 22 other participants also registered. Then Mark Sytsma, Director of the Center for Lakes and Reservoirs (CLR) at PSU, commented on progress made since Portland hosted the WRP meeting nine years ago. Dan Diggs, USFWS Assistant Regional Director for Fisheries, said that ANS management and control rose in priority in recent USFWS strategic planning for fisheries. He described several collaborative efforts addressing fisheries issues and ANS.

WRP FUNDED PROJECTS

Tina Proctor, USFWS Region 6 ANS Coordinator, introduced reports on WRP-funded projects.

Working with Mexico

Leigh Johnson, University of California Sea Grant Extension Program, talked about establishing collaboration with Mexico to prevent hull transport of aquatic invasive species (AIS) along the western regional coast. Already, about 80% of boats in Baja California marinas are from the United States, either for maintenance or recreation, and boat traffic is likely to increase. Previous efforts to engage Mexican participants failed, so this project focused on identifying prospective Mexican participants, developing contacts in various industries and organizations, and translating materials into Spanish for dissemination. Leigh highlighted successful components of the project, including hiring an enthusiastic bilingual staffer and making two trips to Ensenada to meet new contacts, exchange perspectives, and explore opportunities for collaboration. Overall, they learned that successful collaboration relies on having fluent Spanish communication, building personal relationships, understanding cultural norms, and funding participation by Mexican colleagues. No efforts will be effective without Mexican participation for research and outreach in Mexican ports and harbors.

One of the challenges to preventing hull transport is the difficulty in cleaning marine boats relative to their freshwater counterparts that can be transferred to trailers for cleaning. Leigh shared estimated costs for cleaning hulls of marine boats. Information about hull-borne invasive species and hull cleaning before departing and returning was included on a bilingual poster (Stop Aquatic Invaders on Our Coast! / ¡Detenga el Transporte de Especies Invasoras Acuáticas en Nuestras Costas! available from jagonzalez@ucdavis.edu), which has been distributed in the United States, Mexico, and other countries. She provided a list of other translated documents (available at <http://seagrant.ucdavis.edu>) and others that will be available soon. Leigh thanked the WRP for providing these funds, especially because they covered expenses that other funding sources could not (such as work outside the state or country).

ANS Early Detection Program Prototype

Karen McDowell, San Francisco Estuary Project, talked about a prototype booklet for early detection on which she and Joan Patton have begun working. Although in the early stages, they will network with watershed groups and create a booklet that can be used by these groups to identify new invasive species, developing two samples for the San Francisco Bay (one for creek habitat and one for estuarine habitat). She described the booklet format, which will include information about AIS in general, local areas, target species, contacts, useful web links, and instructions. Plastic pockets will protect information from water and facilitate updates. She and Joan will concentrate future efforts on identifying contacts and species watch cards and engaging watershed groups. Watershed groups currently involved are enthusiastic about participating. One is staffed while others are volunteer-based. She hopes to convene the advisory committee soon and complete the project in late 2006/early 2007. The staff and time necessary for a detection program to work are not yet in place, but Karen is working on the California AIS management plan to encourage their availability in the future.

Desert Fishes Council Meeting

John Chapman, Oregon State University, presented on the WRP's funding contribution to the Desert Fishes Council (DFC) meeting November 16–20, 2005, in Cuatro Ciénegas, Coahuila, Mexico. Increasing international cooperation for managing ANS has been a priority for the WRP, and the DFC is a good link, given its close relationships with many Mexican scientists.

John had initially worried that preventing the spread of ANS would not be a priority issue in a country with limited resources. But he found Mexican participants and regional politicians very concerned, especially given the region's focus on ecotourism. The poor soil, hard water, and overabundance of introduced *Arundo* render agriculture in the area difficult and unsustainable. The economic viability of the area for ecotourism is better but depends on maintaining the uniqueness of the Cuatro Ciénegas area and reducing threats to native flora and fauna. The region has an endemic diversity of species that rivals the Galapagos Islands.

Thanks to the nearly \$6,000 contribution, the WRP funded a Spanish translator, provided funds to allow several Mexican scientists to attend, and hosted a special session on nonindigenous species. The meeting was the largest in DFC history. Susan Ellis, California Department of Fish and Game, presented Tina with a shirt from the DFC meeting.

Research Priorities for Invasive Aquatic Plants

Mark Sytsma spoke about research priorities for AIS. Although development of research priorities that address key biological, ecological, and management questions is critical to help direct available (and increasingly limited) funding, the WRP had been unable to reach consensus, likely due to the diversity in habitats, organisms, pathways, and management options for AIS.

So a group of aquatic plant managers and scientists met in La Jolla, CA, to address submersed freshwater aquatic plants specifically. Mark reviewed the nine workgroups that had been created and their chairs. All the chairs prepared summaries of past research and directions and presented their findings. Participants then broke out into their workgroups, developed priorities for research, and identified obstacles. Upon reporting to the full forum to develop recommendations, areas of overlap became very clear. Following the workshop, people have been writing papers that will be compiled. Draft research priorities for two workgroups were presented to the Invasive Species Council Advisory Committee in September. Final results from all the workgroups will be presented at the next ISCAC meeting in July in Florida for endorsement. The peer-reviewed *Journal of Aquatic Plant Management* has agreed to publish workshop results. Mark plans to collect the remaining papers, write an overview of the workshop, and submit it by the end of the year.

Development of Preemptive Rapid Response Teams

Mark also updated participants on the development of preemptive rapid response teams for *Trapa natans* (water chestnut) and *Lagorosiphon major* (oxygen weed), a project led by Lars Anderson (USDA–Agricultural Research Service). These species are not present in the western United States, but if they appear, people should know how to respond. Literature searches and expert contact lists have been completed for both species. In addition, a “round table” pest/alarm exercise is planned for late October or early November at UC–Davis. People with experience will attend and help determine whether their control programs can be used in western states. The exercise will also include a number of topics, such as pathways, survey approaches, taxonomic expertise, dispersal and reproduction, containment and control options, quarantine and permitting issues, science advisory panels, and state ANS plan guidance. Lars anticipates submitting a report by December 31. This report will include summaries of recommendations, identification of gaps in response resources, and appendices containing references and expert contact information. Mark commented that this exercise could apply to other species as well. He invited anyone interested to attend as an observer. Tina mentioned that the ANSTF will talk about rapid response at the November 7–9 meeting, so she will be interested in hearing results of this exercise.

Inventory of ANS Education and Outreach Materials

Robyn Draheim, PSU, spoke about the inventory of regional AIS education and outreach materials that was undertaken to avoid duplication of efforts, enhance exchange of readily available information and resources, and highlight gaps in existing outreach efforts. Originally funded for \$2,500, this project proved to be quite ambitious and required an additional \$11,000. The initial funding allowed CLR staff to identify brochures, fact sheets, public service announcements, binders, posters, and other education and outreach materials and include them in a searchable database. But it was inadequate for online use, so the project was expanded and additional funding sought.

PSU's Academic Resources and Computing Department has created the database design, added search capabilities and an authentication feature, and uploaded an image catalog (to help with “image fatigue”). They are still developing the web interface and a peer-review evaluation and comment system that will allow some registered users to rate products. Once the beta version is available (tentatively by mid-October), CLR staff will announce its debut and seek reviews. Given interest expressed by other regions, the platform is designed to be expandable, possibly to a national level. It will also be usable by a variety of groups, including teachers. She asked that people enter new materials into the database as they are

developed. In response to questions about maintenance, Robyn said that, if the database works as it's supposed to, it should require little upkeep. PSU will do the technical maintenance as long as the database is stored on its system. The registration process is fairly rigorous to deter pranksters from uploading garbage.

Invasive Ecosystem Engineers in Salt Marshes

Some AIS impacts are direct interactions between the invader and native species (e.g., predation or competition), but impacts of other invasives are more indirect; that is, they affect other species through modification to the habitat. As "ecosystem engineers," they change the very essence of habitats, with possible effects that ripple throughout the ecosystem. Jeff Crooks, Tijuana River National Estuarine Research Reserve, spoke about a newly initiated WRP-funded project focused on two invasive ecosystem engineers, a marine pillbug (*Sphaeroma quoyanum*) and salt cedar (*Tamarisk* spp.), in the salt marshes of southern California and northern Baja California.

Crooks reviewed project goals, including assessing the extent of the problem and existing management activities, developing additional management strategies, and communicating with resource managers in both Mexico and the United States. He showed a map of the study area, extending from Santa Barbara to about 200 miles south of San Diego. Various habitats are included in the transition zones of the coastal estuaries. Because these habitats are home to numerous endangered species, investigators have been constrained at times, such as the nesting seasons for several listed birds.

A tamarisk project in the Tijuana Estuary salt marshes, funded by NOAA Sea Grant, allowed investigators to assess effects of invasive tree removal to plant, bird, and other communities. One of the most interesting findings was the "hybrid swarm" of tamarisk in the Tijuana Estuary. The occurrence was thought to be *Tamarix ramosissima*, but several hybrids were found, likely explaining the success of the invasion: the offspring can live where the parents cannot. This same kind of hybridization has been found in the San Francisco Estuary with *Spartina*. Investigators then looked at tree species by elevation and extended the project to the bioregion, with supplemental funding from the WRP. Preliminary results showed distinct patterns with respect to tidal elevation.

Through this research, investigators are examining other invaders, especially the Australian isopod *S. quoyanam*. Although the extent of this marine pillbug in the bioregion is unknown, its impacts are clear. *Sphaeroma* burrows undercut banks and cause them to slump to the tidal flat. Certainly other factors cause erosion as well, but this invader clearly exacerbates the problem. The marshes aren't growing as they would have done naturally, so it is difficult to assign the proportion of loss due to the pillbug. Some work has been done to estimate numbers and biomass based on burrow densities. Other invaders assessed include the exotic sea lavender (*Limonium ramosissimum*) in the Carpinteria salt marsh and perennial pepperweed (*Lepidium latifolium*). Although these are not yet big problems in the southern California salt marshes, they want to keep an eye on the situation.

Pacific Coast Estuarine Information System

Debbie Reusser, USGS Western Fisheries Research Center, reported on the PCEIS database (pronounced "Pisces"), which was initiated three years ago with WRP funding. In 2003, the content was expanded with additional funding secured through the proposal process. The USEPA provided funding for more development and enhancement. At this point, version 1 of PCEIS is in USEPA internal review. External distribution is scheduled to follow peer review. PCEIS now includes over 8,000 invertebrate, fish, and plant species associated with West Coast estuaries. The system links information to publications and estuaries. However, not all the taxonomic work is complete.

Debbie demonstrated the functionality of PCEIS, showing the wealth of information that can be obtained. Users can print publication and species lists, view maps, export data, and search by a number of parameters. In 2007, they plan to expand the geographic scope to include aquatic species in Alaska, Canada, and northern Mexico, wetland restoration information beginning with Washington and Oregon, and National Wetlands Inventory habitat information for estuarine areas; synthesize habitat characteristics and biogeographic distributions; and incorporate information from the new *Light and Smith Manual: Intertidal Invertebrates from Central California to Oregon*, to be published soon.

Debbie also displayed a spreadsheet developed during the quality control process. This document illustrated that infested estuaries generally had many species of invaders. She is working on a proposal with Oregon State University for web distribution, an activity planned for 2008.

Assessment of Potential for Zebra Mussel Invasion in the Western United States

Bob McMahon, PhD, University of Texas at Arlington, spoke about a thermal regime study funded last year by the WRP but not yet complete. Zebra mussels (*Dreissena polymorpha*) have been invading water bodies in Oklahoma that were thought to be too warm for the species to establish. However, some Russian literature suggested that mussels in the effluence of power plants adapted to a higher thermal regime. For the thermal study, Bob used WRP and university funding to have PhD students retest the upper thermal limits of zebra mussels to determine whether a thermally tolerant strain could develop and spread to southern waters. They also hope to better understand how mussels are appearing in relatively isolated water bodies. Sampling at some of these water bodies is complete. Genetic samples are also being collected so that genetic fingerprints of isolated populations can be compared with those of potential source populations. If results don't elucidate where currently established populations came from, at least the genetic fingerprints exist for comparison with future invasions. The Amplified Fragment Length Polymorphisms (AFLP) analysis of genetic samples will begin this September and be completed in December.

Bob summarized research objectives, methods, and water bodies included in the study. Chronic thermal tolerance work has already been conducted in the lab, while acute temperature testing will start this fall. Testing will be repeated for samples taken during cooler winter months. Although survival statistics aren't yet complete, preliminary results do not indicate that zebra mussels are adapting to higher temperatures. The summer water temperature profile was also analyzed for Lake Oolagah to determine the degree of thermal selection experienced by its zebra mussel population. Results showed that surface water temperatures rarely exceeded the incipient upper thermal limit of 30 °C and then only for short periods. Deeper lake waters rarely exceeded that limit at all.

Bob added that temperature profiling of water bodies may be useful for identifying susceptibility of southwestern water bodies to zebra mussel invasion. This information would be useful to managers. Follow-up discussion focused on whether temperature data already existed for water bodies in this region or could be collected via other approaches.

Rapid Response Plan for Zebra Mussels in the Columbia River Basin

Stephen Phillips, Pacific States Marine Fisheries Commission (PSMFC), explained that this project began with funding from NOAA to the WRP. Funds were used to contract with Mike Fraidenburg, Dynamic Solutions Group, who produced a draft plan last November based on a workshop and other input. Paul Heimowitz, USFWS Region 1 ANS Coordinator, noted that this initial effort had a strategic planning focus. Since then, Paul and Stephen (with support from the 100th Meridian Initiative Columbia River team) have collaborated to make the plan more operational so that managers know what to do if zebra mussels show up in the region (i.e., a "road map"). In further developing the plan, they have considered a number of other response plans and borrowed information when appropriate. The current working draft was recently posted to the Internet. One area of the plan that needs substantial work is the definitions of roles and responsibilities. They also hope to incorporate several detailed scenarios. A "tabletop" exercise in the future will help point out additional gaps. Paul commented that the Bonneville Hydroelectric Project has a specific response plan that is included as an appendix to the basinwide plan; people on the field trip will hear more about this. Paul noted that this plan is a living document and encouraged people to review it and provide input.

Stephen added that permits and regulatory reviews are a huge issue in rapid response. The plan talks to the issue, and a contractor is studying the advance work that can be done to facilitate rapid response. After the presentation, Kevin and Tina gave Stephen a plaque for PSMFC to acknowledge the vital role it has played in administering WRP research contracts and a Leatherman for his part.

MEMBER REPORTS

Co-chair Eileen Ryce, Montana Department of Fish, Wildlife, and Parks, introduced members who highlighted specific projects. Full reports were provided in a packet distributed to participants.

States

Oregon—Mark Sytsma talked about work on hull fouling and calculations of percent colonization cover on West Coast ships to better understand their importance as a vector. Post-doctoral student Ian Davidson has completed an initial hull-fouling survey of selected “mothballed” fleet vessels for the U.S. Maritime Administration. MARAD allows the crew to assess hull fouling before a “soft scrub,” but there is generally insufficient time to do a thorough assessment. Details of the assessment and taxonomic information will be released after MARAD reviews the findings. Ian is also completing his assessment of hull fouling as a vector of AIS. He recently finished several weeks of video work assessing fouling on commercial vessel hulls in San Francisco Bay for the California Department of Lands.

Arizona—Larry Riley, Arizona Game and Fish Department (AZGFD), said that, in April 2005, Arizona Governor Janet Napolitano issued an Executive Order to establish the Invasive Species Advisory Council. This 27-member citizen panel was charged with identifying current statutory authorities, rules, and programs and developing a coordinated, multiple-stakeholder approach to invasive species management in the state. The council completed its charge and submitted findings and recommendations in June 2006. A recent fire in the Sonoran Desert emphasized the need for a longer-term effort. The state is working on a follow-up Executive Order, although details are unknown at this point (possibly a center for invasive species and some degree of legislation). In the meantime, a report with Southwest strategies was developed to coordinate efforts by Arizona and New Mexico. This report has been well received.

California—Susan Ellis reported that the state declared *Caulerpa taxifolia* as eradicated from California!

Hawaii—According to Tony Montgomery, Hawaii Department of Land and Natural Resources, in 2003, Hawaii created the Hawaii Invasive Species Council to address both terrestrial and aquatic invasives. The aquatic component has good funding, with eight staff and other biologists involved. Draft ballast water regulations are nearly finalized, after which they will be reviewed by the Attorney General’s office. Montgomery also mentioned two eradication projects, for mushroom anemone (*Actinodiscus nummiformis*) and five targeted species of alien algae. For the latter, they have used the “Supersucker,” a vacuum mounted on a barge that has proven highly efficient. These efforts are followed by control measures. They hope to build another smaller barge that can operate in shallow water near shore.

Kansas—Jason Goeckler, Kansas Department of Wildlife and Parks, commented that, in the afternoon joint session, he would present on zebra mussels in El Dorado Reservoir. Although this invasive was reported in Cheney Reservoir, which supplies water for Wichita, Jason was unable to find any there: so far, it has been classified as uninfested. However, silver carp have now been reported in the state, and results of surveys indicate that spawning is occurring.

Montana—Eileen reported on an evaluation being conducted on the effectiveness of two traveler information system (TIS) stations in Montana. Surveys were finished during Labor Day weekend, so results are preliminary. Although one site is on an interstate and one is on a rural highway, results were similar, with about 50% to 60% of respondents saying that they saw the signs. However, very few people tuned in to the radio station given; those who did were locals who eventually became curious about the signs. She will have more information at the 100th Meridian Initiative meeting next month.

North Dakota—Lynn Schlueter, North Dakota Game and Fish Department, said that over 80 lakes were surveyed over the summer to monitor for ANS. Finds include curlyleaf pondweed (*Potamogeton crispus*) and Eurasian watermilfoil (*Myriophyllum spicatum*) in the Sheyenne River, and survey results were fed into a database for continued monitoring. The AIS Committee is moving ahead on regulation, although Lynn is especially concerned about the marketing needed to change people’s behavior.

South Dakota—Andy Burgess, South Dakota Department of Game, Fish and Parks, has replaced Jeff Shears as the state’s representative to the WRP. Jeff moved to another position with the state. The agency partnered with South Dakota State University on a pallid sturgeon (*Scaphirhynchus albus*) study.

Although project motivation was primarily to determine prey availability to juvenile hatchery-reared pallid sturgeon, a concurrent benefit includes an active monitoring program for macroinvertebrate ANS, especially zebra mussels. Data loggers for that study have been installed on substrates suitable for zebra mussels. To date, no zebra mussels have been found, but he appreciated the efficient use of resources.

Texas—Dr. Earl Chilton, Texas Parks and Wildlife Department, reported that the Texas Invasive Species Task Force has been organized. Eight state agencies are involved, and details are still being worked out. They are continuing to work on the state comprehensive management plan and collaborating with Mexican officials on aquatic invasive plant control in the Rio Grande River (from the coast to about 400–500 miles upstream).

Washington—Pam Meacham, Washington Department of Fish and Wildlife, mentioned several activities occurring in the state, including an expanded boater-monitoring program, educational responsibilities shifted to a dedicated full-time enforcement officer in the ANS program, and an early detection/rapid response template for a plan. The state is also moving forward on implementing and enforcing the State Ballast Water Act. Under this act, vessel operators have to report how they will deal with the law change in 2007, given that there will no longer be a safety exclusion.

Alaska—Bob Piorkowski, Alaska Department of Fish and Game, talked about a ballast water treatment technology workshop held recently, for which a paper will soon be published. Given around 6,000 ships landing in Alaska a year, discharge is a high priority. Other emphases include border control training, European green crab (*Carcinus maenas*) training, tunicate projects, and education and outreach materials. A USEPA grant was used to start an invasive species workgroup with 40 members from federal, state, and private entities.

Idaho—According to Fred Partridge, Idaho Department of Fish and Game, a member of the state legislature became interested in Eurasian watermilfoil, which has facilitated invasive species issues. The state was able to direct \$4 million of surplus money through the Department of Agriculture to address the watermilfoil problem, mostly in northern and southwestern Idaho.

Provinces

British Columbia—Gary Caine, British Columbia Ministry of Agriculture and Lands, said that the federal government is in charge of tidal water while provincial governments are in charge of fresh water. ANS in British Columbia include pumpkinseed (*Lepomis gibbosus*) in many lakes, northern pike (*Esox lucius*) is one lake in Region 4 (Kootenay), red-eared slider turtle (*Trachemys scripta elegans*), North American bullfrog (*Rana catesbeiana*), green frog (*Rana clamitans*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), brown bullhead (*Ameiurus nebulosus*), yellow perch (*Perca flavescens*), common carp (*Cyprinus carpio*, introduced around 1935), and goldfish. One snakehead (*Channa argus*) was found in Okanagan Lake last summer. The British Columbia Ministry of Environment will convene a workshop next week to develop a policy framework targeted at addressing illegal introductions of freshwater sportfish to the province. If it's successful, the approach will be expanded to other introduction means.

Federal Agencies

Environmental Protection Agency—Joan Cabreza, USEPA Region 10 IS Coordinator, commented that, because authority for invasives is nebulous, she has focused on information transfer and coordination. The USEPA has numerous grants available. Some grant projects underway include studies on regional pathways, a genetic analysis of certain invaders along the West Coast to determine their origins and pathways, development of the Oregon rapid response plan, development of the Washington biodiversity action plan, and various educational materials.

Fish and Wildlife Service—Paul Heimowitz spoke on behalf of Mike Stempel, Assistant Regional Director for USFWS Region 6. His update covered five USFWS regions all contained within the geographical area of the WRP. Common themes in these five regions include prevention through such means as the 100th Meridian Initiative, trailer stickers, interactive guides for boat quarantines, a database of state laws and regulations regarding enforcement, and Hazard Analysis and Critical Control Point (HACCP) training and planning. Among the species being addressed are the freshwater Amur goby

(*Rhinogobius brunneus*) recently discovered in the lower Columbia River, purple loosestrife (*Lythrum salicaria*) in Alaska, water snakes (*Nerodia* spp.) in California, and New Zealand mudsnail (*Potamopyrgus antipodarum*). He congratulated Tina for completing the draft mudsnail control and management plan and presenting it to the ANSTF.

Geological Survey—David Woodson, USGS Western Fisheries Research Center, reported that the Center has set up a new invasive species section and hired Scott Smith to lead it. The Columbia River Research Laboratory (CRRL) is continuing research on American shad (*Alosa sapidissima*), which have become so abundant during their upstream migration to spawn that they are now about three times as common as adult salmon (*Oncorhynchus tshawytscha*). The CRRL is also conducting a study on European watermilfoil.

National Oceanic and Atmospheric Administration—According to Blake Feist, National Marine Fisheries Service, Northwest Fisheries Science Center, one new project involves modeling research on the potential for European green crab expansion up the West Coast, funded through the National Sea Grant Program and Northwest Fisheries Science Center. Investigators will collaborate with a physical oceanographer and others. Currently, no green crab populations appear to be establishing, but there is concern about potential establishment. Research tasks include a literature review of impacts worldwide, a larvae dispersal model, habitat suitability indices, potential conditions resulting from global climate change, a risk assessment, and an economic impact assessment.

Other Coastal Interests

At-Large Coastal Interests—John Chapman has completed a paper for publication on impacts of an introduced parasitic isopod on native mud shrimp in an Oregon estuary. This is the first obligate marine invader and perhaps the most ecologically significant marine ballast water invasion of the eastern Pacific. Another paper has been accepted for publication in *Biological Invasions* on the introduction of the marine snail *Littorina littorea* in the western Atlantic. John has also completed a chapter of the *Light and Smith Manual: Intertidal Invertebrates from Central California to Oregon*, 4th edition. His chapter covers all 330 native and introduced shallow-water marine and estuarine gammaridean amphipods of the northeastern Pacific between the Columbia River and Point Conception, CA. The manual should be published in 2007 and useful for rapid response.

CALFED—Jeff Herod, Non-native Invasive Species Program Coordinator, invited participants to visit the CALFED website for information about NIS Program projects. The CALFED Watershed Program recently funded a proposal to host three regional symposia focusing on area watershed groups and their invasive species successes and needs. These symposia will run a day and a half each, leaving a half day for HACCP training.

Inland Academia/Research Interests—Bob McMahon talked about a state-supported study of the physiological limits of the freshwater apple snail, *Pomacea canaliculata*, introduced to southeastern Texas. The state is concerned about rice crops and other species. This snail, which he called a “piranha” snail, has a high salinity, pH, and desiccation tolerance. At the university, they are also looking at novel antifouling compounds for zebra mussel and working with Region 2 to maintain a number of websites and databases.

Pacific States Marine Fisheries Commission—Stephen Phillips, ANS Program Manager, reported that the PSMFC hosted a June workshop on alternative ballast water exchange areas, provided administrative support and staffing for numerous ANS interjurisdictional efforts, continued to provide support for several monitoring projects, and collaborated with several other agencies on drafting a rapid response plan for zebra mussels in the Columbia River basin.

San Francisco Estuary Project—Karen McDowell also invited people to read more about SFEP projects on its website. Staff representing SFEP participated in the General Technical Advisory Group, Technical Advisory Group for Ballast Water Discharge Standards, and Vessel Fouling Advisory Group, all coordinated by the California State Lands Commission. In addition, the state AIS management plan is out for agency and public comment, with comments due by September 22.

PANEL: ANS IN THE CLASSROOM

Paul Heimowitz initiated discussion on science curricula as a pathway for ANS introductions. Efforts have included a now out-of-print booklet by the Washington Sea Grant and the Habitattitude campaign focused on the pet trade and industry. Habitattitude messages are applicable to this issue, but audiences differ, instead including teachers, curricula developers, and biological supply houses. He introduced panelists Samuel Chan, Larry Riley, Mark Hitchcox, and Bob Flanders. The goal of the panel was to raise awareness of this pathway, consider examples of local efforts that might work at a broader scale, determine whether the issue needs national action, and if so, make a recommendation to the ANSTF.

Schools and Science Curricula as Potential Pathways for Aquatic Invasive Species

Sam Chan, Oregon Sea Grant College Program and Extension Service at Oregon State University, passed around a binder with a FOSS (Full Option Science System) curriculum used throughout North American. FOSS is a research-based science program for grades K–8 developed at the Lawrence Hall of Science at UC-Berkeley. Live species commonly used in classrooms (e.g., rusty crayfish [*Orconectes rusticus*] and Brazilian elodea [*Elodea densa*]) highlight a potential AIS problem involving both technical and social issues. This issue of schools, curriculum, and biological supply houses extends well beyond state borders and is international in scope. It first came to his attention in the spring of 1995 when a colleague attended a parent-teacher conference and was invited to help release lab species into a local creek. She was uncertain how to proceed, but she did address the issue with the teacher. In examining the curriculum, they discovered that it includes little or no information about the specific species used or their disposal. (The curriculum says that releasing the specimens is all right if they are native to the system, but since teachers don't know which species of crayfish they are using, it is difficult to impossible to determine whether they are native.) Instead, teachers infer that, if the supply houses provide them, the species must be acceptable.

They began researching the curriculum and involved parties and developing a brochure to address the short-term goal of providing schools with information and resources about AIS. Medium-term goals include providing AIS information built on science and social knowledge and informing students and teachers about more ecologically benign options for dealing with organisms. In the longer term, goals could include stopping use of invasive species (but that approach would ignore an important teaching opportunity) or incorporating concepts of biological invasions and invasive species awareness and prevention into existing lesson plans and using native species or instream learning.

Sam also shared some project outcomes specific to the biological supply houses, including developing AIS prevention literature jointly, encouraging suppliers to use local or less invasive organisms, and providing training on stewardship. He shared possible updated animal-care instructions for crayfish that could be included in the curriculum, as well as solutions that a 4th-grade classroom brainstormed.

Control and Management of AIS in the Curriculum

Larry Riley, AZGFD, reported that the Partnership in Amphibian and Reptile Conservation (PARC) identified several major challenges to herpetofaunal conservation, including invasive species, and anticipated the issue of AIS in established curricula. With the AZGFD, PARC created a "Don't Turn It Loose!" brochure to inform educators, students, and others about impacts that released pets may have on native species of amphibians and reptiles and their ecosystems, especially regarding pathogens and competition for resources. Members of the PARC Southeast Regional Working Group plan to adapt the brochure to their region. PARC has also begun discussions with partners in the Pet Industry Joint Advisory Council (PIJAC) about incorporating these ideas into Habitattitude.

Another outreach project concerned crayfish species, none of which are native to Arizona but which have become problematic in the state. Rather than vilifying crayfish, the AZGFD chose to stimulate people to harvest them. This approach has worked well, and instructions for catching and cooking crayfish are included in another brochure ("Crayfish: Ugh and Yum!").

The state was also concerned about the science curriculum. Eric Proctor, AZGFD, developed a lesson plan for 4th graders. To ensure its adoption, he aligned it with state education standards. It is critical to help educators understand how these topics can help them meet state-identified standards for curriculum

and educational outcomes. Larry mentioned the Trout in the Classroom curriculum provided by Trout Unlimited. After taking care of the fry, students release the trout into state-approved waters, an action that could result in pathogen introduction. TU directs interested educators to coordinate with their state wildlife authority about acquisition of eggs or release of fish.

Larry listed actions that the ANSTF has taken regarding curriculum: addressing the issue of science fair use of potentially invasive species, the Gulf of Mexico Regional Panel including a charge to the Education and Outreach Work Group in its 2003–2004 work plan, and corresponding with Intel with related recommendations. California's draft AIS plan also includes several measures for addressing the issue. Habitattitude and PARC efforts have provided invaluable strategies for social marketing that should be followed. Consideration needs to be given to the specific audiences, ways to reach them, desired outcomes, and the scale of action.

Regulatory Oversight and Activities Pertaining to Aquatic Pest Species

Bob Flanders and Mark Hitchcox, Plant Protection and Quarantine (PPQ), Animal and Plant Health Inspection Service, spoke about changes in APHIS regulations and actions regarding ANS. According to Bob, in the Plant Protection Act of 2000, Congress gave APHIS authority to protect plants from anything that negatively impacted them. Although this charge was broad, they were primarily interested in invertebrate pests. Historically, terrestrial pests were given greater consideration than aquatic plants, algae, and plant debris. With increasing damage to rice crops by the channeled apple snail (*Pomacea canaliculata*), PPQ's perspective changed, as reflected in the April 2006 Federal Register notice on permit requirements for movement of aquatic snails. Impacts of the changed regulations were greater than they had foreseen. The production industry is very profitable, and major distribution networks have been moving snails for up to 60 years. Many sales are made over the Internet, and although moving freshwater snails interstate is a violation, possession is not. (Marine snails are not plant pests under APHIS's authority, so only importation to the country is a violation.) Bob summarized modifications to the policy and listed interactions that APHIS has with the regulated community, including attendance and a booth at National Science Teachers Association conferences.

Mark then talked about activities on the ground in Oregon. Although the Department of Homeland Security's Customs and Border Protection inspects imports at Portland and Coos Bay, PPQ works closely on identification and protection. There is also interest in interstate movement. His duties are not generally aquatics oriented, but he invited input on integrating aquatic issues into the Cooperative Agricultural Pest Surveys (CAPS), funded at \$1.5 million in Oregon in 2006. "Hotzone" surveys cover niches that the state is not specifically looking for, such as exotic terrestrial mollusks that attach to containers and cargo and can infest seed and grain shipments. Such species are found quite frequently, and his office is sometimes notified of aquatic hitchhikers as well. Mark also mentioned industrial pathways (nursery and aquarium trades), as well as cultural pathways (consumption and education). Outreach includes participation at science teacher conferences and the Summer Agriculture Institute. Notices were sent to science teachers in Oregon, and his office is working with the Oregon Museum of Science and Industry on a traveling exhibit. Future efforts include more market visits, CAP surveys on high-risk aquatic plant pests, and continued outreach to schools, Summer Agriculture Institute, and the media.

Discussion

During subsequent discussion, the following suggestions were made, although no specific action items were assigned:

- Using scientific names in import, transport, and permit documentation to facilitate identification.
- Collecting information at points of entry to measure the permitting "track record."
- Trying to add aquatic plants into the APHIS definition of plants.
- Working with watershed councils on the science curricula issue.

ECONOMIC ANALYSIS OF ZEBRA MUSSELS IN THE WEST

Tina introduced two speakers, Stephen Phillips and David Lodge, discussing potential economic impacts of zebra mussels coming into the West.

POTENTIAL ECONOMIC IMPACTS OF ZEBRA MUSSELS ON HYDROPOWER FACILITIES IN THE COLUMBIA RIVER BASIN

Stephen Phillips updated participants on the PSMFC ANS Program. In 2004, the Bonneville Power Administration (BPA) funded a scoping study to determine potential economic impacts of zebra mussels on its hydropower facilities in the Columbia River basin. PSU (Mark Sytsma) and the U.S. Army Corps of Engineers (ACOE, Tim Darland) were also authors on the study. For the scoping study, PSMFC investigators assessed facilities at Bonneville Dam. Because salmon are important to the Pacific Northwest culture, there was concern about the immense impact that zebra mussels could have on the salmon industry if they established in the Columbia River system. Zebra mussels would affect upstream and downstream fish passage facilities, several components of which were shown in his presentation.

For the study, they looked at 13 of 31 federal dams of varying sizes and generation capabilities. They broke costs down per generator using two mitigation technologies and then expanded those costs to the 13 facilities, based on the number of generators at each. The two technologies were sodium hypochlorite injection (to keep veligers from settling) and antifouling paint, neither of which is necessarily a recommendation. Phillips detailed sources for estimating the costs and the math used. Ultimately, the estimated cost to install the sodium hypochlorite injection system was \$62,599 per generator, while annual operational costs were estimated at approximately \$100,000 per project. The estimated cost of antifouling paint was \$81,000 per generator (not including labor and installation). These estimates do not cover generation downtime. Using these estimates, the total capital costs of implementing these mitigation technologies at the 13 hydropower facilities would be \$23,621,000. He suggested that people read the report at www.aquaticnuisance.org.

He commented that, although Columbia River water quality parameters are favorable to zebra mussel colonization, the Columbia River has lower plankton densities than the Mississippi River or Great Lakes have. These lower levels *may* limit zebra mussel population densities to much lower levels. Phillips also listed several afterthoughts, including the need for more information on antifouling paints, the lack of interest to date in investing in mitigation technology, alternative mitigation technologies, environmental assessments that might be needed for any mitigation, and engineering consultation with Ontario Hydro and other hydropower facilities. Ongoing rapid response planning in the Columbia River basin should help address some of these concerns.

ECONOMIC ANALYSIS OF ZEBRA MUSSELS IN THE WEST

David Lodge, University of Notre Dame, also gave a presentation on preliminary results of an economic analysis of zebra mussels in the West. He distributed copies of his final report, *Aquatic Nuisance Species—Evaluating the Ecological and Economic Value of the 100th Meridian Initiative*. The analysis was initiated with funding from the 100th Meridian Initiative and supplemented by NOAA Sea Grant. The research team included both economists, who conducted most of the analysis, and ecologists, who provided technical information. It focused on the Great Lakes as the beachhead for secondary invasions since the Great Lakes are connected to virtually every port in the world.

One question to answer was whether suitable habitat existed in the United States where zebra mussels did not already occur. He showed a map of suitable habitat identified using the genetic algorithm for rule-set production (GARP) approach. Investigators then looked at U.S. areas where zebra mussels had already invaded and their maximum observed densities in those areas. Results were analyzed, using a model by Ramcharan based on European data, to predict densities in places where the species does not occur (e.g., Roosevelt Lake and Lake Mead).

The next question was about the likelihood of the species getting to these places alive. They used a gravity model to simulate movement of recreational boaters in the United States. Although calculating probabilities from results was difficult, they came up with rough estimates. So now data are available about locations of suitable habitat, the likelihood of nuisance densities, and probability of movement.

The last question was about financial costs. They didn't attempt to assess nonmarket costs (e.g., extirpation of native clams). Rather, economists analyzed the market costs, such as clogged water intake pipes, using computable general equilibrium (CGE) modeling. Numbers that Stephen provided (see

section above) were provided, as well as other data from the hydropower, agriculture, and water supply industries.

David showed a graph depicting scenarios of annual costs of zebra mussels in the Columbia River basin relative to 2001 baseline data. According to the simulation, the expected value of annual loss under an invasion would be \$1.5 million. Several factors confound this result:

- The probability of invasion could be lower because the percentage of boats is probably greater than the probability of invasion. On the other hand, it could be higher because other pathways may exist.
- The welfare loss estimate is an underestimate because it is based on market values only, impacts of zebra mussel only (while the Meridian Initiative efforts are effective against other species as well), and the Columbia River basin only.

JOINT SESSION WITH PNALMS

Mark welcomed people to a joint session with the Pacific Northwest Region of the North American Lake Management Society (PNALMS).

Zebra Mussel in El Dorado Reservoir, Kansas—Monitoring, Containment and Control Strategies, and Lessons Learned

Jason Goeckler talked about zebra mussels in El Dorado Reservoir, KS. The reservoir was constructed in 1981, covers an area of 8,000 surface acres, and has a mean depth of 19 feet. Zebra mussels infested the reservoir in 2001. Counts in 2003 indicated 135 mussels/m² while 24,178/m² were found in 2004. Routine studies of plankton samples under cross-polarized light detected veliger densities of 236/L in July 2006. Numbers have been rising since sampling began in 2004.

Using drawdowns as a control measure appears to be of little value since zebra mussels are present at all depths and quickly recolonize dried areas. In addition, costs outweigh the benefits. So current management practices focus on protecting other water bodies and conducting genetic analysis to determine where populations come from, risk assessments to determine potential invasion sites, population monitoring to determine whether the mussels are impending flow, and containment research to evaluate the potential for spread.

Fisheries management includes stocking the reservoir with native fish that feed on the mussels and educating the public through the media. Additional public education includes distributing brochures and windshield flyers, partnering with citizen groups who are concerned about children cutting their feet on the mussels, partnering with the Stop Aquatic Hitchhikers! campaign, adding information to fishing regulations, and developing a website.

What Factors Mediate the Impacts of Introduced Species? Investigating the Success of Kokanee since Establishment of Lake Trout and *Mysis relicta* in a Large, Oligotrophic Lake

Erik Schoen, University of Washington, Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fishery Science, reported on graduate research he has conducted so far with David Beauchamp, Nathanael Overman, and Christopher Sergeant. Species introductions can have devastating impacts on aquatic communities. The opossum shrimp (*Mysis relicta*) and the top predator lake trout (*Salvelinus namaycush*) have been blamed for reducing planktivorous fish populations in many lakes across western North America, but in a few systems, they appear to have little adverse effect.

Lake Chelan is located in Washington east of the Cascade crest. It is 50 miles long and the ninth deepest lake in the world. The lake is composed of two basins—the shallower, bowl-shaped Wapato basin and the extremely deep Lucerne basin. This difference makes Lake Chelan an ideal site to test whether differences in lake morphometry mediate the impacts of introduced species. In Lake Chelan, kokanee (*Oncorhynchus nerka*) have thrived, even in the presence of *Mysis relicta* and lake trout, leading researchers to ask why these species can coexist in this particular lake. Specific questions that his team strove to answer included how many mysids and kokanee were in the lake, how much zooplankton each

individual ate, how much zooplankton was produced in the lake and available to planktivores, and whether the availability of mysids caused lake trout to grow into a more effective predator on kokanee.

Mysid abundance was estimated with vertical hauls at night, and zooplankton abundance was estimated with vertical hauls during the day. Mysid vertical distribution was determined from hydroacoustic surveys. A bioenergetics model was used to estimate how much of the zooplankton biomass was consumed by mysids during each season of the year. Kokanee abundance was estimated with hydroacoustic analysis using echo-counting and age-structured population modeling based on spawner survey data. Lake trout were caught in gill nets, and their stomach contents analyzed.

Preliminary conclusions indicate that mysid predation is not a significant source of mortality for zooplankton (except possibly during winter and spring in Lucerne basin); mysids and kokanee may be too dispersed to serve as an effective food source for lake trout in the Lucerne basin, where kokanee spend most of the year; and lake basin morphometry may mediate the impact of these introduced species.

Controlling the Spread of New Zealand mudsnail from Field Gear with Dry Ice in Portable Coolers

Scott Wiedemer, Marine Resource Management graduate program, and Sam Chan, Assistant Professor with the Oregon Sea Grant College Program and Extension Service at Oregon State University, have been working with West Coast Watershed Councils to reduce the spread of New Zealand mudsnails. This species, introduced into the Snake River in 1987, is now found in 10 western states. The mudsnail is very small and easily transported on boats, trailers, or wading gear and during fishery operations. It adapts well to varying water conditions, survives extreme events such as dewatering, and dominates the benthic layer where it has invaded.

Gear treatment protocol is needed to limit mudsnail spread. Physical cleaning is possible but inefficient, and chemical options can damage the gear and carry ecological risks. Prior research indicates that both desiccation and freezing for one hour at -3°C kills New Zealand mudsnails, but these measures are difficult to implement in the field. Wiedemer hypothesized dry ice in a portable cooler as a workable solution.

He conducted experiments using three coolers containing 10 pounds of dry ice and three pieces of gear planted with three patches of 15 adult New Zealand mudsnails, for a total of 135 mudsnails per cooler. Results indicate that the dry ice must be placed at the top of the cooler for nearly 100% mortality. Otherwise, temperature stratification occurs with warmer temperatures near the top and colder temperatures at the bottom. Adding gear to the cooler raises the temperature, suggesting that exposure periods greater than 2 hours may be necessary to achieve lethal freezing temperatures throughout most of the cooler. There was no observable damage to the gear. Despite the apparent success of the measure, challenges include access to dry ice in remote locations and sublimation of any packed dry ice. Packing dry ice together in a smaller cooler will slow sublimation and allow longer storage of dry ice.

Modeling Dispersal of New Zealand Mudsnails in Oregon

“Michael” Chi-Chang Liu presented on the need to predict the spread of the New Zealand mudsnail. He displayed a map of Oregon showing the mudsnail spreading down the coast in a “leapfrog” pattern. To help understand mudsnail dispersal, Michael developed a model from the modified law of gravitation (Newton). Application of the gravity model to recreational boats in Oregon coastal counties is a two-step mechanism, including 1) the probability of a boat becoming contaminated when visiting an infested lake and 2) the probability of a contaminated boat introducing the species to an uninfested lake.

Although extensive work, including field surveys and lab studies, has been conducted to predict the suitability of an uninfested lake, the suitability of every lake was assumed as 100%, an assumption that proved to be inaccurate. Data were collected and fed into the model. Results indicate that sites for potential contamination are close to a contaminated water body or large population center. According to the model, the potential for lake invasion in the county was highest where the population (thus the number of boats) was very large and/or very close to the infested water body and/or where the water body had many boat ramps with a higher number of visitors.

The suitability analysis can be based on multiple linear regression or Bayesian inference network. From this model, researchers can learn more about potential infested lakes after a time period, behavior of the invasive event through a time series, and important mechanisms and stages of invasion. Michael encouraged participants to view the model at www.ent.orst.edunzms/default.aspx. Management suggestions and future research include cleaning boats and trailers before leaving contaminated waters, concentrating efforts on high-risk waters as predicted by the model, educating the public, and focusing on vectors.

WRP BUSINESS MEETING

Tina and Kevin led the discussion on several business items:

- *WRP priorities.* Kevin thanked those members who responded to a request several months ago to help identify funding priorities. He plans to continue working on these priorities for the next two years. Tina asked that people participate in the decision-making process whenever their input is needed.
- *WRP membership.* Tina reviewed changes in membership. Scott Smith replaces Lyman Thorsteinson as the USGS representative. Anita Shaul, Nevada Department of Wildlife, has retired but no one new has been appointed in her place yet. Vicki Milano, Colorado Division of Wildlife, is the acting ANS coordinator. Andy Burgess is the new representative from the South Dakota Department of Game, Fish and Parks, while Walter Donaldson is the interim replacement for Don Archer, recently retired from the Utah Division of Wildlife Resources. Pam Meacham is acting representative from the Washington Department of Fish and Wildlife. Tony Montgomery and Sara Pelleteri, Hawaii Department of Land and Natural Resources, were in attendance, but no official representative has been appointed yet. Lisa Ka'aihue replaces Marilyn Leland as representative for the Prince William Sound Regional Citizens Advisory Council.

Votes were taken on adding the USFS as a federal member and replacing Jack Lorrigan, Alaska Natives, with Kay Wallace. Both motions passed unanimously. The first issue requires a change to the "Western Regional Panel Guide to Procedures." Tina will continue working to secure representation from the Western Aquatic Plant Society and The Nature Conservancy.

- *WRP funded projects 2004–2006.* Kevin reviewed a handout listing WRP-funded projects for the last three years and their status. Presentations had already been given on some of these projects.
- *WRP 2006 work plan.* Because the PSMFC is no longer going to be the fiscal agent for the WRP, 2006 funds had to be obligated by the end of June. The Executive Committee considered three proposals in May and decided to fund a pilot study by Ian Davidson, PSU and Smithsonian Environmental Research Center, characterizing the risk of species transfer on recreational boats in marine systems via hull fouling.
- *Annual report to the ANSTF.* Scott Newsham, Executive Secretary for the ANSTF, developed a template for regional panels to report to the ANSTF. The idea was to keep the report simple and include recommendations. The annual report to the ANSTF for 2005–2006 summarized the WRP's strategic planning process, the five priorities identified, accomplishments related to those priorities, and three key recommendations to the ANSTF: 1) clear guidelines of ANSTF committees and how the WRP can become more involved, 2) coordination of an interpanel and international project to provide ANS materials to recreational boaters at border crossings with Canada, and 3) consideration of consistent and equitable funding regarding ballast water technology between the Atlantic, Pacific, Great Lakes, and Gulf Coast. Scott commented that on November 6, the regional panel heads will meet to discuss issues that regions have in common and forward recommendations to the ANSTF during the November 7–9 meeting.
- *Executive Committee elections.* The ballot for four Executive Committee positions listed five candidates for two-year terms: Susan Ellis, John Wullschleger, Lynn Schlueter, Jason Goeckler, and Billie Kerans. Susan declined a seat on the committee, citing other ways in which she can contribute to the WRP. John, Lynn, Jason, and Billie were elected.

Proposal Presentations

The WRP, which has \$30,000 available, solicited proposals for projects that address high-priority issues for ANS. Kevin provided a summary of project applications, commenting that all were reviewed to ensure that they addressed priority issues, and introduced those requesting funds so that they could present their proposals. Following the presentations, members discussed the merits of the various projects and voted on which would receive funds.

Thermal Regimes of Water Bodies Potentially at Risk for Zebra Mussel Invasion in the Southwest

Bob McMahon proposed to extend the study of thermal regimes of water bodies potentially at risk for zebra mussel invasion in the Southwest to include an additional 21 water bodies. Given that zebra mussels don't appear to be developing a thermal tolerance, temperature profiling could help identify which water bodies are susceptible to invasions by zebra mussels or other invasives for which thermal tolerances are known. Temperature profiling is relatively inexpensive and easy to do, and temperature is often one of the most important factors for determining habitat suitability. Bob thought that this study could be considered a feasibility study for a nationwide effort. He then listed ways in which this study aligns with WRP objectives for regional coordination, prevention, early detection and rapid response, education, and cooperation with Canada and Mexico.

Humboldt Bay Cooperative Eelgrass Project

Susan Ellis spoke on behalf of Susan Schlosser, California Sea Grant, regarding a coastwide effort in Humboldt Bay to eradicate eelgrass (*Zostera marina*). Objectives of the project include identifying high-priority ANS in intertidal habitats of Humboldt Bay and the Eel River Estuary (known and potential); for each species, identifying the types of data desirable to determine the level of threat posed by the species and/or data needed to implement control/eradication measures; and designing a multispecies survey protocol with integrated data collection to the extent feasible. With the WRP portion of funds, they will develop the priority list. They also hope to improve collaboration by involving nongovernmental organizations and others.

Control Plan for Invasive Water Snakes in the Western United States

Jeff Herod, USFWS, presented for Eric Stitt, USFWS, on developing a control plan for invasive water snakes in the western United States and setting management priorities and tactics for *Nerodia* spp. populations. There are several concerns about these snakes. For example, few snake species have become established, but those that have are problematic. *Nerodia* spp., which prefer temperate areas, are viviparous and habitat generalists. These water snakes have demonstrated an ability to establish populations and are now documented in several western states, although the status of populations is unknown. And they could have negative impacts to several endangered or threatened species, such as the giant garter snake (*Thamnophis gigas*).

Objectives of the project include providing a framework for western states to manage and control invasive *Nerodia* and similar snakes, producing a control plan that defines management options, and identifying and prioritizing specific management actions needed and communicating the needs for these actions. Herod discussed proposed activities and deliverables associated with the project.

Expansion of the National Habitattitude Campaign to the Outer Main Hawaiian Islands

Sara Pelleteri, Hawaii Department of Land and Natural Resources, sought WRP funding to expand the national Habitattitude campaign to the outer main Hawaiian Islands. Challenges to implementing a statewide program are isolation of the seven outer islands from each other and from Oahu, large distances between or a lack of obvious drop-off sites (on some islands), and until recently, a greater focus on terrestrial invaders. She recounted an invasion of giant salvinia (*Salvinia molesta*) in Lake Wilson in 2001, likely introduced as an aquarium release. Invasions have also included marine fish.

Hawaii's AIS management plan, published in September 2003, includes several key strategies and tasks related to the pet industry. Several actions are underway to address these strategies, including school

presentations and brochure/flyer development. With WRP funding, the department hopes to prevent introductions of new aquatic species through educating the public and targeted user groups, increasing the number of repositories where people can drop off fish, and building bridges to industry groups in Hawaii for possible future partnerships. Sara discussed the total budget of nearly \$24,000 and the specific request of nearly \$14,000, most of which would go for personnel and travel. The issue of an evaluation mechanism was raised during follow-up discussion.

Regional surveys and outreach for nonindigenous burrowing isopod

Catherine de Rivera, PSU, requested funds to conduct regional surveys and outreach for the nonindigenous burrowing isopod *S. quoianum*, the same species that Jeff Crooks talked about previously. Quoting Jeff, she said this isopod is the “most underappreciated cause of wetland loss.” Objectives of the study are to gather ecological information crucial for management (distribution, impacts, and restrictive factors) and create an educational website with management recommendations for this and other ANS.

She summarized field survey methods, including surveying wood, marshes, and docks at 7 to 35 sites in several bays in California, Oregon, Washington, and British Columbia. Investigators will document several environmental variables in areas with and without the isopod, including substrate, erosion, temperature, salinity, and dissolved oxygen, in addition to conducting lab experiments on tolerances. The website will provide information about the isopod and 10 other ANS (taxonomy, identification, ecology, ranges, vectors, damage, and management recommendations), as well as allowing users to upload sightings and create management reports. Catherine shared the projected budget (\$14,658) and its components. She believed that they could achieve a considerable amount with a small amount of money because the student slated to lead the effort, Tim Davidson, is already an expert on the species (although he has not yet agreed to continue his graduate studies at PSU). In addition, Jeff’s work south of Point Conception can help inform this effort north of that location.

ANS Risk Assessment for the Greater Yellowstone Ecosystem

Eileen Ryce spoke on behalf of Mary Maj, Yellowstone Coordinating Committee, requesting \$15,000 for an ANS risk assessment for the Greater Yellowstone Ecosystem (GYE). This is a unique area for many reasons: it crosses three states and includes two national parks and numerous national forests. It is also a destination hot spot, drawing people from around the world. The various jurisdictions have created a “logistical nightmare,” and part of the proposal is to coordinate their separate activities. Montana has the most developed ANS plan so the Department of Fish, Wildlife and Parks has agreed to help with the major components. Most of the information needed for the risk assessment already exists. Objectives of the assessment include identifying ANS with high potential to invade the GYE in the next five years, conducting pathway analysis and determining risk potential, and developing management recommendations for the GYE region. The goal is not to develop a regional ANS management plan. Tina mentioned that Joe Starinchak, USFWS, and Bob Wiltshire, Federation of Fly Fishers, have developed a program to target industry for help with outreach to their publics. A workshop will be conducted at the end of the month in Jackson Hole, WY.

Voting on Proposals

Following presentations, WRP members discussed merits of the various proposals and the process for voting on them. Two projects were chosen for full funding: expansion of Habitattitude to the outer main Hawaiian Islands and the isopod surveys and outreach. Members further requested that an evaluation component be added to the Hawaii project and that the proposed lead investigator for the isopod project be confirmed. The remaining \$1,500 will be split between the two projects. In addition, Tina agreed to talk with Bob McMahon about submitting his proposal for funding through the 100th Meridian Initiative.

MRBP Risk Assessment Workshop

The Mississippi River Basin Panel (MRBP) is sponsoring a risk assessment workshop similar to one held in Tampa, FL, last year. This workshop, to be held in January in Kansas City, MO, will provide additional information and exercises. Tina will forward information to members.

Rapid Response Theme of ANSTF Meeting

The first day of the November ANSTF meeting will be dedicated to rapid response. The MRBP asked its members about any rapid response experiences they had had and whether those experiences had worked. Kevin and Tina liked the idea of presenting something to the ANSTF that would address the WRP perspective. Several people volunteered to participate in conference calls (led by Tina) to that end: John Chapman, Tony Montgomery, Susan Ellis, Stephen Phillips, Paul Heimowitz, John Wullschleger, Eileen Ryce, and Larry Riley. Tina will then forward results to Scott Newsham to incorporate into the ANSTF agenda.

2007 Annual WRP Meeting

The next annual meeting of the WRP was set for Hawaii in mid-September. An ad hoc planning committee will be created to plan that meeting.

ANS TASK FORCE

Scott Newsham has been traveling to regional panel meetings and updating their membership on the ANSTF and his role. He provided information about his background, including 23 years with the U.S. Coast Guard (5 as ANS/ballast water program manager) and his more recent experience driving a school bus in his children's district and now serving on the Alexandria School Board. He was hired in September 2005 as the first full-time ANSTF Executive Secretary, with the expectation that he could help the ANSTF realize its potential. Housed within the USFWS, the Executive Secretary supports the ANSTF, regional panels, and committees and keeps things moving administratively between meetings. He particularly hopes to facilitate what the regional panels and states are trying to accomplish by increasing open communications at all levels.

Scott also summarized tasks on which he and the ANSTF are currently focused. The strategic plan is being revised to include measurable goals. In addition, he is developing a process for an annual report to Congress to provide a picture of what's happening nationally to address ANS and challenges to those efforts. Scott encouraged the WRP to use the annual report as a vehicle for raising awareness and making recommendations to the ANSTF rather than viewing it as "another annual report to file."

The format of the semiannual ANSTF meetings has changed to include regional panel heads at the table with other ANSTF members and to accommodate one day of discussion focused on a theme and fewer agenda items with more time for discussion and networking. Panel heads are also meeting the day before the ANSTF's November meeting to discuss issues that should be brought before the full Task Force.

Scott mentioned the static funding for implementation of approved state management plans, despite more plans being developed and approved. Funding was \$1.075 million for the past two years and is unlikely to change. The ANSTF agreed at its May 2006 meeting to distribute funds equally among plans. He added that two draft control and management plans (Asian carp and New Zealand mudsnail) are available for public comment. The ANSTF approved these two plans at the May 2006 meeting, and they should be finalized in early 2007.

He reiterated that the ANSTF provides the mechanism and venue to make needs known. If the ANSTF is to be effective, regional panels, committees, and others need to speak up about those needs. The ANSTF may not be able to solve all problems, but effective communication will give those at the federal level increased awareness of what state and regional priorities are. Recommendations are key and can be sent to the ANSTF at any time.

ERADICATION EFFORTS

Kevin introduced a panel on regional eradication efforts, two in freshwater and two in marine environments.

Geographical Eradication of an Alien Octocoral in Hawaii

Tony Montgomery talked about an ongoing project to eradicate an alien octocoral, snowflake coral (*Carijoa riisea*) on Kauai. Its characteristics have enabled it to become widespread throughout the main

Hawaiian Islands, with the possible exception of Kauai. Sightings there have been limited; Kauai has a large, healthy black coral population; and Port Allen provides a perfect study site. Port Allen has a heavy infestation with three lighter infestations nearby. Investigators have been trying a smothering technique to eradicate snowflake coral. The approach includes wrapping pilings with plastic and securing with tape, completing all pilings before moving to the next phase, and finally removing the plastic. The smothering treatment works by cutting off oxygen and water flow. It has proven to be very effective at killing everything on the pilings. Bacterial growth returns after about a month. The project also includes outreach to local divers and dive charters for *Carijoa* sightings, as well as surveys and eradication of isolated populations in other locations (using smothering techniques and a hot water gun developed for treatment of *Undaria*). Tony showed photographs of infested and wrapped pilings, the plastic and tape used, pilings at different points in treatment, sloppy or ripped treatments, bycatches of coral and fish, fouling, and diver safety. Wrapping the pilings involves various depths, and some divers have injured their ears due to the pressure changes.

Zebra Mussel Eradication in a Virginia Quarry

Brian Watson, Virginia Department of Game and Inland Fisheries, offered what he called a “small ray of hope” regarding eradication. He was involved in the first successful eradication of zebra mussels in a water body. Milbrook Quarry in northern Virginia was closed in the early 1960s and has been used for dive-shop operations. Zebra mussels, probably introduced intentionally, were first found there in 2002. Because the quarry is adjacent to a river called Broad Run, transport of veligers through flooding or other means was a concern. In addition, two downstream reservoirs supply water for over 2 million people.

An ad hoc workgroup was convened, which included state and federal agencies and local organizations. Some regulatory obstacles prevented surveying in the quarry, but a 2003 act enabled the state agencies to sign waivers so that assessments could begin. Bathymetry work was also done. The group reconvened in July 2003, and despite some funding challenges, awarded a contract in 2005 to use potassium carbonate (potash) in the quarry. The USEPA approved its use in January 2006, and the eradication project was finally underway. Brian showed photographs of the equipment and described the treatment process. The target concentration was reached in the third week of treatment. Because potash paralyzes, biologists conducted a small mortality study, with a control and recovery period, to ensure that the method would work.

Post-treatment they took underwater video and observed dead mussels, caddisflies, and Asian clams (*Corbicula fluminea*) at the bottom of the quarry. Levels were too low to kill fish. Potassium concentrations were checked recently, and levels were still at 100 parts per million, although spikes were observed at depths. Likely, potassium is being released by the dead mussels on the bottom. Levels may be elevated for up to 30 years, so no new populations can become established. Brian summarized that it took only 3.5 weeks for eradication but 3 years to get to that point. Funding the eradication project was also challenging and is an issue to address. Divers should also be considered a method of introduction.

Spartina in Willapa Bay

Kyle Murphy, Washington State Department of Agriculture (WSDA), spoke about a *Spartina* hybrid in Puget Sound. Although the nonnative *Spartina alterniflora* (smooth cordgrass) was introduced in the late 1800s, it has only become invasive in the last 20 years. In 2003, this species was at the height of its infestation in Willapa Bay, a huge shellfish-producing area midway along the Washington coast. Large-scale, multipartner eradication began at that time. Partners involved include the WSDA, Washington Department of Fish and Wildlife, Department of Natural Resources, The Nature Conservancy, USFWS, Pacific County, Washington State University, University of Washington, and Shoalwater Bay Tribe. The herbicide glyphosate (Rodeo), used since 1994, has been ineffective on large infestations. Another herbicide (imazapyr) took 10 years to get registered for aquatic use but was approved for use in 2004.

In 2005, they treated 5,000 solid acres, eradicating 3,500 solid acres. Some infestations were left untreated. In 2006, they treated all areas of the bay, including the entire Long Beach Peninsula. Only 3 of over 350 landowners refused to approve use of the herbicide on their shorefronts, but 2 of these allowed mechanical control. Kyle was still receiving information about the efficacy of 2006 treatments, but he was

optimistic. The new herbicide appears to be effective: only scattered patches remain. Also effective were the strong partnerships that the agency built with others.

Kyle showed photographs of reduced *Spartina* infestations following treatment. Time-lapse photography has allowed them to compare treated and untreated areas. In these comparisons, researchers observed distinct shorebird and water fowl use of infested and uninfested areas. Restoration efforts have begun, and Kyle commented on the potential for research on returning birds and invertebrates. They are also looking at developing a program that includes more oyster-grower involvement.

Hydrilla Eradication in Washington

Kathy Hamel, Washington Department of Ecology, talked about eradication efforts for hydrilla and Eurasian watermilfoil in Washington. Although eradication may not always be feasible, she believed it was possible in smaller water bodies with early detection and rapid response, appropriate tools and funding, and political will. She gave examples of eradication or near eradication of watermilfoil. Of 45 lakes for which groups adopted eradication goals, 7 are now free of the invasive, and the others have minimal amounts that don't interfere with beneficial uses. She described the infestation and eradication efforts for Long Lake. After 15 years of intensive management, there is still an extremely small amount of milfoil in the lake. In 2005 only four pounds wet weight of milfoil was removed by divers from the lake.

Hydrilla (*Hydrilla verticillata*) is considered one of the worst aquatic weeds because of its multiple reproduction strategies. The only infestation in the Pacific Northwest was in the interconnected Pipe and Lucerne lakes outside Seattle. King County and the state took action immediately, identifying and assessing the infestation and beginning treatment with fluridone. In 2001, the court ruled that no herbicides could be applied without National Pollutant Discharge Elimination System (NPDES) permits, but diver hand-pulling efforts continued. After a small section of healthy hydrilla was found, aquathol was used, and King County took over management of the project, completing the necessary training to become licensed applicators of fluridone. Divers also conduct periodic surveys throughout the two lakes. One more survey is planned for this year. If no hydrilla is found, then the countdown for eradication will begin.

FEDERAL REGISTER NOTICE REGARDING TWO ASIAN CARPS

Erin Williams, USFWS, informed participants that a notice had been published in the Federal Register requesting information on the largescale silver carp (*Hypophthalmichthys harmandi*) and silver carp (*Hypophthalmichthys molitrix*), especially information addressing nine questions. Information will help the USFWS make a final determination as to whether these species should be listed as injurious wildlife species under the Lacey Act. If so, importation and interstate transport will be prohibited. The comment period will be open until November 6, 2006. Bighead carp (*Hypophthalmichthys nobilis*) will be addressed through a separate evaluation. The USFWS is working on the final determination for black carp (*Mylopharyngodon piceus*).

GRIFFEN'S CURSE: PARASITES IN BALLAST WATER

John Chapman informed people of a parasitic marine invader with huge economic and conservation implications that has "slipped in under the radar." Invasions of such "uncharismatic" species further complicate rapid response since they often arrive and establish unnoticed. Moreover, this is one of the very first known invaders of the open ocean.

John reported on the ecology and natural history of the bopyrid isopod parasite, *Orthione griffenis*, a species first described in 2004 that is now in all remaining eastern Pacific populations of the native estuary mud shrimp, *Upogebia pugettensis*. He organized high school students to survey several Oregon estuaries and additionally searched in Washington and California estuaries to find very high infestations in every mud shrimp population examined. Mud shrimp are dominant organisms in eastern Pacific estuary geomorphology and trophic dynamics. Impacts to the mud shrimp include reduced host energy reserves, castration and feminization, and in poor conditions, population extinctions.

The parasite's life cycle is the same as for other bopyrid isopods, with at least three open-ocean pelagic life stages. Little is known about the open-ocean pelagic stages, including the stage that attaches to a marine copepod. The species was likely introduced to North America as one of these "larval" stages in discharged ballast water arriving from Asia.

John displayed graphs illustrating mud shrimp growth alterations and the extinction of one population with increasing infestations of this new parasite. *Orthione* could improve conditions for some species of fish but not for those desired by humans. In addition, ghost shrimp, a pest for oyster growers, appear to benefit from the invader by increasing their numbers where the mud shrimp decline. John also showed photographs of affected mud flats in Yaquina Bay where the mud shrimp appears to have recently gone extinct. If mud shrimp occurred in San Francisco Bay historically, an unknown invader such as this one may have eradicated it since none occur there now.

John reiterated unknowns about this species, its impacts to the ecosystem, and likely indications of poorly known and underestimated impacts of introduced species in general. Despite the virtual improbability that an organism with such specific needs could become established elsewhere, *Orthione* did, and other uncharismatic organisms may as well. A weakness of present rapid responses is that they generally focus on well-known species.

100TH MERIDIAN WEBSITE

David Britton, USFWS, demonstrated two new features of the 100th Meridian Initiative website that are designed to help law enforcement officials: a database of relevant laws for western states and a quarantine time estimator. These two features are based on assumptions that these officials may be more likely to act if they know their authority and actions to take if they find zebra mussels on a boat or trailer. The database has a graphical interface and provides laws for each state, a summary and PDF of each, and links to more information. The quarantine time estimator considers temperature and humidity by location and month to estimate a recommended quarantine time for a boat/trailer. David demonstrated use of both features.

He also discussed and demonstrated a staffed hotline that will facilitate prompt preventative action in cases of impending potential ANS introduction. An existing hotline (1-877-STOPANS) records messages and is more appropriate for early detection/rapid response, not prevention. This system will augment the existing hotline. David and Bob Pitman, USFWS, are currently the only people to whom messages are routed, but he anticipated a number of trained responders across the nation. He and Bob compared contract services and chose the one that best met their needs without being overly expensive. He invited feedback on this project.

WRAP UP

Tina invited participation on a small workgroup to address the biological supply house issue. Paul Heimowitz agreed to chair it. Those interested included Pam Meacham, Kevin Anderson, Jeff Herod, and Joan Cabreza. Tina will email others asking if they're interested as well. She thanked the Planning Committee, meeting organizers, Native American trainers, and meeting support.