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AQUATIC INVASIVE SPECIES NEWS IN A NUTSHELL

Joan Cabreza, Editor

This newsletter, like its EPA precursor, focuses primarily on regional and aquatic issues, but it also contains terrestrial, national and international invasive events of interest. Contents do not necessarily reflect views of the PSMFC. We welcome any questions, comments, and news items; direct them to the nutshell editor Joan Cabreza <Joan_cabreza@psmfc.org>. To access all past Nutshell issues 1-21, go to [<http://www.aquaticnuisance.org/newsletters.php>].

[Some Quotes To Ponder...](#)

These quotes are related to the Galapagos Islands, but they are relevant in many places!

“We’ve created an ecological bridge across a formidable barrier—a vast salty ocean. If nothing is done, it will become a superhighway”

- UN delegate Mark Patry, about tourism in the Galapagos

“People aren’t going to pay top dollar for a degraded place. We need to be restorative. It’s not enough anymore to ‘leave no trace’ ”

- Sven Lindblad, Galapagos cruise line owner, about ecotourism

“[In 2005] I found a \$2.8 million budget for environment. That wasn’t enough to pay park rangers in the Galapagos. Remember that the Miss Universe pageant in 2004 cost us \$14 million. What an embarrassment.”

– Equador President Rafael Correa, about environmental funding

[This Quarter’s Off-The-Wall News](#)

Cane Toads vs Crocodiles. Everyone is probably familiar with the now-famous photo of the Florida crocodile and the Burmese python, a duel to the death for both species. But crocodiles apparently can be felled by something much smaller, as well. In 1935, Australia imported 102 cane toads (*Bufo marinus*), from Hawaii, to kill off the scarab beetles that were decimating Australian sugarcane crops. Unfortunately, the plan backfired because the toads, natives of

Central and South America, could only jump a couple of feet high, and the beetles lived high in the upper parts of the cane stalks. So instead of eating the beetles, the toads ate anything else they could fit in their mouths. They have no known predators or diseases, and because their skin has glands that secrete a powerful poison when they are stressed, the toads took a heavy toll on any would-be native predators. The Australian Department of the Environment and Heritage states "almost anything that eats the toad dies rapidly from heart failure" ... including, apparently, crocodiles. According to the University of Sydney, crocodile populations that encounter these new pests have dropped in some places by as much as 77 percent. Other species at particular risk are goannas, tiger snakes, red-bellied black snakes, death adders and dingoes. (*Excerpted from articles by Rachel Oliver CNN article, September 21, 2008 and Tina Butler, mongabay.com, April 17, 2005*)

Some Lights at the End of the Tunnel?

Tamarisk Biocontrol Shows Success. Tamarisk, or salt cedar, (*Tamarix spp*), is an invasive shrub dominating riparian corridors of the American Southwest and crowding out native willows and cottonwoods. Considered an ecosystem transformer, it uses up to ten times more water than the local vegetation. With a 100 foot taproot, it easily draws water tables down beyond reach of local vegetation. Some estimates indicate tamarisk uses more of the Colorado River water than all of the residents of Las Vegas and southern Nevada. It also accumulates salt in its leaves, and repeated leaf drop increases soil salinity. Because *Tamarix* also has high oil content, it burns easily, and its presence changes frequency of the local fire regime. But now there is some hope: a relatively new biocontrol, the salt cedar leaf beetle, *Diorhabda elongata*, a small green beetle originating from Kazakhstan and Crete. A three-year field test showed the beetle can survive the winter, reproduce, and effectively defoliate salt cedar. It not only eats the green vegetation, but it crates holes in the leaves that allow water to escape, and causes branches to wither and die. Defoliation normally takes four years to kill off the tamarisk. The beetle is now being used in river systems in the Virgin River Gorge, AZ. The first permitted releases of beetles began on western NV rivers in 2001, and these early sites are just beginning to yield information about the long-term impacts of the more than 1 billion beetles now in the US. Following their release two years ago in St. George, UT, 15 miles upstream from the gorge, beetle populations exploded on the Virgin River. And early signs on the Colorado River around Moab, UT, show that tamarisk defoliation is giving native plants a sudden second life. Areas with defoliated tamarisks are showing some modest water gains. But there are also risks: natives may not return in areas of poor hydrology, and other invaders may move in. In addition, some 50 species of birds, including the federally endangered southwestern willow flycatcher, now use the tamarisk. The flycatcher was able to transition from nesting in native willows and cottonwoods to the tamarisk that replaced them. Now, anything affecting the tamarisk might risk the flycatcher as well. Unfortunately, government follow-up on re-vegetation and monitoring has lagged. (*Excerpted from several sources, including a Ben Arnoldy, Christian Science Monitor article, September 23, 2008*)



Photo- USDA APHIS

Whirling Disease-Resistant Trout. In the last decade, whirling disease (*Myxobolus cerebralis*) has crippled or killed young fish before they grow big enough to spawn, severely affecting the wild rainbow trout fishery in a number of areas. Hofer-cross rainbow trout may be one way to restore the fisheries, because testing shows they're resistant to whirling disease. Hofer rainbow trout are a 100-year old strain discovered a few years ago in the Hofer hatchery in Bavaria, Germany. But it is considered possible the Hofer rainbows are originally from Colorado fish, because rainbow trout eggs for the Bavarian hatchery originated from the U.S. In CO, wildlife stocking crews recently released 1,300 young Hofer-cross rainbow trout into the South Platte River. The fish have also been stocked in the Poudre, Gunnison, and Colorado rivers and some reservoirs. Officials are hopeful that the fish will survive, and reestablish a wild naturally reproducing rainbow fishery within ten years or so. Program funding comes from private donors and the sale of fishing licenses. (*From a September 1, 2008 CBS4 article by Paul Day.*)

AK Rat Eradication. Norway rats arrived on Rat Island, a 6,871-acre island at the end of the Aleutian chain, in the 18th century. They came via a shipwrecked Japanese ship. Prior to the rats, there were no land mammals on any of the western Aleutian Islands, and as a result, birds have not evolved strategies for protecting themselves. Many birds like puffins, auklets and storm petrels are ground-nesters, and the foraging adults spend considerable time away from their nests, leaving eggs and young vulnerable to rat predation. Very few seabirds remain on Rat Island today. But in October, the AK Maritime National Wildlife Refuge, the Nature Conservancy, and Island Conservation began a \$3 million rat extermination. The first operation came off without a hitch, and in less than half the time projected. In a little over a week, two ships, two helicopters, and a field crew of nearly 30, scattered 100,000 pounds of bait (Brodificoum rodenticide in a grain matrix) over the island. They used helicopters to disperse the bait along grid lines established and monitored by GPS. Helicopter "skips" were filled in with dribble buckets, and hand baiters on foot worked around ponds and sensitive areas. Dealing with the presence of endangered Steller sea lions at two sites required moving them gently off the rocks prior to bait application, to avoid spooking and stampeding. The work was also specifically scheduled during the stormy fall season to avoid disturbing young sea lion pups, other breeding marine mammals, and migratory birds.

Worldwide, rats cause up to 60 percent of seabird extinctions, primarily on islands. Rats have been removed from some 300 islands around the world. If successful, Rat Island would become the third largest island to be cleared of rats. (The largest success was the 27,922-acre Campbell Island south of New Zealand. Since the eradication seven years ago, seabirds have returned and the Campbell Island Teal, one of the world's rarest ducks, has been reintroduced). If successful, this will be the first time rats have been removed from an AK island. Although success cannot be assured until field monitoring in 2009 and 2010, it is believed likely that all the rats died. To follow the progress of this project, visit [www.seabirdrestoration.org]. (*Excerpted from a November 3 email from Poppy Benson, and a Mike Campbell September 24, Anchorage Daily News article. Thanks to Kevin Aitkin*)

Didymo Removal Screen. Didymo ("rock snot") algae, (*Didymosphenia geminata*), was first detected in the South Island of New Zealand in 2004, and has spread to such an extent that Biosecurity New Zealand has declared the South Island a controlled area. Now Aqwell Water Treatments has developed a screen which sits over irrigation system water intakes and

automatically removes didymo by a conveyor and brush system, preventing pumps and nozzles from becoming blocked. This system may remove the need for constant surveillance and manual cleaning, and its developers say the intake should only need checking once a week and manually cleaned once a month. The screen can be set to clean itself continuously if the river is heavily infested, or every 15 to 30 minutes if there is less infestation. The algae is scraped on to river



bank and removed by the farmer. The Aqwell didymo screen elements are sized to handle flows from 200 to 2000 liters a second. Screens range in cost from \$25,000 to \$50,000, depending on size. (*Excerpted from a Neal Wallace, Otago Daily Times article, September 19.*)

Advanced Weed Mapping Technology for Invasives. A camera system that can map thousands of acres by airplane with images so detailed that tree leaves can be identified, is expected to revolutionize conservation work. Resource Mapping Hawaii developed the technology for the Nature Conservancy, which is testing it on 80,000 acres of forest land on Kauai. The camera system is specifically for conservation purposes, and uses small portable multispectral and natural-color digital cameras that can be attached to any Cessna aircraft. It uses three specialized cameras: a multispectral high-definition digital video camera that collects images in green, red and infrared wavelengths, and two extremely high-definition digital models with 210 mm lenses, which shoot in natural color. The two natural-color cameras each have 33-megapixel sensors and the high-definition multispectral camera has about 12 megapixels. The big natural-color cameras fire once every 1.5 seconds, providing a continuous swath that's 12,000 pixels wide. Each pixel covers 2.2 centimeters square (less than an inch), so different kinds of ferns and invasive species can be identified by leaf structure. A three-dimensional capability allows scientists to calculate heights of individual plants. Many forests have no trails and are inaccessible from the ground, and helicopter surveys are expensive. This method is a complete revolution in aerial mapping of weeds because it allows researchers to make detailed photographic records and search for specific plants. (*Excerpted and paraphrased from a Helen Altonn article, Honolulu Star Bulletin, September 18.*)

Zebra Mussel Invasion Updates

Zebra Mussel Decontamination Study. As zebra and quagga mussels continue to spread across the west, the question arises: how effective are our decontamination procedures? The Western Regional Panel is leading an effort to identify all agencies/organizations currently engaged in watercraft/equipment inspections and decontaminations in the 20 western states. They will also conduct a survey of all these groups regarding their current procedures for screening interviews, inspections, decontaminations, quarantine/drying time, exclusion and

certification. Results of this phase of the study are expected to be available by early February.



The project is being funded by the PSMFC and the Oregon Marine Board. Other issues that need to be addressed include establishing standard decontamination procedures and a certification program, so that an inspection station can feel confident about the quality of inspections conducted by the other groups elsewhere. This way, once boats are decontaminated, they would not have to undergo annoying, repeated inspections en route to a new destination, and agencies/organizations conducting inspections could save valuable staff time and resources. Funding is currently being sought for this larger effort as of this writing, and partners are welcomed. For more information, contact lead staff on the project, PSMFC contractor Bill Zook <bjzook2@msn.com>.

Northwest Rapid Response Exercise #2 The 100th Meridian Initiative Columbia River Basin Team met in Portland, OR, on October 15. An abbreviated team meeting was followed by a one and a half day facilitated mock response exercise focusing on the "Columbia River Basin Interagency Invasive Species Response Plan: Zebra Mussels and Other Dreissenid Species." The exercise scenario focused on pathway management and movement of commercial shipping after the discovery of a zebra mussel-infested container barge at the Port of Portland. This also focused on the roles and responsibilities of the coordination and support staff of state, federal, and tribal agencies that would be involved in an actual incident, and their relationship to the Multiagency Coordination (MAC) Group. The MAC Group is composed of interagency representatives with decision-making authority for their agencies, and it coordinates the overall management policy for a response. It may be convened at the national level, the geographic area level (e.g. Columbia River Basin), and/or at the local level. Lessons learned at the exercise will be useful in preparing the region for an actual infestation.

Regional Rapid response Plan (Update). The regional "Columbia River Basin Interagency Invasive Species Response Plan: Zebra mussels and Other Dreissenid Species" has now been signed by WA, OR, ID, MT, USFWS (Region 1), and Columbia River Inter-Tribal Fish Commission. Go to [www <http://www.100thmeridian.org/ColumbiaRT.asp>] to download the late4st version (October 1,2008) of the plan. For further information on the plan, contact <Paul_Heimowitz@fws.gov> or <Stephen_phillips@psmfc.org>.

Mussels in Utah? Earlier this fall, samples from Pelican Lake and Red Fleet Reservoir in the Uintah Basin, and Midview Reservoir on Ute Tribal Lands, tested positive for the larval form of what could be zebra or quagga mussels. But after further testing, the results are still unclear. Three tests have been used, one based on electron microscopy and two based on DNA comparisons. But the samples taken at Pelican Lake, Red Fleet and Midview reservoirs (northeast UT), Electric Lake (southeast UT) and the Colorado River (near Moab and Lake Powell), have been conflicting. All samples tested positive with at least one of the tests, but none was positive with all three. Meanwhile, funded by a legislative appropriation of \$2.5 million, forty-one biologists and technicians are monitoring boats launches across UT as part of a

state effort to keep exotic species out of the state. (*Excerpted from a Patty Henetz, Salt Lake Tribune article, November 4.*)

100th Meridian Web-Based Response System. A pilot Aquatic Invasive Species Notification Database is being developed. It is focused toward environmental managers, not the general public, and will allow people to come to a central location to report and receive information on mussel invasions, and be used to assist in quickly routing information on preliminary ANS detections and contaminated boat reports to first-tier ANS response contacts in the West. The prototype database is now on-line, comments are being solicited. For more information, contact David Britton at <david_britton@fws.gov>.

Dreissenid Monitoring Workshop. The 100th Meridian Initiative is sponsoring a monitoring workshop in Denver, CO. January 21-22. The goals of the meeting are to discuss the relative strengths and weaknesses of existing analysis of water samples for veligers (primarily microscopy and PCR), share sampling and analysis protocols, and ultimately seek consensus on criteria for classifying, verifying, and communicating results of sample evaluation with the intent to implement consistent methods in the 2009 field season. The workshop will include discussion of light microscopy, PCR and other monitoring methods. The workshop will immediately be followed by the National 100th Meridian Initiative meeting, on January 22-23. For more information, contact David Britton, at <david_britton@fws.gov>.

New Columbia River Brochure. The USFWS is wrapping up final design of a brochure and associated poster on existing exotic species found in Columbia Basin waters: *International Waters: Nonnative Aquatic Species in the Columbia River Basin.* This outreach project of the 100th Meridian Initiative's Columbia Basin Team aims to complement the numerous prevention/detection-oriented outreach materials, with the "back story" about nonnative aquatic species already in the Northwest, including a summary of several recent Columbia River ANS surveys. As Oregon Sea Grant began to develop their now-published "On the Lookout for Aquatic Invaders" identification guide, the project focus shifted to creating a more concise brochure. The project recently expanded to adapt a map section of the brochure into a stand-alone 24"x36" educational poster. Both documents are scheduled to go to print by the end of this year, with distribution anticipated in early 2009. If interested in seeing the final draft versions, contact Paul Heimowitz, at <paul_heimowitz@fws.gov>.

Zebras and Quaggas Confirmed in Colorado Reservoirs. Zebra and quagga mussel larvae and adults were first identified in Lake Pueblo, CO, last January. Sampling efforts were expanded this summer to include 6 additional sampling sites, and resulted in the new finds. CO monitoring has confirmed the presence of invasive mussel larvae in Grand Lake, Shadow Mountain and Willow Creek Reservoirs. These waters are physically connected to Lake Granby, where quagga mussel larvae were discovered earlier this summer. Results from an independent laboratory confirm that both zebra and quagga mussels are present in Grand Lake, but only quagga mussels have been found at Willow Creek, Shadow Mountain and Lake Granby. Quagga mussels were also found in Lake Pueblo this past summer. State and Federal agencies are cooperating with local partners to develop an appropriate plan for each of the Colorado-Big Thompson (CBT) reservoirs. Boaters from all CBT lakes were encouraged to participate in a watercraft inspection and decontamination day on September 27th. Then in October, monitoring

confirmed additional quagga mussel larvae in Jumbo and Tarryall Reservoirs. For more information on the CO infestations, go to:

[www.wildlife.state.co.us/WildlifeSpecies/Profiles/InvasiveSpecies/ZebraandQuaggaMussels.htm]

New Rules at Tahoe. The Tahoe Regional Planning Agency has approved new rules requiring boat ramps and launching facilities at Lake Tahoe be staffed with qualified aquatic invasive-species inspectors. The rules took effect at the beginning of November. They make all watercraft subject to inspection by qualified personnel, and also require that vessels launching at the lake be decontaminated if inspectors determine that vessels pose a risk of infesting the lake with invasive species. The ordinances require that the owners and operators of boat ramps and launches close their facilities when qualified aquatic invasive-species inspectors are not present. To comply, gates have been installed at public and private ramps. Up-to-date information on ramp hours, lake conditions and procedures will be available through the winter by calling (888) TAHOANS or at [www.protecttahoe.org]. The stepped-up inspection and decontamination requirements are in response to mounting concern that Lake Tahoe is at risk of invasion from quagga and zebra mussels, the New Zealand mud snail and other species. (*Excerpted from the Tahoe Daily Tribune, November 3*)

Offutt AFB ZM Eradication. Offutt Air Base, outside of Omaha, NE, applied copper sulfate pentahydrate to their 119 acre man-made lake on September 17-18, 2008, to eradicate the zebra mussel population. Based on the volume of water in the lake, approximately 26,890 pounds of copper sulfate pentahydrate was needed to obtain an overall concentration of 1 part per million of elemental copper. They applied the copper sulfate via vortex spreaders mounted on a pontoon boat, and used hand application in drainage ways and other areas that could not be reached with the boat due to obstructions (docks, trees, rocks, etc.). The chemical was applied within a 30 hour timeframe, and a GPS unit and ArcView GIS software was used to ensure full coverage was achieved. Post-application monitoring was performed for residual copper concentration, adult zebra mussel mortality, and veliger (larval) presence. No live zebra mussels (shelled or veligers) were observed after 96 hours of treatment. The Base chose to use copper sulfate (as opposed to the less-impacting potassium chloride successfully used in the VA quarry eradication conducted in 2006), because of the amount and cost of the potassium chloride that would be needed. However, in an apparent surprise, dead fish began appearing on the second day of application. Gar, paddlefish, and 12 other species were killed, amounting to approximately 39,000 pounds (including 6,000 pounds of invasive bighead carp.) But not all of the fish species were affected, and some fish still remain in the lake. Additional monitoring will be conducted, and the Base expects to make a second, follow-up, chemical application in April. For more information, contact <karl.morris@offutt.af.mil> (*Excerpted from the interim report, Offutt Base Zebra Mussel Eradication, and thanks to Karl Morris*)

Other West Coast Invasions

New OR Infestation: African Rue. African rue (*Peganum harmala*) has been found on one of the Burns Paiute Tribal allotments in OR. The infestation is estimated to consist of 3-400 plants scattered over 2700 acres. African rue is a bright green succulent, perennial, herb that is



allelopathic. It also contains at least four toxic alkyloids, and is toxic to cattle, sheep, horses and humans. It has many effects, and may even be fatal. Although toxicity is high, livestock will rarely graze it, due to its bitter taste and smell. A plan to deal with it is being developed. For more information, contact <bilrey@crestviewcable.com>. For a fact sheet on rue, go to [<http://www.colorado.gov/cs/Satellite?c=Page&cid=1184920449085&pagename=Agriculture-Main%2FCDAGLayout>]. (Photo by Kelly Uhing, CDA)

New WA and OR *Spartina* Sightings. The NAS database has generated new alerts for *Spartina alterniflora* (Atlantic cordgrass) in both WA and OR. In WA it was recently been reported at the Waatch Creek mouth in the Hoh-Quillayute drainage, and in Mukkaw Bay on the Olympic Peninsula. (For more information on the WA specimen, go to [<http://nas.er.usgs.gov/queries/specimenviewer.asp?SpecimenID=256694>]). In OR, a new infestation was found in the Lower Columbia drainage near Warrenton (Clatsop County.) Go to [<http://nas.er.usgs.gov/queries/specimenviewer.asp?SpecimenID=256693>] for more information on the OR specimen.)

New Algal Infestation in CA. Six years ago researchers found and eradicated a small population of a non-native brown alga called knotted wrack (*Ascophyllum nodosum*) near Redwood City. It was probably originated from the East Coast, as packing material for shellfish and bait. This summer, field personnel found a new population near Alameda. It is distributed as floating rafts similar to *Spartina* wrack, and could possibly spread as far north as Vancouver Island. Apparently it grows slowly but lives for a long time. The degree of risk it poses is unknown, but volunteers and field personnel are encouraged to be aware of it and report it if they find suspects. The October 2008 edition of the San Francisco *Estuary* newsletter discusses this alga. Find the newsletter article (once it is posted) at [<http://sfestuary.org/estuarynewsletter.html>]. A Wiki description of this alga is available at [http://en.wikipedia.org/wiki/Ascophyllum_nodosum]



(Photo from [www.marlin.ac.uk]; Thanks to Kevin Anderson, PSP)

African Codling Moths in California. A codling moth, *Thaumatotibia leucotreta*, was found at Port Hueneme on July 24. It arrived in CA sometime between July 8 and 24. This is the first time the species has been found on US soil, although since 1984, it has been intercepted at the port

more than 1500 times on 99 different plant species. (!) In Africa, the moth eats a variety of things including citrus, avocados, cotton, peaches, peppers, and corn, and it destroys both the fruit and the trees. USDA and Ventura County Agriculture Commissioners are setting out traps; a second find will trigger a federal quarantine. (From 9/14 Stephanie Hoops article in Scripps News Service; thanks to Dan Hilburn, ODA.)



Asian Clams in Lake Tahoe. Asian Clams were probably introduced to Lake Tahoe through a bait bucket about six years ago. Research shows that the Asian clams are more widely distributed than first reports in April 2008 suggested. Unlike quagga and zebra mussels, Asian clams cannot attach to boats with byssel threads, which means the clams cannot as easily attach to boats and be transferred in and out of the lake. There are two large clam beds in South Lake Tahoe. In late August, shore lines near Zephyr Cove experienced unprecedented levels of algae growth, something that could be attributed to the clams, according to the Lake Tahoe Aquatic Invasive Species Working Group. There is also strong evidence that nuisance blooms of green algae plaguing the southeast shoreline this summer were directly related to the large clam beds in that region and the associated water currents. For questions, contact: Marion Wittmann, <mwittmann@ucdavis.edu> or Sudeep Chandra, <sudeep@cabnr.unr.edu>. (Excerpted from an October 19 Annie Flanzraich article in Bonanza News Service.)

Oyster Bacteria in Oregon. An explosion of the bacteria, *Vibrio tubiashii*, late last summer shut down Whiskey Creek Hatchery on Netarts Bay, one of the largest shellfish hatcheries on the West Coast. The hatchery usually produces billions of oyster larvae each year but couldn't produce any, once the bacteria invaded in August. Concentrations of *Vibrio* have spiked as high as 1 million/ml of water -- at least 100 times usual levels -- and remain higher than normal. It is also a likely cause in the disappearance of recent generations of wild oysters from usually prolific estuaries such as Willapa Bay, WA. Researchers say the rise of bacteria may be tied to the same unusual ocean conditions that caused the "dead zones" appearing off the OR coast in recent summers: strong but intermittent upwelling of deep water that pushes rich nutrients toward the surface. The bacteria, long known in coastal waters at low levels, seem to have taken off in the same areas and about the same times as the dead zones. Besides oysters, geoducks grown farther north on the West Coast are at risk. Clams and mussels seem less vulnerable, although fisheries officials have noticed a lack of young razor clams along some areas of the coast. But oyster larvae suddenly disappeared from Willapa Bay last year, and the bacteria may have contributed to poor reproduction of native oysters and razor clams in bays and coastal beaches. Hatfield Marine Science Center has developed a filtration system that uses a combination of ultraviolet light and other methods to remove the bacteria from water entering their hatchery. A similar system at the Whiskey Creek hatchery is now up and running at a cost of about \$180,000, although it handles only enough water for the hatchery to produce about half its normal oyster crop of close to 50 million larvae a day. It will cost an additional \$80,000 to expand the system to provide a full water supply. (From a Michael Milstein Oregonian News

article September 10, 2008, thanks to Jan Haertel, EPA)

Other West Coast Happenings

EPA Ballast Water Permit. The EPA Vessel General Permit (VGP) is on track to be issued by December 19, 2008. As of that date, the exemption from permitting for ballast water and other discharges incidental to the normal operation of a vessel will be vacated. All non-recreational vessels over 79 feet (except for commercial fishing boats) must have permit coverage beginning December 19, 2008 or be in violation of the Clean Water Act (CWA). EPA is planning to issue the permit by the vacatur date to prevent this from happening, but many details regarding implementation of the permit are still being worked out, including the state role. This has implications for a number of states: some believe they have the authority to write their own state NPDES permits for these discharges, while EPA believes that states would have to revise their NPDES programs first. If EPA is correct, the legality of some other state permits, such as stormwater permits, could be in doubt. States still have the ability to issue permits for discharges incidental to the normal operation of a vessel pursuant to state law, under CWA section 510.

To compound the issue, CWA section 401 requires states to certify that federal decisions, such as EPA permits, do not undermine state water quality programs. States have the option to certify the permit with additional conditions, or to waive, or to deny certification. EPA feels the deadline for a state to issue its 401 certification for the new permit has been given to states in accordance with the CWA, but states feel the timeline is too short, and the state, not EPA, would have to defend against any challenges to its 401 certification decision in state court. If a state waives its right to issue a 401 certification, then the permit will go into effect for that state's waters without any state-specific requirements. If a state decides to deny the 401 certification, the permit will not go into force within the state, and vessel owner / operators will be discharging without an NPDES permit and violating the Clean Water Act.

WA Department of Ecology has now notified EPA that at this time, it is not possible for them to either certify or deny certification of the VGP. They believe the EPA request for certification ignores the timeline Congress gave states to issue certifications, and that it also requests them to provide certification on what is still only a draft permit. By requiring certification of the draft permit, states are not provided the opportunity to review and evaluate any changes to the draft that EPA made as a result of public comment, thus placing them in the difficult position of not knowing exactly what they are actually certifying. In addition, given that many vessel operators will be subject to multiple state certifications, it is important there be an opportunity to coordinate the state certifications of this permit among the West Coast states. Ecology is encouraging EPA to convene a West Coast initiative to bring consistency to the regulation of vessel discharges along the West Coast, and recommends that if EPA issues the VGP in December as planned, that it include provisions allowing the permit to be re-opened and modified to incorporate the results of a West Coast initiative. See the VGP at [http://cfpub2.epa.gov/npdes/home.cfm?program_id=350].

EPA Invasion Pathways Reports Now Available. These regional applied research (RARE) projects have been discussed at length in previous 2005-2007 Nutshell issues. Funded by EPA Region 10 (WA) and 9 (CA), the projects are finally completed! Projects used DNA analysis to study the transport of invasive species across Pacific Coast estuaries and to determine west coast invasion pathways. They have resulted in a large variety of articles, some completed and many others are underway:

Four articles have recently been published:

- * Blum, MJ et al. (2007) *Geographic structure, genetic diversity and source tracking of *Spartina alterniflora**. Journal of Biogeography 34: 2055-2069.
- * Darling, JA and Blum, MJ (2007) DNA-based methods for monitoring invasive species: a review and prospectus. Biological Invasions 9: 751-765.
- * Darling, JA and Tepolt, CK (2008) *Highly sensitive detection of invasive shore crab *Cacinus maenas* and *Carcinus aestuarii* larvae in mixed plankton samples using polymerase chain reaction and restriction fragment length polymorphisms (PCR-RFLP)*. Aquatic Invasions 3: 141-152.
- * Darling, JA et al. (in press) *Genetic patterns across multiple independent introductions of the globally invasive crab genus *Carcinus**. Molecular Ecology, in press.

Three manuscripts are in preparation:

- * Tepolt, CK et al. *Gene flow erodes founder effects at an expanding invasion front in the European green crab *Carcinus maenas**. (expected submission date October 15, 2008)
- * Darling, JA et al. *Human mediated introductions determine the nonnative distribution of the dispersal limited estuarine invertebrate, *Nematostella vectensis**. (expected submission date October 1, 2008)
- * Pilgrim, E., Darling, JA *Genetic diversity and cryptic species of the non-native *Jassa marmorata* complex (Amphipoda: Ischyroceridae)*. (expected submission date December 1, 2008)

Seven products still require additional data analysis:

- * Pilgrim, E, Darling, JA. *Quantitative PCR approach for detecting invasive species propagules in environmental samples*.
- * Pilgrim, E, Darling, JA. *Population genetics of the invasive tube-building amphipod *Ampithoe valida* Leach (Amphipoda: Ampithoidae) along the Pacific coast of North America*.
- * Pilgrim, E, Darling, JA. *Phylogeography of invasive populations of *Melita nitida* Smith (Amphipoda: Melitidae) on the Pacific Coast of North America*.
- * Pilgrim, E, and Darling, JA. *Population genetics and invasion history of the amphipod *Grandidierella japonica* Stephensen (Amphipoda: Aoridae)*.
- * Darling, JA et al. *Integrating genetic analysis with vector strength models to predict the spread of an invasive species: *Styela clava* in the eastern Pacific*.
- * Darling, JA et al. *Patterns of regional expansion of estuarine invasive species in the eastern Pacific: what do the genetics tell us?*
- * Darling, JA. *Application of genetic methods for tracking the introduction and spread of invasive species on the US Pacific Coast*. APM report (Summary report. Completion date September 1, 2009)

(Thanks to Roseanne Lorenzana, EPA. For authors, contact Mike Blum or John Darling at <mjblum@tulane.edu> and <darling.john@epa.gov>)

Pedicure Fish (Updates). (See *Nutshell 21* for the pedicure article). Texas has now banned fish pedicures because of health and safety concerns. The state was concerned about salons using the same fish to clean the skin of multiple customers, leaving them open to possible infections. [*Ed comment: For those that bought the fish, (500 fish for \$2,500), let's hope the salons send them back, rather than "liberating" them into the nearest water body!*]

The Washington Department of Health has a ruling that nothing can touch human skin unless it is sterilized, something obviously not possible with live fish, so this new fad won't be taking off in WA either. In September, WDFW asked the Department of Licensing to forward a letter providing advice to salons that have "pedicure fish" and would like to properly dispose of them. (They suggest checking with the distributor and local pet stores, that might offer to take fish back to resell, or euthanizing fish before disposal by placing them in a plastic bag or container in the freezer for at least 24 hours - more if needed to freeze solidly. The frozen dead fish should then be placed in the trash, to prevent other animals from accessing them or unintentionally transporting potential diseases into state waters.) The two most common commercially available "pedicure fish" are the *Garra rufa* and the Chin Chin fish. The *Garra rufa* is classified by the department as an "unlisted aquatic animal species" and the Chin Chin (Nile tilapia or *Oreochromis niloticus*) is classified as a "regulated aquatic animal species". It is prohibited to release animals in either classification into waters of the state. The Chin Chin is known to be invasive, with rapid growth and a voracious appetite. Not as much is known about the *Garra rufa*, but it is obviously a hardy species and must be considered invasive. (For more info, go to: [http://wdfw.wa.gov/fish/ans/you_can_help.htm] or contact Pam Meacham at (360) 902-2700.

OR Interagency Noxious Weed Symposium. The 2008 Interagency Noxious Weed Symposium will be held at the Oregon State University at LaSells Stewart Center in Corvallis, OR from Dec 2-4, 2008. Registration is now open. For agenda, registration form, lodging, and other information, check the website: [<http://www.oregon.gov/ODA/PLANT/WEEDS/agenda.shtml>] Posters, flyers, hand-outs or other materials suited for the symposium are also solicited. Contact Beth Myers-Shenai at 503-986-4627 or email her at <smyers@oda.state.or.us>. Re-certification credits will also be available.

Marine Bioinvasions Conference. The North Pacific Marine Science Organization (PICES), PSU, National Sea Grant, and PSMFC are jointly sponsoring the 6th International Marine Bioinvasions Conference, to be held at Portland State University in Portland, OR, on August 24-27, 2009. The purpose is to examine marine bioinvasion vectors, patterns, distribution, ecological and evolutionary consequences, economic impacts, biosecurity approaches, and invasion impacts on biodiversity. Registration will open in 2009. For now, just save the date! For more details, go to [www.clr.pdx.edu/mbic].

OR Noxious Weed Control Grant Applications. The Oregon State Weed Board (OSWB) invites applications for grant funding for noxious weed control projects related to the protection and enhancement of watersheds and fish and wildlife. This will be the fourth cycle for the 2007-

09 biennium. Specific criteria are outlined within the grant application. Closing date for grant applications is December 3. The grant application is available at: [<http://www.oregon.gov/ODA/PLANT/WEEDS/grantindex.shtml>]. Hardcopies are also available upon request. For more information, contact Shannon Brubaker <sbrubake@oda.state.or.us>.

OR Ballast Water Report. *Managing Aquatic Invasive Species Risks from Shipping Transport Pathways*, a report prepared for the 2009 State Legislature, by the Oregon Task Force on the Shipping Transport of Aquatic Invasive Species, is now completed. The report provides information and analysis on (i) current ballast water regulations at international, federal, and regional levels; (ii) shipping and ballast water discharge trends in OR waters; (iii) shipping industry compliance with Oregon Law; (iv) threats and possible management options for non-ballast water pathways of introduction such as hull-fouling; and (v) emerging issues that may impact OR efforts to reduce invasive species threats associated with shipping transport. The report also provides program development suggestions for the ODEQ and legislative recommendations for strengthening invasive species prevention in OR waterways. The final chapter identifies four general themes that deserve increased attention (program resources, ballast water treatment, biofouling, and regional cooperation) and concludes with specific recommendations aimed at better protecting our waterways from invasive species threats. The report is available from the ODEQ website at [<http://www.deq.state.or.us/lq/cu/emergency/staistaskforce.htm>] (*Thanks to Rian Hooff*)

Idaho Rulemaking. Earlier this year, the ID Legislature passed the ID Invasive Species Act of 2008, giving the ID State Department of Agriculture (ISDA) the authority to regulate both aquatic and terrestrial invasive species in the state. ISDA is in the process of developing rules that will include the determination of which species are invasive and procedures for inspection, decontamination and permitting. A public meeting was held in Boise on July 22, and a draft rule was released in August. A second draft was completed in October, and public hearings were held in Sandpoint (October 14) and in Jerome (November 14). ISDA continues the negotiated rulemaking process and may hold additional meetings. (*Thanks to Amy Ferriter, ISDA*)

City of Portland, OR, Invasive Species Summit. Several regional partners are hosting a November 18 summit to highlight the significant progress accomplished as a result of the 2005 Invasive Species Town Hall meeting. It will showcase Portland's three year work plan and ten year goals from the Invasive Species Strategy Report – a successful outcome from the 2005 event. Other regional partners will share success stories, challenges and solutions for eradicating invasive plants and animals in the Portland metropolitan area. The 2008 summit will also rally private, public and non profit partners in the region, to lay the groundwork for the next phase and to keep the momentum moving forward. Review Portland's Draft Invasive Plant Strategy at [<http://www.portlandonline.com/Bes/index.cfm?c=47815>]

King County Biocontrol (Update) Between March and August, King County (WA) released a total of 8,500 insects for six different weed species: -
Purple loosestrife: 92 loosestrife beetles, *Hylobius transversovittatus*, were released to hopefully develop a local rearing program for this species. (The larvae are root crown feeders and the adults are foliage feeders, so this should complement the control being provided by 1,250

Galerucella beetles released this year.)

- Scotch broom: 800 scotch broom bruchids, *Bruchidius villosus*. (Larvae feed on seed pods, and adults eat pollen.)

- Spotted knapweed: 50 knapweed root weevils, *Cyphocleonus achates*. (Larvae feed on roots); 250 *Larinus minutus*, (larvae eat flower heads, adults are foliage feeders) and 500 *Larinus obtusus* (Larvae eat flower heads, adults feed somewhat on foliage.)

- Tansy ragwort: 500 tansy ragwort flea beetles, *Longitarsus jacobaeae*. (Larvae are root miners in rosettes, adults are foliage feeders.) This was the Swiss strain of this insect, one of only three releases of this strain statewide. This is important because Swiss strain flea beetles lay eggs in spring, rather than fall like the more common Italian biotype, and adults emerge in mid-summer and immediately begin feeding. This different life cycle should increase the success of the flea beetle in some areas.

- Dalmatian toadflax: 200 stem weevils, *Mecinus janthinus*. (Larvae mine stems, adults eat foliage.)

- Canada thistle: 960 stem gall flies, *Urophora cardui*. (Larvae form a gall within the stem causing a metabolic sink.)

For questions about the county biocontrol program, contact Jessica McKenney (206-296-0290) or Jennifer Andreas (206-205-3100) or email the noxious weed program at <noxious.weeds@kingcounty.gov>. (Thanks to Sasha Shaw, KC)

Oregon 100 Worst List. OR is updating its list of the 100 most dangerous invaders threatening to enter OR. These are species not yet established in OR; placing them on the list provides focus on exclusion, early detection, and eradication. The species on this list can still be eradicated if found in OR. The list does not rank the species, as they are all high priority. Getting off the list is more difficult than getting on, because although new threats emerge each year, only a few are worthy of bumping listed species. The OR Invasive Species Council is accepting recommendations for changes to the list until December 15, 2008, and will consider and vote on recommendations at their February 2009 council meeting. For more information, contact Lisa DeBruyckere, <lisad@createstrat.com>.

OR Invasive Species Council (Update). The final report to the Governor (including appendices) on the statewide invasive species summit held on July 22, 2008, in Salem, OR, is now available at: [http://www.oregon.gov/OISC/docs/pdf/oisc_finalsummitreport08.pdf] Also, the council just completed its first-ever business plan. It will soon be posted to the OISC website at [<http://www.oregon.gov/OISC/docs>], but is currently posted at: [<http://www.createstrat.com/i/oisc2008businessplan.pdf>]. (Thanks to Lisa DeBruyckere.)

WA Invasive Species Council The Council met on August 20th. It added new members and elected a new Chair & Vice Chair. On June 5, the Council released *Invaders at the Gate*, the state's first Strategic Plan to combat invasive species, and followed it with two fall workdays, one in Pasco and one in Tacoma, where experts from around the state met to write a three-year implementation plan. The state plan can be downloaded from: [[www.rco.wa.gov /WA Invasive Species Plan Development](http://www.rco.wa.gov/WA%20Invasive%20Species%20Plan%20Development)]. Future council meetings will be held on November 19, 2008, and January 8, May 7, September 10, and December 3, 2009.

Pacific Northwest Ambient Monitoring Partnership (PNAMP) Activity. PNAMP's main focus is aquatic resource monitoring collaboration and coordination. One of the tasks identified in the January PNAMP workshop was the need to develop short lists of 'priority species' for early detection and rapid response by ecoregion. To develop the lists, invasive species researchers and managers and are being asked to select species for ecoregions in the Pacific Northwest. These will be compiled and sent out for a final comprehensive review and comment before sending them out to the greater PNAMP community. To help with this task, or get more information on PNAMP, contact Jacque Schei, <jschei@usgs.gov>. PNAMP has also started a newsletter. To be added to the mailing list, contact <jbayer@usgs.gov>.

This year PNAMP formed an Aquatic Invasive Species (AIS) work group, and hosted a work session to identify actions to advance the early detection of AIS via collaboration with existing monitoring programs. The work session discussed ways to incorporate existing aquatic/riparian invasive species surveys into a comprehensive monitoring and information management system; the need for improved coordination of AIS data; and identified specific near-term actions and next steps to improve early detection capabilities. The group will also focus on identifying funding opportunities to support the addition of AIS monitoring to existing programs. For more information, visit the work group page on the PNAMP website: (<http://www.pnamp.org/web/content.cfm?WorkGroupID=8>). (Thanks to Jacquelyn Schei jschei@usgs.gov)

Knotweed Papers. Abstracts from the Western Society of Weed Science knotweed symposium, held in Portland, OR, on March 15-16, 2007, are now available at [http://weblogs.nal.usda.gov/invasivespecies/archives/2007/09/knotweed_sympos.shtml]. Interestingly, although the symposium attracted presenters from all over the world, the majority of presenters are from WA, which says something about either our enthusiasm or the state of our infestation! A 25 page document contains 15 abstracts, with author contacts if you want more information. Abstracts include: *The Genetics of Invasive Knotweed Species in Europe; Invasion Dynamics and Ecology of Knotweeds in Central Europe: A Hybrid Superior to Parental Species; Vegetative Regeneration by Japanese Knotweed; Current Status of Herbicides for Controlling Invasive Knotweeds in the United States; Herbicide trials for Bohemian Knotweed Control; Ecological Consequences of Giant Knotweed (Polygonum sachalinense) Invasion into Pacific Northwest Riparian Forests; Developing a Biological Control Program for Invasive Knotweeds; The Role of Temporal and Spatial Variability in the Treatment of Bohemian Knotweed (Polygonum x bohemicum) on the Hoh River, Washington, USA; What is the Threat from Invasive Knotweed Seed Production?; Invasive Knotweed Control in King County, Washington; Management of Knotweed in the Upper Skagit River Basin of Washington; Eradicating Small Knotweed Patches Without Herbicide; Non-herbicidal treatments of knotweed species on the Queen Charlotte Islands, BC; Replacing Knotweed with Desirable Vegetation in Northern Coastal Oregon; The Nature Conservancy's Sandy River Watershed Knotweed Control Program: Lessons from six years of landscape scale control; and The Washington State Program for the Control of Invasive Knotweeds.*

Green Crab Research Article. A new paper resulting from an EPA grant, is now available: *Highly sensitive detection of invasive shore crab (Carcinus maenas and Carcinus aestuarii) larvae in mixed plankton samples using polymerase chain reaction and restriction fragment*

length polymorphisms (PCR-RFLP), by John Darling and C.K. Tepolt. The crab genus *Carcinus* consists of two species, *C. maenas* and *C. aestuarii*, both of which have invaded multiple regions of the globe. *C. maenas* has established introduced populations on every non-polar continent outside its native range, and exhibited the capacity to spread rapidly once established. The authors have developed a PCR-RFLP approach that enables the specific and highly sensitive detection of both species in mixed plankton samples, including those drawn from ballast water. It excludes all non-target brachyuran species tested, including a number of species whose ranges overlap with those of the *Carcinus* species. Sensitivity of the assay is extremely high, allowing the detection of single stage I zoea in over 1 gram (filtered weight) of mixed non-target plankton. The assay also successfully detected single larvae in mixed plankton derived from ballast water, indicating the potential use of this approach as a tool for targeted screening of *Carcinus* sp. in ship's ballast. (See the entire article in *Aquatic Invasions* (2008) Volume 3, Issue 2: 141-152) or contact <darling.john@epa.gov>.

MT Biocontrol Insect Exacerbates Invasive Weed. Spotted knapweed was first discovered in the US in the late 1800s, and is now a serious problem in WA, ID, WY and MT, as well as in Alberta and British Columbia, Canada. As early as 1971, scientists began releasing gallflies to reduce knapweed populations. Now, MT scientists have found that a gallfly introduced for biocontrol may exacerbate the effects of the invasive plant it was meant to control. The adult gallflies lay their eggs in the weed's flowers, and after the larvae hatch, they induce the plant to grow tissue around the insect, encasing it and isolating it from the rest of the plant. When the plant devotes extra energy to producing these galls, it has less energy to produce seeds. Scientists and managers expected that this seed deficiency would limit knapweed population growth. However, omnivorous deer mice, whose diet usually consists of native seeds and insects, have also begun to prey on the introduced gallflies. They can tell which seed heads have the most larvae inside them, and an average mouse can process 1200 larvae in one night. This extra nourishment bolsters mouse population size, increasing the numbers of hungry mice feeding on their original source of food: the seeds of native plants. As mouse consumption of native plant seeds increases, fewer native plants survive past the seed stage. Even if the fly reduces 80 percent of the knapweed population, the 20 percent of seeds left to germinate are often enough to outcompete native plants. The authors make the case that although biocontrol agents are carefully selected for specificity to their host plants, these restrictions do not prevent them from drastically altering the community food web, which can have far-reaching repercussions. Results are reported in the September issue of *Ecological Applications*. (*Excerpted from the September 5 Science Daily, adapted from materials provided by Ecological Society of America.*)

AK Invasive Film Festival. The Alaska Forum on the Environment (AFE) is inviting agencies, organizations and individual participants to submit films to be shown at their third Film Festival. Films should be current, applicable to the AFE and generally not more than 30 minutes in length. Topics include invasive species, climate change, emergency response, environmental regulations, pollution prevention, energy resource-conservation, and rural issues. AFE must receive a film by December 1, 2008, in order for it to be reviewed. For more information on how to submit films, contact Moses Tcheripanoff (907/276-2700 x 297) (*Thanks to Lisa Ka'aihue*)

OR Proposal to Add to Weed Quarantine List. Oregon has issued a Notice of Proposed Rulemaking to add six weeds to the state noxious weed quarantine list. The proposed amendment

to OAR 603-052-1200 proposes updating the list of prohibited plants to add goats rue (*Galega officinalis*), oblong spurge (*Euphorbia oblongata*), taurian (*Onopordum tauricum*), and white bryonia (*Bryonia alba*) to the A list; it would also add lesser celandine (*Ranunculus ficaria*), and spurge laurel (*Daphne laureola*), to the B list. These changes would bring the noxious weed quarantine in line with the State Noxious Weed List maintained by the State Weed Board. The last day for public comment is December 26, 2008 (*Thanks to Tristen Berg, <tberg@oda.state.or.us>*)

Western Aquatic Plant Management Society (WAPMS) Meeting. WAPMS will hold its 2009 Conference in Honolulu, HI, on March 29 - April 1. Program development is still underway, but there will be special sessions on invasive seaweeds and management of Eurasian watermilfoil in ID. They are soliciting presentations and posters. To arrange a special session on a particular topic, contact Robert Leavitt, <rleavitt@cdfa.ca.gov>. For agencies or university presenters who would otherwise be unable to attend, WAPMS and the Aquatic Ecosystem Restoration Foundation have limited funds to help, especially with airfare. For more information, contact Tom McNabb <tmcnabb@cleanlake.com>.

Spartina Research Article. Another product from a previous-reported EPA grant, *Geographic structure, genetic diversity and source tracking of Spartina alterniflora*, by Michael Blum et al., has now been published. The research aim was to examine the distribution and structure of genetic variation among native *Spartina alterniflora* and to characterize the evolutionary mechanisms underlying the success of non-native *S. alterniflora* in the intertidal marshes along the Atlantic, Gulf and Pacific coasts of North America. Results showed low levels of gene flow and geographic patterns of genetic variation among native *S. alterniflora* from the Atlantic and Gulf coasts of North America. Results corroborate historical evidence that *S. alterniflora* was introduced into Willapa Bay from multiple source populations, but some Willapa Bay *S. alterniflora* are genetically divergent, probably as a result of admixture following secondary contact among previously allopatric native populations. Authors also recovered further evidence supporting models that suggest within WA State, *S. alterniflora* has secondarily spread from Willapa Bay to Grays Harbor. (See the Journal of Biogeography (2007) 34, 2055–2069, for the whole article, or contact Mike Blum <mjblum@tulane.edu>)

National & International Activity

Sea Squirts on Eelgrass. For several years, the Puget Sound area has been battling several species of invasive marine tunicates (sea squirts; see various 2006-2007 issues of the Nutshell). But in the Northwest - so far- they appear to be colonizing hard surfaces. A report of sea squirts on eelgrass on the east coast is, therefore, not something we really want to hear, given the value of our eel grass in Puget Sound for juvenile fish habitat and other ecosystem functions. But Woods Hole researcher Mary Carman has found areas on the Atlantic Coast in a pond and lake on Martha's Vineyard, where tunicates *Didemnum exillum* and *Diplosoma listerianum*, are growing on acres of underwater eelgrass and taking over former scallop habitat. So far, sea squirts have apparently not had a direct, negative impact on wild populations of bay scallops or on other shellfish that use eelgrass for habitat, such as oysters, quahogs, or clams, but, they are a

nuisance to the aquaculture industry. (For the whole article, see the Woods Hole Oceanographic Institution magazine *Oceanus*, November 12, article by Amy Nevala).

USDA Awards Grants for Economic Research. USDA has awarded \$974,000 to six universities in AZ, CO, GA, MD, MA, and NV to research the economic effects and efficiency of strategies to prevent, control, or eradicate invasive pests. The projects are competitively awarded by the Program of Research on the Economics of Invasive Species Management (PREISM), and administered by USDA's Economic Research Service. Projects selected include: CO State University (\$178,000) to analyze economic tradeoffs of proactive and reactive management strategies for white pine blister rust in high-altitude, non-timber pine forests; University of NV-Reno (\$178,000) to examine contractual mechanisms to encourage ranchers to preemptively manage weeds that induce wildfire in the Great Basin; University of GA (\$174,000) to develop cost-sensitive decision support tools to aid risk analysis of potentially invasive, imported ornamental plant species, using information about taxonomy, ecology, and biological features gained prior to importation; University of MD (\$172,000) to investigate the effect of alternative phytosanitary policies, such as pre-clearance, pre-treatment requirements, and World Trade Organization notifications, on invasive pest risks in imports, and the implications for allocating surveillance resources; University of MA (\$147,000) to investigate the structural characteristics of a surveillance network for emerging animal diseases that will be most robust in early discovery of unknown or undetected diseases while adhering to performance and cost criteria; and to AZ State University (\$125,000) to compare mechanisms that could encourage growers to use integrated pest management to combat a potential pest invasion, and focusing on the pesticide-resistant whitefly on AZ cotton. Find further information about these projects at: [<http://www.ers.usda.gov/Briefing/InvasiveSpecies/>] (*From October 8 USDA press release*)

Didymo: New Zealand Research. An international team will undertake an 8-12 week project on the Waitaki River which may identify ways to control the "rock snot" alga *Didymosphenia geminata* in rivers. The project site is close to where didymo was first found in January, 2006. Shortly after that, it spread thickly through the Waitaki River, but didymo did not become well-established in braids with spring-fed water, and was virtually absent in adjacent spring-fed streams and rivers feeding into the Waitaki River. The team will research why didymo is inhibited or does not become established in spring-fed streams and rivers. Using an experimental, trailer-mounted flume system developed in Canada, the team will first try to demonstrate there is a factor in spring water which inhibits didymo, and then try to identify it. The project could also identify waterways naturally resistant to didymo, and factors in spring water which reduce the invasive alga's survival. The team is being led by Environment Canada and funded and supported by the National Institute of Water and Atmospheric Research, Environment Canada, and Fish and Game New Zealand. (*Excerpted from a David Bruce, Otago Daily Times article, Aug 19*)

Online Field Guide Grows to 2.7 Million Species Pages (!) ZipcodeZoo.com, the online field guide for professional and amateur naturalists, has grown to 2.7 million species pages, making it the most comprehensive resource of its kind, and significantly reducing the need to search widely for detailed species information. Descriptions are available for more than 1.2 million plants, 1.2 million animals, over 12,000 bacteria, 17,000 chromista, 203,000 fungi, and nearly

16,000 protozoa. The Web site's location-based platform enables visitors to view information on invasive species, species that are threatened, and all species that live in a specific geographic area or ZIP code. (From *EPonline.com* 10/29/08)

VHS Ruling. Viral hemorrhagic septicemia (VHS) has been found in all the Great Lakes except Lake Superior, and it has killed millions of fish in recent years. On September 10, USDA APHIS announced a regulation designed to prevent VHS spread, by establishing procedures for moving fish across state lines in the Great Lakes region. USDA APHIS requires testing and inspections of 28 farm-raised and live bait species susceptible to the virus. Fish covered by the rules include brown and rainbow trout, Chinook salmon, walleye, yellow perch, lake whitefish and muskellunge, as well as bait species such as emerald and spot-tail shiners. VHS threatens the region's sport and commercial fisheries, which generate billions of dollars a year. The regulation was originally intended to take effect November 10, but on October 28, the agency announced it would push back the date until January 9 so it can consider public comments.

Dams and Impoundments Increase Risk of Invasive Species. There are now over 80,000 large dams and an additional 2.5 million smaller impoundments across the US. A new University of CO study, *Dam invaders: impoundments facilitate biological invasions of freshwaters*, by P.T. Johnson et al. has been published in *Frontiers in Ecology and the Environment* (2008, 6, pp.357–363). It concludes that dam construction and biological invasions are closely linked, and that the growing number of dams and other impoundments is increasing the number of invasive species and the speed at which they spread. The researchers studied 4,200 lakes and more than 1,000 impoundments across WI and the Upper MI Peninsula, and they combined data on water chemistry, the distribution of five "nuisance invaders", and boating activity from the Great Lakes region. Results showed the increasing occurrence of such species in impoundments creates "stepping-stone habitats" for them into natural lakes, ponds and waterways. Non-indigenous species are up to 300 times more likely to occur in impoundments than in natural lakes, increasing the invasion risks for natural lakes. The study showed impoundments significantly reduced the average distance between "uninvaded" lakes and lakes inhabited by zebra mussels, increasing the number of natural lakes considered vulnerable to zebra mussel invasion by 50 percent. Freshwater ecosystems exhibit higher rates of extinction and a greater proportion of threatened and endangered species than terrestrial or marine environments, and dam construction and biological invasions are major contributors to the biodiversity crisis. For more information, go to: [<http://www.colorado.edu/eeb/facultysites/pieter/index.htm>]. (Excerpted from a *Science Daily* article, Sep. 3, 2008)

Jellyfish Increasing. A May National Science Foundation report states: "Scientists generally agree that human-caused stresses, including global warming and overfishing, are encouraging jellyfish surpluses in many tourist destinations and productive fisheries." Jellyfish are found everywhere from beneath the Antarctic ice shelf to thermal vents at the bottom of the Pacific Ocean, tropical saltwater lakes, and in the surf along beaches. Because of their versatility, and ability to thrive in damaged environments, jellyfish are often called "cockroaches of the sea". Jellyfish populations seem to be increasing everywhere, and the reasons are varied: rising ocean temperatures, increased nutrients and phytoplankton growth, overfishing of jellyfish predators, depleted oxygen levels, and the addition of man-made breeding grounds such as oil platforms, piers and reefs. In Northern Ireland, last fall a Smack (swarm) of jellyfish covering 10 square

miles killed \$2 million worth of salmon at a fish farm. In Japan, jellies have clogged coolant intakes at nuclear power plants. In AL, this April hundreds of Portuguese men-of-war jellyfish washed up in Orange Beach. Around Mobile, AL, in 2000, basketball-sized Australian spotted jellies were so thick that they choked water inlets and basically shut down shrimp operations. That same fall, tens of thousands of *Drymonera dalmatinum*, 60-pound pink jellies with 70-foot-long tentacles, appeared in the Gulf of Mexico. Recently, a Sea Lab trawler ran into masses of moon jellies south of Dauphin Island so thick that researchers were unable to hoist the boat's net back onto its deck. [*Ed comment: With climate change, many species are extending their ranges into new areas. Coastal states should probably look at their watch lists and/or monitoring efforts, to see whether there are jellyfish that should be included.*] (Excerpted from a Ryan Dezimmer, Newhouse News Service article August 30, 2008)

African Cities Commit to Defend Biodiversity. Political representatives from 21 cities around the world have signed a declaration to protect and re-develop urban biodiversity in their towns. Each city committed to identifying five vital initiatives to conserve plants, animals and natural resources and put those plans into practice within the next 18 months. In Africa, the Namibian town of Walvis Bay and four South African municipalities (Cape Town, Durban, Johannesburg and Ekurhuleni) are part of the Local Action for Biodiversity (LAB) project, kicked off in 2006 at the Sustainability World Congress. Each participating city will select five projects to enhance biodiversity according to its particular natural environment. In Southern Africa, the focus is primarily on protecting what they have, with the core issues being invasive species, climate change and habitat loss due to urban expansion. By the end of 2009, the 21 LAB cities will submit an assessment report to evaluate their progress in protecting urban biodiversity, just in time for the International Year of Biodiversity in 2010. Although South Africa has progressive environmental policies and laws, the country has been slow in their implementation. One of Cape Town's core initiatives will be the protection of its plant biodiversity. The municipality, which measures only four percent of South Africa's landmass, has half of the country's plant biodiversity, and more than 70 percent of the 9,000 species are endemic, occurring nowhere else in the world. (From *Kristin Palitza* article, *AllAfrica.com*, *Inter Press Service*, *Johannesburg*, *September 15.*)

Michigan Sea Lamprey Surveys. During September 17-24, USFWS surveyed the Tittabawassee and Chippewa rivers in Saginaw and Midland counties, MI, for lampreys (*Petromyzon marinus*). The information gathered will be used to determine the need for sea



lamprey control.

Sea lampreys invaded the Great Lakes in the 1920s and have impacted the fishery ever since. They attach to fish with a suction cup mouth, rasp a hole through the fish's scales and skin, and suck out blood and body fluids. The average sea lamprey can destroy up to 40 pounds of fish during its parasitic phase. A first step in lamprey control is a survey of hundreds of Great Lakes streams each year to determine the

presence of larval lampreys. Most surveys use electrofishing, but in deep waters, crews use Bayluscide, a 3.2% Granular Sea Lamprey Larvicide, formulated onto sand granules and covered with a time-release coating. The formulation is sprayed over the surface and sinks to the bottom, where it rapidly dissolves, causing the larval sea lampreys to leave their burrows and swim to the surface, where they are collected. The Great Lakes Fishery Commission implements the sea lamprey control program in partnership with the USFWS, Fisheries and Oceans Canada, USACE and the USGS. The Commission initiated chemical control of sea lampreys in 1958. The Commission recently conducted a \$6 million series of studies to assess the effect on human health and the environment, and has implemented a research program to develop alternative control techniques. It is also developing a strategy to increase the number of barriers on sea lamprey-producing streams, and conducting research into barrier design, traps, attractants, and biological controls. The USFWS and Fisheries and Oceans Canada are also currently evaluating the release of sterile male sea lampreys as a control measure in the St. Marys River. *(Excerpted from a Sept. 26 NBC25 online article.)*

Innovative Ballast Water Treatment System Installed On BW Gas Carrier Wilhelmsen Ships Equipment (WSE) has announced the test installation of the Uitor Ballast Water Treatment (UBWT) system on the 78,500 m³ carrier, BW Gas' Berge Danuta. The deal marks the first ballast water system installation on a BW Gas vessel. WSE will also provide project engineering and installation supervision for the system, which has been specifically designed to fit the carrier's 800 m³/h ballast pump capacity. Under the latest IMO convention, vessels with ballast water capacities of this size are not obliged to meet performance standards before 2016, so the fact that a system is ready for retrofit now, and the fact that BW Gas is proactive in installing such a system, is encouraging. The UBWT system is predominately based on ultrasonic cavitation, supported by electro-chlorination and ozonation, all well-known water treatment techniques. The combination of methods provides a system that is not only efficient in saltwater and freshwater, but is also able to handle diverse water conditions such as high turbidity and polluted water. The system requires no additional storage facilities, as the disinfectants are produced from within. *(Excerpted from Mar EX newsletter, Oslo, Norway September 24, 2008; thanks to Capt. Keith Striek, WDFW)*

Chicago's Electric Carp Barrier Hits A Snag. The new \$9 million electric fish barrier in the Chicago Sanitary and Ship Canal continues to have problems. Bighead and silver carp have migrated to within 15 miles of the new barrier, but federal officials won't permanently activate the barrier until they are convinced the electrified water is safe for the barge operators. In the past, a smaller, weaker "experimental" barrier has been operating, but it has a history of failing and it may not be strong enough to repel juvenile carp, which are less affected by electrified water. The Army Corps turned on the new barrier temporarily at a lower power level last month so the old corroding barrier could be shut down and refurbished. Once work on the old barrier is done, (scheduled for completion Oct. 15), then the new barrier will again be turned off. But at best, the barrier will slow the fish down while the federal government engineers a longer-term solution. And there is also a big problem with the barrier location: the Des Plaines River, which flows into the infested Illinois River, runs parallel to the canal, and the two waters have a history of merging during heavy floods. A twin electrical barrier is also planned just upstream from the new barrier, and the hope is to run the two simultaneously in case a fish somehow makes it past the initial barrier. Congress also approved funding for the experimental barrier to be refurbished

for further backup. Overall the whole project is now expected to cost taxpayers about \$30 million. (*Excerpted from a Dan Egan, Milwaukee Journal Sentinel article, October 5.*)

Wildfire Publication Available. A new publication, *Wildland Fire and Ecosystems - Fire and Non-native Invasive Plants*, is available from the U.S. Forest Service. The state-of-the-art review of information concerning wildland fires and invasive plants was developed to help fire managers and other land managers in prevent, detect, eradicate, and control invasive plants. [http://www.fs.fed.us/rm/pubs/rmrs_gtr042_6.pdf].

Environmental Weeds of Australia This now available. Published by the Center for Biological Information Technology at Australia's University of Queensland, this publication provides a visual-plus-text database of more than 1,000 plant species. It is intended to improve identification of invasive plant infestations and to aid in the application of effective management. It includes a Lucid3 key to over 1,000 major environmental weeds of Australia, detailed descriptions of weed species, links to website information, a search engine, a detailed close linked glossary and thousands of images. For more info, go to [<http://www.cbit.uq.edu.au/software/envioweeds>] (*Thanks to the NISC Newsletter*)

Plant Disease Management Reports. The 2008 version of *Plant Disease Management Reports* (vol. 2) by the Plant Management Network is now available. The report contains over 500 searchable entries concerning the use and effectiveness of fungicides and nematicides, resistant (plant) varieties, and other methods that defend against row and horticultural crop disease. To subscribe, go to [<http://www.plantmanagementnetwork.org/pub/trial/PDMR/about.asp>].

Biocontrol of Insects and Mites. *Biological Control of Insects and Mites, an Introduction to Beneficial Natural Enemies and Their Use in Pest Management* is now available. This book addresses biocontrol implementation, cost analysis, planning, and integrating biocontrol into an Integrated Pest Management (IPM) framework. Approaches can apply to invasive plant and plant disease control. Download the PDF file at [<http://learningstore.uwex.edu/pdf/A3842.pdf>]. (*Thanks to the NISC newsletter*)

New Book on Bee Colony Collapse Disorder (CCD). There is a new book on CCD, *Fruitless Fall: the Collapse of the Honeybee and the Coming Agricultural Crisis*, by Rowan Jacobsen. It is written for the general audience, but describes bee life cycles, the various bee species, and the various possible causes of CCD. (Bloomsbury, 245 pp, about \$25)

Delaware Proposes Exotic Animal Permit System DE has proposed regulations to establish a two-tier permit system for owning and selling exotic animals. The regulations cover reptiles and “wild” mammals “not native to or generally found in DE,” and ban the breeding on any exotic animal (including many considered as pets), outside of an accredited zoo. The regulations would require the state veterinarian to issue, deny and revoke permits and maintain a public list of animals that are exempt from permits. In addition, permit holders must provide primary and secondary lockable and escape-proof enclosures for the exotic animals. The animal’s owner or caretaker must immediately notify the Agriculture Department (DOA) and appropriate animal control agency of any escaped animal, and help in the animal’s recapture. Because permitted animals are not allowed to reproduce in captivity, only sterile animals and animals unable to reproduce may be kept in shared enclosures, and pet owners would need an individual permit for

each such “exotic” animal kept. Owners need to file permit applications within 10 days of acquiring the animal or moving into the state, and need to renew the permit every three years. Businesses selling animals would need to obtain an exotic animal sales permit for specific classes of animals (carnivores, herbivores, hybrids of wild mammals, omnivores, primates and reptiles). Applicant businesses would need to include an inventory identifying each animal stocked by the business at the time of application, by name, age, gender, breed, markings, approximate weight, and/or identification number (such as tattoo or microchip). All permit holders would need to notify the DOA immediately of any change in ownership of an animal, an exotic animal’s birth or death, or an escape of an exotic animal from its enclosure. The regulations do not specify permit fees, but the existing state law sets permit fees at \$25 and punishment for violations at no more than \$500 and 30 days imprisonment for each offense. The state accepted written comments on the proposed rule through Nov. 1, 2008. (*From PetProductNews.com, October 8, thanks to Aquatic Hitchhikers.*)

Ballast Water Regulation Report. The Congressional Research Service has issued a report on regulating ballast water discharges. It focuses on the differences between the legislative approach provided for Coast Guard Authorization Act, as passed by the House of Representatives, and the regulatory approach under consideration by the EPA. Go to: [http://assets.opencrs.com/rpts/RL34640_20080828.pdf] to obtain a copy of the report. (*Thanks to Stephen Phillips*)

New Zealand Mudsail Article: *Application of Household Disinfectants to Control New Zealand Mudsails*, by George J. Schisler et al. The New Zealand mudsnail, *Potamopyrgus antipodarum*, is expanding its invasion of the western US. Two disinfectants, antibacterial Formula 409 All-Purpose Cleaner and Sparquat 256, were compared as potential control agents. Snails were submersed for 5 or 10 min in one of two Formula 409 solutions (50% or 100%) or one of three Sparquat 256 solutions (1.6, 3.1, or 4.7%), with distilled water as the control treatment. Snail mortality at 48 hours and 56 days after exposure was evaluated. Findings suggest that the current recommendation (5-min application of 50% Formula 409) is not sufficient; half of the snails survived this treatment. In contrast, a 10-min exposure to 100% Formula 409 or to a Sparquat 256 solution of at least 3.1% resulted in 100% snail mortality. In addition to its effectiveness in controlling New Zealand mudsnails, Sparquat 256 has also proven useful as a disinfectant for whirling disease spores and other fish pathogens. (*Published Online: August 21, 2008 North American Journal of Fisheries Management 2008; 28:1172–1176.*)

Great Lakes Report. *Transportation Research Board special report #291, Great Lakes Shipping, Trade, and Aquatic Invasive Species; the Committee on the St Lawrence Seaway options to eliminate introduction of aquatic invasive species, option 2*, is now available. The report discusses the Saint Lawrence Seaway, impacts of aquatic invasive species on the great Lakes, ballast water, and options for management of the great lakes. Download the report at: [<http://onlinepubs.trb.org/Onlinepubs/sr/sr291.pdf>].

Native Biodiversity On Islands. A new article, *Species invasions and extinction: The future of native biodiversity on islands*, by Dov F. Sax and Steven D. Gaines discusses biodiversity and predation on islands. Although competition from exotic plants has caused few native plant extinctions, predation by exotic species has caused the extinction of many native animal species

on islands. Exotic plant addition to islands is highly nonrandom, with an almost perfect 1 to 1 match between the number of naturalized and native plant species on oceanic islands, and the authors evaluate several alternative implications of these findings. They show that the number of naturalized plant species has increased linearly over time on many individual islands, and the mean ratio of naturalized to native plant species across islands has changed steadily for nearly two centuries. These patterns suggest that many more species will become naturalized on islands in the future. They also discuss how dynamics of invasion bear upon alternative saturation scenarios and the implications these scenarios have for the future retention or extinction of native plant species. Read the whole *Scientific American* article at [<http://tinylink.com/?t9XGSphZSp>]. *Adapted from materials provided by the Ecological Society of America. Thanks to Robyn Draheim, PSU*

16th International Aquatic Invasive Species Conference. The 16th international conference will be held on April 19-23, 2009, in Montreal, Quebec, Canada. Early registration is available at a reduced rate (save \$50) until February 1, 2009. The conference will include a forum on bullfrog control and eradication. All participants should register for the conference via the website at [<http://www.icaais.org/>]. For more information on the bullfrog seminar, contact Stan Orchard at <bullfrogcontrol@shaw.ca>.

Pathways

Middle East Cockroaches Invade U.S. During the Iraq War. As the War in Iraq continues, a counter invasion has been arriving on U.S. soil. American military personnel have unknowingly been bringing back Middle Eastern cockroaches in their belongings and equipment, including the Turkestan cockroach, now settled in the southwestern part of the U.S., and the Madagascar hissing roach, the lobster roach and the orange spotted roach. [*Ed. Comment:* I wonder what else is/will be coming along for the ride embedded in tank tracks and vehicle wheels, when vehicles from the war return home. Is anyone even looking at this?](*From October 8 Discovery News*)

Himalayan Blackberry. You can thank Luther Burbank, “the father of modern plant breeding” for bringing a cultivar of this species to the U.S. in 1885 because he thought it would make a good backyard crop. He grew it in his home garden in Santa Rosa, CA, and birds and other animals then spread the seed along the West Coast. He wrote, “Its popularity was so great that for several years the plants could not be multiplied fast enough to meet the demand. It is a plant of extraordinary vigor.” The OR Department of Agriculture would agree with the vigor part, at least. They state Himalayan blackberry *Rubus armeniacus*, is “the most widespread and economically disruptive of all the noxious weeds in western OR. It aggressively displaces native plant species, dominates most riparian habitats, and has a significant economic impact on right-of-way maintenance, agriculture, park maintenance and forest production.” [*Ed comment:* the moral of the story is that a lot of non-natives may seem really nice to propagate in the beginning, but we need to look ahead to possible impacts.) (*Excerpted from Green Light: Sustainable puzzles explained, by Jennifer Anderson, Pamplin Media Group, Sep 11, 2008*)

Natural Disasters Spread Invasive Species. Flooding of the Mississippi River in the 1990s caused spread of bighead and silver carp from aquaculture farms. Then in 2005, Hurricane Katrina left New Orleans with a devastated landscape that facilitated the invasion of terrestrial

weeds. Now in Myanmar (formerly Burma) a tidal surge caused by Cyclone Nargis submerged 783,000 ha (about 2000 acres) of rice paddy, resulting in an explosion of unidentified freshwater snails. The snails have devastated rice fields by feeding on the base, leaves and stems of rice seedlings, consuming the young plants overnight. Normally farmers have controlled pests by hand removal, but given the numbers, and lacking governmental assistance, farmers resorted to a pesticide- although they apparently did not know either the name of the snail or the pesticide, or the active ingredient in the pesticide. The result: crab and fish kills, but it didn't seem to be very effective against the snails. [*Ed comment*: There are several lessons here! Assume natural disasters may precipitate invasions, and be alert for them; learn the name and biology of the species you are dealing with before attempting treatment; and be sure you know the name, ingredients, and registration of any herbicides or pesticides before using chemical controls.] (*From a September 27 article, UN Office for Coordination of Humanitarian Affairs.*)

Felt-Soled Waders (Update). In an ongoing effort to help stop the spread of Aquatic Nuisance Species throughout America's rivers and streams, in September Trout Unlimited (TU) asked angling product manufacturers to stop producing felt-soled waders and shoes by 2011. TU hopes to raise awareness of anglers and other users through this announcement.

New Zealand Fish and Game *has already banned* felt soled waders, and there is a maximum \$5000 fine for those found wearing the boots. The move is not going to be popular with anglers but was needed to keep the highly invasive didymo algae from local rivers. Research showed live didymo cells could exist in the core of felt-soled boots for many months without treatment. The only way to treat felt-soled boots was to either freeze them solid or to soak the boots in water at 45C for 40 minutes. Most anglers are not geared to treat their boots to the required level if they are fishing a number of different water bodies over a short space of time. There were plenty of good alternatives to the felt soles available, including replacing soles. (*From Hawke's Bay Today article, October 7, by Joe Dawson*)

IMO Ballast Water. The MEPC adopted guidelines for ballast water sampling and revised guidelines for approval of ballast water management systems, intended to assist in the effective implementation of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention), bringing to 14 the package of finalized guidelines required by the Convention. One final set of guidelines, on port State control, is being developed by IMO's Sub Committee on Flag State Implementation and is to be adopted before the Convention's entry into force. The Committee also approved the Guidance document on arrangements for responding to emergency situations involving ballast water. The MEPC gave final approval to two ballast water management systems that make use of active substances, bringing to four the total number of systems having received final approval to date. To date, 16 States have ratified the BWM Convention, adopted in February 2004, representing about 14.24% of the world's merchant shipping. In accordance with article 18 of the BWM Convention, the treaty will enter into force twelve months after the date on which not less than thirty States, the combined merchant fleets of which constitute not less than thirty-five percent of the gross tonnage of the world's merchant shipping, have become Parties to it. The Committee urged other States to ratify the Convention at the earliest opportunity. (*Thanks to Mike Moore*)

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