



ISSUE 34

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AQUATIC INVASIVE SPECIES NEWS IN A NUTSHELL

Joan Cabreza, Editor

This newsletter focuses primarily on Western U.S. and aquatic issues, but it also contains terrestrial, national, and international news of interest. Contents do not necessarily reflect views of the PSMFC. We welcome questions, comments, and news items; to submit these, or to subscribe/unsubscribe, contact the Nutshell editor at <joancabreza@msn.com>. For past Nutshell issues 1-33, go to [<http://www.aquaticnuisance.org/newsletters>].

[This Quarter's Unusual News](#)

Whac-A-Mussel. Fishermen at the February Bassmaster Classic Expo in LA pounded out their fight against aquatic invasive species with a new interactive outreach tool: Whac-A-Mussel. It plays just like the arcade classic Whac-A-Mole, but instead of moles, zebra mussels pop up the holes and people "mash the mussels".



At the same time, they learn how they can Inspect-Clean-Dry their gear to stop the spread of invasive mussels and other aquatic nuisance species. "Invasive species education is critical," said Teeg Stouffer, Recycled Fish Executive Director. "But say the words 'Invasive Species Education' to people, and watch their eyes glaze over. This is a learning tool that is fun, dynamic, engaging and interactive." Whac-A-Mussel was funded by partnership support from DICK'S Sporting Goods, The Mississippi River Basin Panel on Aquatic Nuisance Species, Fishhound, Recycled Fish, and Clean Angling. Rental and purchase information are now available at [<http://www.cleanangling.org/WhacAMussel.htm>]. All orders will be processed by Recycled Fish. For more on Recycled Fish and their work to engage, educate and equip anglers go to [<http://www.recycledfish.org/>].
(Thanks to Bob Wiltshire)

♪ [Successes & Lights at the End of the Tunnel](#) ♪

New Zealand's Invasive Ants Mysteriously Vanish. The Argentine ant (*Linepithema humile*), one of the world's worst invasive species, is disappearing from New Zealand without any human intervention. The alien ant arrived in New Zealand in 1990, and has since marched across both of the nation's main islands. Control was projected to cost NZ\$68 million per year. But Phil Lester at the Victoria University of Wellington says that alien ant colonies in 60 locations are collapsing on their own. He thinks low genetic diversity, which is associated with reduced disease resistance, is the most likely the reason for the ant's decline. (Almost verbatim from 'New Zealand's Invasive ants mysteriously vanish', in *Protect Your Waters.net*, December 19).

LTS: Faster, More Cost-Effective eDNA Detection. A new technique called laser transmission spectroscopy (LTS) is capable of rapidly determining the size, shape and number of nanoparticles in suspension. In a new paper appearing in the international, peer-reviewed, open-access, online publication *PLoS ONE*, Notre Dame Physicists Carol Tanner and Steven Ruggiero describe how they used LTS as a new method for detecting species-specific DNA, to differentiate an invasive species from a closely-related sister species. They are using environmental DNA (eDNA) as part of their Asian carp surveillance in the Great Lakes region. The LTS technique has many benefits over established DNA detection techniques; it is highly sensitive and takes only a few seconds to genetically score a sample for species presence or absence. Researchers feel that LTS will prove much more rapid, practical and cost effective than current detection methodologies, and could ultimately reach the sensitivity required to eliminate the need for polymerase chain reaction (PCR) amplification. Although the paper describes the use of LTS as invasive species detection, the researchers believe the technique could also serve as an important tool in detecting human pathogens and indicating the presence of genetic diseases such as cancer. (*Excerpted heavily from Physorg.com, December 16, provided by University of Notre Dame.*)

New Hope to Save Hemlock Trees. The hemlock woolly adelgid (*Adelges tsugae*) first appeared in the eastern U.S. in Richmond, VA, in 1951, and is rapidly killing off Eastern hemlocks. In 2003, it crossed the river from South Carolina to Georgia trees. Georgia trees decline faster than those in northern states, where winter weather kills back adelgid populations. The adelgids suck cells from the tree's needles, preventing them from transferring water and conducting photosynthesis. The first obvious sign of an infestation is thinning foliage. Needles fall off, the crown starts thinning, and from a distance, trees look gray. A new University of Georgia study published in the December issue of the *Journal of Economic Entomology* offers hope for more successful future control. "Because the trees being attacked are mostly in remote forests where insecticide application is impractical, predators may be the best hope for tree survival," said author Shimat Joseph. "Previous studies have shown that widely released predator beetles, *Laricobius nigrinus* and *Sasajiscymnus tsugae*, have been successful in controlling adelgid populations, but they have not survived well through multiple seasons." Strategic placement of the beetles is important for successful control of the adelgid (and for the bottom line). Adelgid populations are not concentrated where we are releasing the predators," Joseph said. "Previous studies assumed adelgid populations are evenly distributed, but we are seeing that is not the case." Adelgid populations tend to be more abundant in the upper crown, especially early in the infestation. Previous beetle releases have been made in the lower third of the tree crown; this study suggests releases should focus in this area where higher densities are more likely. "Chemical control can slow the spread of adelgids, but beetles provide some hope that we will be able to manage the adelgids and bring them into balance [but] we may never be able to eliminate them," said paper co-author Kris Braman, an entomologist with the UGA College of Agricultural and Environmental Sciences. "Part of the problem with maintaining predator beetles has to do with the declining tree health," said study co-author Jim Hanula, a USFS entomologist. "As tree health declines, adelgids produce fewer eggs and, in turn, [they are] less food for the beetles." (*Excerpted from Science Daily, January 10, 2012*)

Pet Amnesty Day. The West Palm Beach, Florida, Garden Club held the city's first-ever Pet Amnesty Day in January. The event gave owners of non-native and invasive pets an opportunity to turn in their animals with no penalty and no questions asked. "Especially with the larger snakes, the more we can prevent from being let loose in the wild, the better," said Lisa Jameson, an invasive species biologist with the USFWS. The event was also an opportunity for 34 individuals who signed up in advance to adopt one or more of the 94 animals that were voluntarily surrendered. (*Excerpted from a story by Brandon Kruse in the Palm Beach Post, January 17*)

[*Ed Comment: What a great idea! It's good for the environment, and one of the few ways that 94 invasive pets can also have a happy ending. We need more of these amnesty days!*]

[Around The U.S. West Coast](#)

Curly leaf Pondweed Infests Flathead Lake. Following a report of Eurasian water milfoil in Eagle Bend Yacht Harbor (MT), a survey found no traces of water milfoil, but led to the discovery of large quantities of curly leaf pondweed (*Potamogeton crispus*) in the harbor and surrounding waterways. Pondweed has spread into every state except ME, SC, AK and HI. It consists of a thin stem with alternating blue-green leaves, with turions, or hard pinecone-like buds, which form in spring, fall off the plant, and are carried by water currents to new locations. An infested boat launched in the Eagle Bend harbor is the most likely the mode of introduction into Flathead waters. Eric Hanson of the Flathead Aquatic Invasive Species group said the survey showed pondweed is heavily infested (i.e., comprises 40 percent of the plants) in the Eagle Bend harbor and channel. Patches were also found along the Flathead River bottom, in Fennon Slough, in two places in Flathead Lake, and along a seawall outside of Bigfork. “We’re guessing it’s been in the yacht harbor between five and seven years,” Hanson said. “Right now the infestation is really small...it’s cost-effective and we can eradicate it.” Eradication would take two to three years and cost around \$50,000. But with no control, in a couple of years, the pondweed could spread to as much as 100 acres of Flathead’s waterways.

A plan of action still need to be determined, but the harbor, channel, river and lake will all be attacked differently. There are many options. Since the harbor and channel are so heavily infested, mechanical dredging and/or application of an herbicide targeting the pondweed, are the only options. Herbicide can specifically target curly leaf pondweed, but there can still be some residual effects among other aquatic plants. Mechanical dredging essentially scrapes the all the dirt and muck off the bottom so it can be sucked up to the surface with a vacuum. Dredging pulls out both good and bad plants, but it can be directed. Another option is to put a barrier across the entrance to the lake and then place herbicide in the channel. In the lake, river and slough, where patches are spread out and not as thick, hand dredging using divers to hand-pick the plants, which are then vacuumed to the surface, or laying down mats to smother the plants, are viable options. (*Excerpted from ‘Aquatic invasive species creeps into Flathead Lake’ by Camillia Lanham in the Bigfork Eagle, February 29.*)



New WA Aquatic Noxious Weed Permit Issued. The WA Department of Ecology has issued a new Aquatic Noxious Weed Control NPDES permit, to the WA Department of Agriculture, and licensed pesticide applicators can apply for “limited agent status” under this permit at no cost. It became effective February 17, 2012. There are two main changes to the new permit. First, it now only covers herbicide application to emergent weeds or weeds near water where herbicide may indirectly enter the water; previously, the permit also covered direct application to water in rivers and streams. This change also simplifies the notification and posting requirements. Second, it adds five new chemicals to the approved aquatic herbicide list, more than doubling the number of chemical tools available for emergent weed control. In addition to the previously approved chemicals (2,4D, Glyphosate, Imazapyr and Triclopyr TEA), the permit adds Bispyribac-sodium (e.g. Tradewind™), a broad-spectrum systemic herbicide; Carfentrazone-ethyl (e.g. Stingray™), a contact herbicide; Flumioxazin (e.g. Clipper™), a contact herbicide; Imazamox (e.g. Clearcast®), a broad spectrum systemic herbicide; and Penoxulam (e.g. Galleon SC™), a broad spectrum systemic herbicide. For more information, or to read the final noxious weed control permit, go to the Ecology website: [http://www.ecy.wa.gov/programs/wq/pesticides/final_pesticide_permits/noxious/noxious_index.html]. (*Thanks to King County Weed News, March, 2012*)

CA Newsletter. California Department of Fish and Game has a nicely done new quarterly newsletter, *Eye On Invasives*, dedicated to relaying new and important information related to invasive species in CA. Check out the third issue at [<http://www.dfg.ca.gov/invasives/>]. (*Thanks to Susan Ellis*)

WA ISC Annual Report. The 2012 Washington Invasive Species Council annual report is available at [<http://www.invasivespecies.wa.gov/documents/2011%20Invasive%20Species%20Council%20Annual%20Report.pdf>]. (*Thanks to Wendy Brown, OISC*)

OR ISC Annual Report. The 2011 Oregon Aquatic Invasive Species Program report is now available at [http://www.boatoregon.com/OSMB/Clean/docs/AISPP_2011_Annual_Report_Final.pdf?ga=t]. (*Thanks to Glenn Dolphin, OSMB*)

Portland Invasive Species Strategy. The new City of Portland Invasive Species Strategy and other documents are available at [<http://www.portlandonline.com/bes/index.cfm?c=47815&>] (*Thanks to Dominic Maze*)

MT 2011 AIS Summary Report. The 2011 Montana Department of Agriculture's AIS Summary for 2011 is now available at [http://agr.mt.gov/agr/Producer/Weeds/PDF/2011_MDA_AIS_Annual_Summary.pdf]]

OR Firewood Rulemaking. On March 15, the Oregon Department of Agriculture held a hearing on Proposed Rulemaking to establish treatment and labeling requirements for firewood imported from outside the Pacific Northwest. The purpose of this proposed rule is to prevent the introduction of wood boring pests and plant diseases such as emerald ash borer, Asian long horned beetle, and sudden oak death, which may be brought in with imported firewood. The rule would require that firewood imported from outside the Pacific Northwest (defined as OR, WA, ID) be heat-treated at 56⁰ C (133⁰ F) for 30 minutes and labeled as "Approved Pest-Free." Violators would be subject to civil penalties, ranging from a Notice of Violation to a \$10,000 fine, depending on the severity of the infraction. (*Thanks to Tristan Berg, ODA*)

ID Strategic Plan 2012-2016. A joint project between the Idaho Invasive Species Council and the Idaho Weed Coordinating Committee has produced an aquatic/terrestrial "all taxa" strategy, blending the 2005 Idaho Action Plan for Managing Noxious Weeds with the 2005 Idaho Action Plan for Invasive Species. The 2012-2016 Strategy aims to build off of the successes achieved with the 2005 plans and develop an "all taxa" blueprint for where they are headed in the next 5 years. See the plan at [<http://www.agri.idaho.gov/Categories/PlantsInsects/NoxiousWeeds/Documents/Idaho%20Invasive%20Species%20Strategy%202012-2016.pdf>]. (*Thanks to Amy Ferriter, IDA*)

OR Department of Agriculture Rule Updates. The following rule changes became effective March 20, 2012:
* OAR 603-052-1230: Amended to expand the *Phytophthora ramorum* (sudden oak death) quarantine boundary. With the expansion of the quarantine, it is proposed to define disease-free and generally-infested areas within the quarantine. Provisions are proposed that would allow use of tanoak logs and firewood from disease-free areas.

* OAR 603-052-0115, 603-052-0116, 603-052-0118, 603-052-0126, 603-052-0150, 603-052-1025: Amended to update six rules: Blueberry Maggot Quarantine (clarifies that fumigation with a labeled product is an acceptable option without a Director's exemption); Peach Yellows Phytoplasma (removes Alabama and West Virginia, adds Ontario, Canada, and updates the host list); Peach Rosette Phytoplasm (updates host list); European Corn Borer (replaces out-of-date prescriptive fumigation instructions with a requirement to fumigate according to the label instructions); Cherry Fruit Fly (corrects title); Small Broomrape (corrects host list.)

* OAR 603-052-0117, 603-052-0201, 603-052-0206, 603-052-0207, 603-052-0208, 603-052-0209, 603-052-0334, 603-052-0800: Repeals (deletes) four regulations: 603-052-0117 (Quarantine Against Peach Latent Mosaic Viroid); 603-052-0201 to 0209 (Umatilla County Control Area); 603-052-0334 (Union County Mint Control Area and Procedures); and 603-052-0800 (Rust-Resistant Varieties of Barberry, Mahonia, and Mahoberberis). The Peach Latent Mosaic quarantine was adopted in 1974. This viroid is now widespread in U.S. orchards including in the Pacific Northwest. The Umatilla County Orchard Pest Control Area was also

adopted in 1941. The complicated boundaries make it impossible to enforce, and a local ordinance makes it redundant. Verticillium wilt has been found in Union County since 2005. The quarantine is no longer scientifically valid. The Oregon Barberry rust statute was repealed in 2009, but Federal regulations remain in place. (Thanks to Tristen Berg, ODA)

'Threats To The West' Update. The long-awaited updated *Threats to the West* brochure (by the Western Regional Panel on Aquatic Nuisance Species) has been completed. This new version is similar to the original but has updated references, a new mix of profiled species to reflect more recent invasions, and short new sections on microscopic invaders and high risks on the horizon. The new version will eventually be posted on the website at [<http://www.fws.gov/answest/Threatstothewest%20revised.pdf>]. For more information on the brochure, contact <Joanne_Grady@fws.gov>.

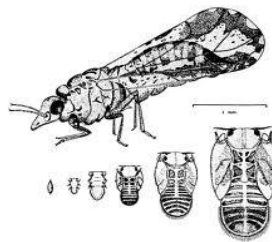
OR iMapInvasives Site Upgrade. The Oregon iMapInvasives team has announced the release of version 1.7. This new version includes:

- * "Repeat" observation data entry (makes life easier for those entering lots of data at once; after entering the first observation, select "Submit Another" and your selections will be saved for the next one, ready for you to change the location, species, or date.)
- * A Quick Search feature on the user map (to find species points and zoom to locations, and search boxes on the data entry maps to quickly navigate to the area of interest.)
- * More documents added to the Resources tab (such as field forms for Survey and the Invasive Plant Management Decision Analysis Tool);
- * A new Survey type: Terrestrial Simple (ideal for volunteers searching in a defined area, such as a campground or town park), and
- * A modified, simpler, interface for survey and treatment. (The same data fields are still there; click the "Additional Information" arrow to expand everything.)

Visit iMap at: [<http://www.imapinvasives.org/orimi/map/>] (Thanks to Lisa DeBruyckere, OISC)

Release of Oregon's WeedMapper 2.0. On April 1, 2012, Oregon's all-new version of WeedMapper went live at [www.weedmapper.oregon.gov]. WeedMapper 2.0 is an interactive platform utilizing Arc GIS Explorer technology to access multiple layers, base maps, printable maps, and data queries, and it has data exportability. ODA has concurrently been cleaning and standardizing all of the previously collected data in the WeedMapper program. This statewide standardized data is available to anyone from the website. Risk prediction maps will also be available as a layer. To maintain a useful database, ODA is continuing their annual request for data. For more information, or to contribute data to WeedMapper, contact Alexander Park, <apark@oda.state.or.us>. (Thanks to Shannon Brubaker)

CA Asian Citrus Psyllid Control. In December, the UC Riverside Center for Invasive Species released 281 parasitic stingerless wasps (*Tamarixia radiata*) as part of a region-wide effort to arrest the spread of Asian citrus psyllids (ACP) (*Diaphorina citri*). ACP was first found in Florida in 1998, and then 10 years later, appeared in California, where it now poses a major threat to the \$1.1 billion citrus industry. The psyllid is an aphid-like insect that feeds on the leaves and stems of citrus trees and other citrus-like plants. But the real



danger it poses is that it can carry an incurable, deadly, bacterial tree disease called Huanglongbing (HLB), also known as Citrus Greening Disease, which causes citrus trees to wither and die. In the past few years, psyllids have been trapped in citrus fields throughout the Inland Empire, as well as Los Angeles, San Diego and Ventura counties. Psyllids originate in the tropical and subtropical regions of South America and south Asia, and the wasp, which originates in the Punjab region of Pakistan, is their natural enemy. The wasps lay eggs in psyllid nymphs, and when the eggs hatch, they eat the nymphs, killing them. Commercial CA citrus producers will still need to take precautions against the psyllids, applying insecticides to prevent the spread of HLB when signs of the disease emerge, but the application frequency may be reduced because of *Tamarixia*. (Excerpted from 'US Riverside researchers try new method of combating citrus-killing insect', in the December 20, 2011, Valley News.) To see 5 videos on the psyllid, go to [<http://www.cdfa.ca.gov/plant/acp/video.html>].

Longview (WA) Nutria Battle... There is some good news in Longview, WA, because it's nutria-trapping season for Longview Diking District, but the nutrias (*Myocastor coypus*), whose burrows undermine the city's flood-control system, are scarce this year. Less than a decade ago, it wasn't unusual for the licensed trapper to catch 50 or 60 in one day, and by the mid-1990s, the diking district was spending nearly \$60,000 a year on trapping. Now if the trapper traps a dozen in a week, "he's doing really good [sic]," said Dan Finn, operations foreman for Consolidated Diking Improvement District No. 1. So far this year, the trapper has caught just 61 nutria, a sharp drop from 592 caught in 2005. This year the district has budgeted only \$10,000. In the 1940s, thousands of the large, semi-aquatic rodents were released into the wild, after attempts to create a profitable nutria fur industry failed. South American natives, nutria are prolific, year-round breeders. They become sexually mature as young as three or four months old, and in one year a female can deliver two large litters and be pregnant with a third. They reach about two feet long and 12 pounds at maturity, and eat about 25 percent of their body weight daily. They damage marshlands by eating native plants, and turning vegetated areas into open waters. They also feed on farm crops and burrow into and undermine riverbanks, dikes, and roads, with their large dens, which can be six feet across. The nutria problem has now gotten so enormous that last year Congress introduced a bill to provide federal funding for nutria eradication and wetlands restoration in LA, DE, NC, VA, OR and WA. (Excerpted from 'Longview ahead of the pack in controlling the non-native nutria' by Amy Fischer, in *The Daily News Online*, March 6, 2012)

A Nutria's View of the Nutria Battle... There is a cute and interesting video that gives a nutria's point of view on his unpopular status. It also provides us a look at how the public might see the invasive species issue. And there are a large number of interesting comments posted with the video as well. See it at [http://www.nytimes.com/2012/03/20/opinion/hi-im-a-nutria.html?_r=1&nl=todayshadlines&emc=edit_th_20120320]. (Thanks to Joe DiVittorio)

Western Zebra/Quagga Mussel News



[*Ed. Comment: Considering that zebra mussels have been such big news for years, and so much effort has been expended on outreach, some interesting points of view have surfaced out there this quarter. First I read about zebra mussels being different than native mussels because "they have tentacles to hang onto things". This was followed a day or so later by another article where a local official is quoted as saying "This is new- no one really knows about these things". Sigh....]*

New Mussel Education DVDs Available. The PSMFC has produced a new two-part high definition video on DVD to replace the original 2008 video by the same name. The new 72 minute DVD includes a 44 minute information and education video that addresses the origin, life history, distribution, transport vectors, impacts, and issues surrounding the invasion of Dreissenid mussels in North America in an updated and more comprehensive manner than the earlier version. The DVD also includes a 28 minute watercraft and equipment inspection and decontamination training video incorporating the latest protocols, standards and science relating to watercraft and water-based equipment interception. The two videos can be shown separately. Portions of the DVD were filmed in the Colorado, Missouri and Columbia River basins and the Great Lakes. For more information on the video, contact Bill Zook at <bjzook2@msn.com>. To order a copy, email <sanderson@psmfc.org> and provide your shipping address. The two remade videos are now also online. See "*Don't Move A Mussel 2011*" at [<http://www.youtube.com/watch?v=4uLKK09TljI>], and see "*Inspection & Decontamination 2011*" at [<http://www.youtube.com/watch?v=JX8TmwTx-tU>].

NM Infestation? On April 1, the Farmington Daily Times (NM) reported: "Last year, biologists did frequent tests for the zebra and quagga mussels in Navajo Lake [NM]. In the fall, the Bureau of Reclamation found trace elements of juvenile quagga mussel DNA in a laboratory, though the test findings were inconclusive", said Mike Sloane, the division chief of fisheries management for New Mexico Game and Fish. "The test is prompting the department to do weekly testing for the invasive species at the lake beginning in May, and "There have been inconclusive tests of the mussels in Navajo Lake and Lake Sumner Sloane [See Nutshell #32] in New Mexico," Sloan said. For the full article please go to [http://www.daily-times.com/ci_20299932/navajo-lake-may-be-invaded-by-mussels]

2012 ID Infested Boats Interceptions. Idaho began opening stations in early February. Through April 11, the State of Idaho had intercepted **eleven** zebra/quagga mussel contaminated watercraft at its watercraft inspection stations and Ports of Entry. Five of the boats have been from the Great Lakes and six from the Lower Colorado River. For further information on the Idaho Department of Agriculture's watercraft inspection program and up-to-date information on number of inspections, go to <http://www.idahoag.us/Categories/Environment/InvasiveSpeciesCouncil/indexInvSpCouncil.php>

CO Reports Two Boats Intercepted. Colorado Parks and Wildlife reported that two fouled boats have been intercepted, to date -- Chatfield State Park in Littleton, Colorado (April 7) and at Pueblo State Park in Pueblo, Colorado (April 10, this boat originated from the Wisconsin side of Lake Michigan). (*Thanks to Elizabeth Brown*)

Federal Funds for Quagga Battle: All indications are that the majority of the \$1 million appropriation in the FY 2012 Department of Interior Budget for "implementation of mandatory operational inspection and decontamination stations at Federally-managed or inter-jurisdictional water bodies considered to be of highest risk", is expected to go to assist Lake Mead National Recreation Area. The Lower Colorado River (Mead, Havasu and Mohave) has been a source of contaminated watercraft for the past 5 years and numerous states and groups have been seeking solutions to the resolve the issue. For background, see the article in the Columbia Fish & Wildlife Bulletin "*Northwest States Want Tougher Boat Inspections At Lake Mead To Reduce Threat Of Quagga Mussels*" at [<http://www.cbbulletin.com/416427.aspx>].

More Texas Lakes Infected? Zebra mussel DNA has now been found in several North Texas lakes. The most recent tests (in October), found low levels of zebra mussel DNA in Eagle Mountain, Lewisville, Ray Roberts, Arrowhead, Bridgeport and Caddo Lakes. Mussels were previously found in Lake Texoma and Sister Grove Creek, which feeds into Lake Lavon. They were presumably brought into Lake Texoma by boat, possibly as early as 2006. For scientists, the threshold for establishing a colony is uncertain. Despite the lack of firm sightings, the Tarrant Regional Water District board has approved spending \$683,000 to study ways to prevent

zebra mussels from clogging the \$2.3 billion Dallas pipeline being built to bring more water from East Texas, and to study ways to modify existing pipelines and intake valves to ward off the mussels. David Marshall, water district's engineering services director, said "We're planning for the inevitable. If we don't plan for it and have to retrofit, it would be really expensive. And once it's in your lakes, it is really hard to control." (*Excerpted from 'Zebra mussel DNA confirmed in several North Texas reservoirs', by Bill Hanna in the March 6 Star Telegram.*)

MDNR Sued Over Spread of Zebra Mussels. Three Minnesota lake associations and a number of concerned individuals filed suit in Carver County against the Commissioner of the Minnesota DNR, alleging that he has failed in his statutory requirement to establish a program to prevent the introduction of zebra mussels into Bavaria, Christmas, and Lotus lakes. The suit also alleges that the Commissioner's permission to launch uninspected watercraft at these three lakes is likely to cause their pollution, impairment, or destruction. "There are proven, scalable, cost-effective solutions to stop the spread of zebra mussels and other invasive species, but the Commissioner has not allowed them to be implemented," said Joe Schneider, President of the Christmas Lake Homeowners Association. "The DNR's statewide aquatic invasive species prevention program continues to fail and unless something is done, every popular lake will get every new invasive species." While the DNR hopes the 2012 legislative session will formally endorse a solution similar to that defined in this injunction, there is little hope that it could be put in place in time to protect the public waters of Minnesota for the 2012 boating season. (*Excerpted from 'Zebra mussel lawsuit: DNR prevention program 'continues to fail', in the ChanhassenVillager, March 20, 2012*)

Convicted. In early March, a Fargo, ND man was convicted of introducing zebra mussels into Rose Lake in MN's Otter Tail County. George Wynn, 54, pleaded guilty to a misdemeanor charge of introducing an invasive species, and was ordered to pay \$500 restitution plus \$500 in fines and fees. "The \$500 in restitution hardly begins to cover the costs of treating Rose Lake last October," said Dick Hecock, president of Becker County Coalition of Lake Associations. Hecock said the court's settlement with Wynn is an indication of why the Legislature should enact stiffer penalties for violating the aquatic species laws. The Department of Natural Resources estimates it will cost more than \$18,000 to treat Rose Lake, and there is no guarantee the treatment will prevent zebra mussels from spreading in Rose Lake or any other lake downstream in the Otter Tail River chain. "This offender got a slap on the wrist.... Minnesota taxpayers got the treatment bill," Hecock said. (*Excerpted from 'Fargo man convicted of introducing zebra mussels to Otter Tail County lake' March 2, in the Grand Forks Herald*)

EPA Approves Dry Formulation of Zequanox. In September, 2011, EPA approved the active ingredient in Zequanox. On March 13, 2012, Marrone Bio Innovations Inc. (MBI) announced that the EPA has now approved a dry formulation of Zequanox®. Zequanox is composed of dead cells from a naturally-occurring microbe (*Pseudomonas fluorescens*) found in soil and water bodies, and it has been proven to be lethal to zebra and quagga mussels without harming humans, infrastructure, non-target species, or the environment. It is currently used for controlling invasive mussels within enclosed systems and infrastructures, and it claims 80 percent efficacy in controlling adult mussels and 90 percent in juveniles. Sarahann Rackl, of Marrone, says they anticipate future regulatory approval for its use in more natural settings. (*Excerpted from a Marrone Bio Innovations Inc. press release March 13, and personal a communication, April 2.*)

Utah's 2012 Quagga/Zebra Mussel Report Now Available. The 2011 Utah boating season report, released in Jan. 2012, is divided into 6 segments. Download all or part of the report as follows (Thanks to Larry Dalton):

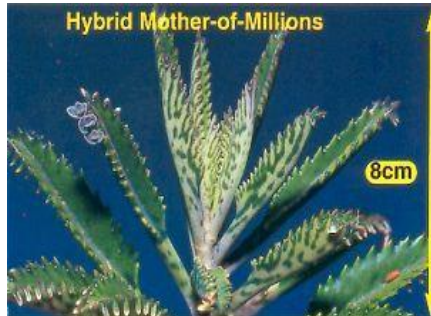
- * statewide summary (http://wildlife.utah.gov/mussels/PDF/ais_summary_annual_2011.pdf),
- * northern region (http://wildlife.utah.gov/mussels/PDF/Northern_Region_ais_summary_2011.pdf),
- * central region (http://wildlife.utah.gov/mussels/PDF/Central_Region_ais_summary_2011.pdf),
- * southern region (http://wildlife.utah.gov/mussels/PDF/Southern_Region_ais_summary_2011.pdf),
- * northeastern region (http://wildlife.utah.gov/mussels/PDF/Northeastern_Region_ais_summary_2011.pdf) and
- * southeastern region (http://wildlife.utah.gov/mussels/PDF/Southeastern_Region_ais_summary_2011.pdf).

Unexpected Interactions

Invasive Plant Protects Lizards From Invasive Toad. Research published in the March issue of *American Naturalist* shows an invasive plant may have saved an iconic Australian lizard species from death by toxic cane toads, another invasive species. Cane toads (*Bufo marina*) were introduced into Australia in the 1930s to control beetles that destroy sugar cane crops, but they quickly became an ecological disaster of their own. The toads produce toxins which have proven deadly to many native species that feed on frogs and toads, and after the toads arrived in northern Australia, bluetongue lizards (*Tiliqua scincoides scincoides*) began to shrink significantly in numbers. But bluetongue populations elsewhere in Australia will likely do better. Richard Shine, study research leader at the University of Sydney, said some lizard populations were found to be vulnerable to the bufotoxins while others were not, and some of the high tolerance populations had never been exposed to toads. Why would these populations have evolved a tolerance to the toad toxin when no toads were present? Shine and colleagues believe the answer is likely an invasive plant species known as mother-of-millions (*Bryophyllum delagoense*), which produces a toxin virtually identical to that of the cane toad. After it was imported from Madagascar as a decorative plant some 70 years ago, mother-of-millions spread widely in



The GOOD...



The BAD...



... And the UGLY

parts of Queensland and New South Wales, and it has become part of the local bluetongue diet. Shine's team collected bluetongues from places both with and without mother-of-millions, and injected each of them with a tiny amount of cane toad toxin. They found that toads from places where mother-of-millions is common had less of a reaction than those from places where it was absent. The results suggest that the plant drove strong selection for lizards that could tolerate bufotoxins- a remarkable example of evolution within only 20-40 lizard generations. "It appears we now have a population of eastern bluetongue lizards that are able to defend themselves well against cane toads, even though they've never actually met one, whereas the devastation of the cane toads on the northwestern lizard population continues," Shine said. "Eating this plant has pre-adapted the eastern blueys against cane toad poisons." Australia has spent millions trying to deal with the toads and mitigate their ecological impact, but Shine suggests they may now be able to focus conservation dollars on those populations less able to care for themselves. (*Excerpted from ScienceDaily, February 22*).

Chinese Mussel Turns Parasites Into Hosts. A study published February 15, in *Biology Letters*, finds an invasive mussel has caused a complete ecological role reversal, turning a host into a parasite and vice versa. Martin Reichard and colleagues at the Institute of Vertebrate Biology in the Czech Republic have focused their research on ecosystems involving the European bitterling (*Rhodeus amarus*), a small, pale-silver freshwater fish that lays eggs in the gills of native mussels. The mussels release their own larvae into the water, where they colonize and develop on fish, including the bitterling. Both the bitterling and the mussels have evolved mechanisms to resist the other: in some sites throughout the world, one or other may prevail, while in other areas, they develop a mutual relationship. Several years ago, the team began working at a Polish site invaded by a Chinese mussel species, *Anodonta woodiana* (from the same family as the native mussels), to determine

how the bitterling and the native mussels were affected by the invading mussel. European bitterling usually have the advantage, laying their eggs in native mussels and resisting colonization by the mussel larvae. But at the Polish site, the invasive mussel ejected bitterling eggs laid in them. The bitterling's "reproductive output was zero", says Reichard. The Czech bitterling would not lay eggs in *A. woodiana*, always choosing to lay them in the native species. But although the fish managed to resist colonization by native mussel larvae, they were successfully exploited by *A. woodiana* larvae. "This invasive species basically reversed the host-parasite relationship completely," says Reichard. Bitterling interactions with *A. woodiana* differ between the Czech and Polish sites, suggesting that the two *A. woodiana* populations are at different stages in their co-evolution with the fish, says Reichard, perhaps because the invading mussels came from different source populations. (Excerpted from 'Invasive species turns parasites into hosts', by Jessica Marshall, in *Nature.com*, February 15, 2012.)

Earthworms Blamed for Ovenbird Decline in Midwest Forests. A new paper published online in *Landscape Ecology*, links a recent decline in ovenbirds (*Seiurus aurocapilla*), a ground-nesting migratory songbird in northern Midwest forests, to earthworms. The survey, conducted by Scott Loss of the University of MN, the Smithsonian Migratory Bird Center in MN's Chippewa National Forest, and WI's Chequamegon-Nicolet National Forest, has shown a direct link between the presence of invasive European earthworms (*Lumbricus spp.*) and reduced numbers of ovenbirds in mixed sugar maple and basswood forests. The worms are invading previously earthworm-free hardwood forests in North America and consuming the rich layer of leaf litter on the forest floor. In turn, herbaceous plants that thrive in thick leaf litter, and that provide cover for ground-nesting birds, are thinning out, replaced by grasses and sedges. So ovenbird nests are more visible and vulnerable to increased predation by squirrels, birds, and other predators, and ovenbirds searching for nesting sites reject these low-cover areas outright. Areas of reduced leaf litter also contain fewer bugs for the ovenbirds to eat, requiring them to establish larger territories, resulting in fewer birds over a given area.

The worms followed the first European settlers arriving in the U.S., inadvertently brought over in ship ballast and root balls of agricultural plants, or even on purpose for use in gardening. Now the leading edge of their continued invasion is reaching interior wilderness areas such as the remote forests of Wisconsin and Minnesota. Loss says, "Everyone has probably heard ... that earthworms have really positive effects in breaking down soil and making it more porous, [and] this is true in agricultural and garden settings, but not in Midwest forests, which have developed decomposition systems without earth worms." Because the forested areas of the Midwest U.S. were once covered in glaciers, there are no native earthworm species present in the soil. "These earthworm-free forests developed a slow fungus-based decomposition process characterized by a deep organic litter layer on the forest floor," Loss says. "Earthworms feed on the layer of leaf litter and make it decompose much faster. As a result, we see the loss of sensitive forest-floor species such as trillium, Solomon's seal, sarsaparilla and sugar maple seedlings, and a shift in dominance to disturbance-adapted species like Pennsylvania sedge." The researchers found no decline in three other species of ground-nesting birds included in their survey, or any correlation between ovenbird decline and invasive worms in other forest types, such as red oak, paper birch and aspen. But ovenbird density may decline by as much as 25 percent in maple-basswood forests heavily invaded by invasive earthworms. Previous studies have shown that invasive earthworms also are harmful to other native North American species, such as salamanders. (Excerpted from 'Earthworms to blame for decline of Ovenbirds in northern Midwest forests, study reveals', in *Smithsonian Science*, February 29.)

[Around The U.S.](#)

PCEIS Database Update. [Ed comment: Before 2008, back when Nutshell was an EPA publication, I talked in many Nutshells about the upcoming EPA PCEIS (Pacific Coastal Estuarine Information System) database. But this ever-increasing database never seemed to move past beta testing to online public access, and I finally

decided I'd better stop talking about it. But it wasn't "eradicated"...it just "mutated", and it has had huge changes in scope and scale. So, here's an exciting update from EPA coordinator, Henry Lee:]

"Shortly after you left us [2008], PCEIS mutated into a database for the North Pacific, under PICES (which is confusing). PICES is an organization focused on marine issues in Japan, Russia, Korea, China, Canada and the U.S. So we changed scope and scale from estuaries to ecoregions. It is now an EPA-USGS-PICES product, and its new name is "North Pacific Marine Science Organization Nonindigenous Species Information System" (though we refer to it as PICES for short). The products we produced are an Atlas of NIS in the N. Pacific (including Hawaii) with 747 NIS. The Atlas consists of a 2-page summary for each species. The Atlas is >1500 pages and will be released as a pdf. We are in the final stages of clearing this for public release (hopefully by the April/May). The actual database will also be released at the same time, but in some ways it has become the metadata for the Atlas. I will forward the links to you when it is public. In terms of the web version, the NIS version of PICES will be a subset of the "Coastal Biogeographic Risk Analysis Tool" (CBRAT). The full CBRAT database contains over 20,000 taxa, and each group needs to undergo QA before going public. We anticipate that the crabs, bivalves, and chitons will all go public this fiscal year [end of September] or early next. The information should be online through PICES. Again, I will send you the link when up and running..." (Thanks to Henry Lee, EPA).

[Ed Comment: I checked out a sample atlas page, and the amount of data is truly impressive! Each species has a North Pacific map showing status (native, nonindigenous, cryptogenic etc.) and areas where the species occurs. There is information on vectors; regime (estuary, nearshore etc.); ecosystem; depths, substrates and salinity; trophic level and feeding; reproduction, development and dispersal; and habitat associations. So stay tuned, and I'll pass on the links as I get them.]

Python Study Documents Severe Damage to Everglades Animals. The Burmese python (*Python molurus bivittatus*), is the largest Indian Python subspecies, and one of the 6 largest snakes in the world. A study by Michael Dorcas et al., published in the *Proceedings of the National Academy of Sciences*, links the python to precipitous declines in formerly common mammals in Florida's 1.5-million-acre Everglades National Park. "It took 30 years for the brown tree snake to be implicated in the nearly complete disappearance of mammals and birds on Guam; it has apparently taken only 11 years ... to implicate pythons in the same kind of severe mammal declines," said Robert Reed, co-author of the paper. Mid-sized mammals are the most dramatically affected, but some Everglades pythons are as large as 16 feet long, and their prey can include animals as large as deer and alligators. "The magnitude of these declines underscores the apparent incredible density of pythons in Everglades National Park ...and such severe declines in easily seen mammals bode poorly for the many species of conservation concern that are more difficult to sample, but that may also be vulnerable to python predation" said Dorcas, who also authored the 2010 book *Invasive Pythons in the United States*.



The most severe declines have occurred in the remote southernmost areas of the park, where pythons have been established the longest; raccoon populations dropped 99.3%, opossums 98.9%, and bobcats 87.5%. Marsh and cottontail rabbits and foxes were not seen at all. Areas north of the park where pythons have not yet been discovered showed mammal abundances similar to those in the park before pythons proliferated. Where pythons have only been recently documented, mammal populations were reduced, though not to the dramatic extent seen

where pythons are well established. Coauthor, John Willson commented "The effects of declining mammal populations on the overall Everglades ecosystem, which extends well beyond the national park boundaries, are likely profound, but are probably complex and difficult to predict." (*Excerpted from ScienceDaily, January 30.*)

On January 23, the USFWS published a rule in the *Federal Register* listing the four non-native constrictor snakes that threaten the Everglades, including the Burmese python, as injurious species under the Lacey Act, and banning their importation and interstate transportation.

National SERC Database Now Online. The Smithsonian Environmental Research Center's new national public database, the National Estuarine and Marine Exotic Species Information System (NEMESIS), is now online. The database provides key information about the non-native marine species throughout the U.S. and allows the public to identify marine invaders with a home computer. NEMESIS focuses on invasions in marine and estuarine waters, while the USGS Nonindigenous Aquatic Species (NAS) database focuses on freshwater habitats. The two databases are compatible, allowing for joint syntheses across U.S. marine and freshwater habitats. Try it out at [<http://smithsonianscience.org/2012/03/serc-database/>] (*Thanks to multiple people*)

Economic Analysis of Emerald Ash Borer Management Options. The Asian emerald ash borer, *Agrilus planipennis* was first found in the U.S. in the 1990s. It has since spread to 15 states, and is responsible for the deaths of millions of ash trees. This insect has the potential to kill billions more trees and cause billions of dollars of damage. In *Economic Analysis of Emerald Ash Borer Management Options*, a recent study published in the *Journal of Economic Entomology*, the authors performed an economic analysis of management options to aid decision-makers in preparing for future infestations. The analysis compared a control option (do-nothing, only remove ash trees as they die) to three distinct management options: 1) preemptive removal of all ash trees over a 5 yr period, 2) preemptive removal of all ash trees and replacement with comparable non-ash trees, and 3) treating the entire population of ash trees with insecticides to minimize mortality. The results show that retaining the ash trees and using insecticide treatments typically retained greater urban forest value, followed by doing nothing, which was better than preemptive removal and replacement. Preemptive removal without tree replacement, the least expensive management option, also provided the lowest net urban forest value over the 20-year simulation. The authors conclude that communities can prepare for emerald ash borer and attempt to minimize a significant loss in canopy in a narrow window of time, through the treatment of ash, preemptive underplanting of non-ash before ash trees die, removing the worst-conditioned ash first, and developing an emerald ash borer management plan in advance. (*Excerpted from ScienceDaily, February 9, 2012*)

Proposed MN Law Requires Boaters to Pass a Course. A law proposed by the Minnesota Department of Natural Resources would require 800,000 boat owners and others to pass a course on preventing the spread of aquatic invasive species before they could trailer boats or other water-related equipment, such as docks or boat lifts. MDNR envisions a required, online training course. Those successfully completing the training class would get a trailer decal valid for three years, and only trailers with the decals could legally haul boats. Fines for those caught violating invasive species laws would also be doubled. Some measures will be implemented this season, including random roadside boat checks and a requirement that boat owners place free DNR stickers on their boats spelling out invasive species requirements, but the training requirement proposal would not be required until 2015. (*Excerpted from 'Boaters would have to pass course to trailer their boats' MN Star Tribune, February 5.*)

AZ AIS Management Plan Approved. The Aquatic Nuisance Species Task Force has approved Arizona's Aquatic Invasive Species Management Plan, making Arizona eligible for USFWS funding to help plan implementation. The main introduction pathways for invasive species into Arizona waters include reservoir/canal connections, watercraft movement, and other human-related, water-based recreational activities. Arizona's plan describes detection and monitoring efforts of recognized aquatic invasive species, current prevention efforts to stop their introduction and spread, and control efforts to reduce their overall impacts. To view Arizona's plan, visit [www.azgfd.gov/ais].

Invasive Plant Disposal Guide. Improperly disposed of plants and animals can start new infestations. Logan Senack, Connecticut Invasive Plant Coordinator, recently completed an Invasive Plant Disposal Guide, which has helpful information on how to dispose of invasive plants. See it at [http://www.hort.uconn.edu/CIPWG/pdfs/Invasive_plant_disposal_guide_8-2011.pdf.]

Hydrilla Management Publication. A new publication ‘*Hydrilla management in Florida lakes*’ is available at [http://plants.ifas.ufl.edu/osceola/pdf/AG37000HydrillaManagementinFloridaLakes-EDIS-HetrickandLangeland.pdf]

National Invasive Species Awareness Week. This year’s National Invasive Species Awareness Week (February 26-March 3, 2012) included a series of events, briefings, and workshops to discuss international, national, and regional invasive species issues. A broad coalition of federal groups, as well as representatives from the private sector and environmental groups, supported and sponsored the events. Highlights of the week included a Kids Invasive Species Day at the U.S. Botanic Garden; an International Invasive Species and Green Economy Forum; an Invasive Species Prevention Session; an Urban Invasive Species Issues Forum; a Grass Roots Invasive Species forum and webcast; a National Invasive Species Achievement Award Ceremony; and a National Environmental Coalition for Invasive Species Panel. (*USDOJ Media Advisory*)

2012 National Invasive Species Awards (presented on March 1, 2012 during NISAW 2012). Peg Brady of the National Ocean and Atmospheric Administration presented the first ever National Invasive Species Awards on behalf of the National Invasive Species Council, the Aquatic Nuisance Species Task force, the ANS Regional Panels, the Invasive Species Advisory Committee and the Federal Interagency Committee on the Management of Noxious and Exotic Weeds. Five awards were presented to the following worthy recipients! Congratulations to all the winners and nominees **Award winners are as follows:**

1. Elizabeth Brown, Colorado State Aquatic Nuisance Species (ANS) Coordinator is this year's recipient of the Outstanding Invasive Species Leadership Award of 2012 for aquatic species. She is from Denver, CO, and has been tireless in her efforts to stop the spread of Dreissenid mussels in CO waters.
2. Dr. Susan Meyer, Research Ecologist for the Shrub Sciences Laboratory is this year's recipient of the Outstanding Invasive Species Leadership Award of 2012 for terrestrial species. She is from Provo, UT, and pioneered the effort to develop a biocontrol that is capable of removing banks of ungerminated seeds.
3. Noel Bassett, American Steamship Company (ASC) is this year's recipient of the Outstanding Invasive Species Volunteer Award of 2012. He is from Williamsville, NY, and demonstrated innovation, creativity, and courage in creating a successful coalition with numerous nontraditional partners through a complex network of scientists and organizations.
4. Doug Jensen, Aquatic Invasive Species Program Coordinator for the Minnesota Sea Grant is this year's recipient of the Outstanding Achievement in Invasive Species Outreach and Education Award of 2012 for aquatic species. He is from Duluth, Minnesota, and has developed hundreds of watch cards used to educate the public about aquatic invasive species. As a result of these cards, many cases of aquatic invasive species have been reported and additional control programs have been created to combat AIS.
5. The Forest Pest Outreach and Survey Project, from Wallingford, CT, is this year's recipient for the Outstanding Achievement in Invasive Species Outreach and Education Award of 2012 for terrestrial species. The project involves federal and state agencies dealing with forestry and agriculture working with nongovernmental partners to produce a comprehensive, coordinated region-wide forest pest outreach and detection program.

USFS iPhone App Helps People Identify Harmful, Nonnative Plants. U.S. Forest Service has developed a free software application that will help people identify and control destructive invasive plants in Southern forests and grasslands. This is part of the Forest Service’s multi-faceted strategy to reduce the impact of nonnative animals, pathogens and plants. *The Invasive Plants in Southern Forests: Identification and Management application* is currently only compatible with Apple products – iPad, iPhone and iPod Touch, and

is available through iTunes. The software provides photos and information that allow users to identify the 56 nonnative plants and plant groups currently invading forests of the 13 Southern states. Future versions of the application will include the ability to directly report new sightings of select species into the Georgia Center's Early Detection and Distribution Mapping System, which provides a quick way to submit photos and report new sightings of invasive plants on the spot, throughout the United States. Suggestions for improving the application can be emailed to the app's creator, Chuck Barger, at <cbarger@uga.edu> or submitted to the iTunes Website.

PNWER Economic Report. The Pacific Northwest Economic Region (PNWER) has produced a new report *Economic Impacts of Invasive Species in the Pacific Northwest Economic Region*. The report is available at [http://www.bcinvasives.ca/images/stories/documents/reports/Report12_Econ_Impacts.pdf]

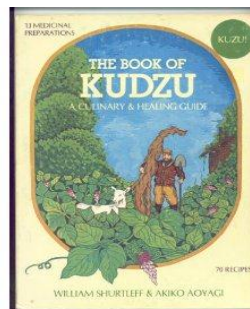
Aquatic Invasions Special Conference Edition. The open access, online, journal *Aquatic Invasions* now has a Special Edition of papers from the 17th International Conference on Aquatic Invasive Species (ICAS) that was held in San Diego, August 29-September 2, 2010, at [<http://www.aquaticinvasions.net/2012/issue1.html>]. Pricing information for the print version of the issue is available at:

[<http://www.aquaticinvasions.net/subscriptions.html>]. The conference has provided a venue for the exchange of information on various aspects of aquatic invasive species since its inception in 1990. This issue includes:

- * Alexander Y. Karatayev et al. *History of Dreissena research and the ICAIS gateway to aquatic invasions research* (pp 1-5)
- * Wai Hing Wong et al. *Settlement and growth of quagga mussels (Dreissena rostriformis bugensis Andrusov, 1897) in Lake Mead, Nevada-Arizona, USA* (pp 7-19)
- * Renata Claudi et al. *Impact of pH on survival and settlement of dreissenid mussels* (pp 21-28)
- * Viola Liebich et al. *Re-growth of potential invasive phytoplankton following UV-based ballast water treatment* (pp 29-36)
- * Blake C. Ruebush et al. *In-situ tests of sound-bubble-strobe light barrier technologies to prevent range expansions of Asian carp* (pp 37-48)
- * Laura N.H. Verbrugge et al. *Risk classifications of aquatic non-native species: Application of contemporary European assessment protocols in different biogeographical settings* (pp 49-58)
- * Helen M. Poulos et al. *Ensemble forecasting of potential habitat for three invasive fishes* (pp 59-72)
- * Stephanie Schmidlin et al. *Separate introductions but lack of genetic variability in the invasive clam Corbicula spp. in Swiss lakes* (pp 73-80)
- * M. Anouk Simard et al. *North American range extension of the invasive Asian clam in a St. Lawrence River power station thermal plume* (pp 81-89)
- * Daniel Cataldo, et al. *Impact of the invasive golden mussel (Limnoperna fortunei) on phytoplankton and nutrient cycling* (pp 91-100)
- * Stephen M. Bollens et al. *Invasive copepods in the Lower Columbia River Estuary: Seasonal abundance, co-occurrence and potential competition with native copepods* (pp 101-109)
- * Steven C. Blumenshine et al. *Environmental factors influencing the dynamics of Chinese mitten crab zoeae in the San Francisco Bay-Delta* (pp 111-124)
- * Doug Mountfort et al. *Development of single and multispecies detection methods for the surveillance and monitoring of marine pests in New Zealand* (pp 125-128)
- * Emily M. Imhoff et al. *Introduced alien ringed crayfish (Orconectes neglectus neglectus [Faxon, 1885]) threaten imperiled coldwater crayfish (Orconectes eupunctus Williams, 1952) in the Eleven Point River drainage, Missouri, USA* (pp 129-134)
- * Christopher L. Jerde et al. *Eurasian water milfoil fitness loss and invasion potential following desiccation during simulated overland transport* (pp 135-142)
- * Ather Masoodi and Fareed A. Khan. *Invasion of alligator weed (Alternanthera philoxeroides) in Wular Lake, Kashmir, India* (pp 143-146)

USDA Matrix for Invasive Plant Management. The U.S. Department of Agriculture (USDA) has developed a new matrix for invasive plant management. The model was created by scientists with the Agricultural Research Service (ARS) in Burns, OR, and helps land managers recognize how rangeland degradation processes vary across landscapes. Ecologically-based invasive plant management (EBIPM) combines state and transition models and successional management as a framework to make the best management decisions for a given landscape based on ecological principles. For more info, go to [<http://www.ebipm.org/>]. (*Thanks to the PNW Invasive Plant Council*)

New Kudzu Cookbook. For all of you “invasivores” out there, here’s a book on kudzu that deals with not only its culinary properties, but its medicinal properties as well. It purports to have 70 recipes. *The Book of Kudzu*, by William Shurtleff and Akiko Aoyagi, is available on Amazon for as low as \$7.99.



New Paper Evaluates Cost of Great Lakes Shipborne Invaders. A new paper by David Lodge et al., published in the journal *Ecosystems*, assigns a median annual estimate of damages to the Great Lakes from ballast water-related organisms at \$138 million, but says it could actually be more than \$800 million annually. And Canadian costs were not included. The researchers note that the economic analyses employed in their damage estimates are far more accurate than previous attempts at calculating the damages caused by invasions, yet are probably underestimates for the U.S. side of the Great Lakes basin. Using the group’s median value of \$138 million, replacing shipping with other modes of transportation might bring net benefits to society in about 30 to 50 years. Using the higher values of damages in the same calculations suggests that net benefits would occur much sooner. By converting the impacts into dollar values, the researchers provide benchmarks that could be used to evaluate the benefits of policy and management choices to reduce the probability of future invasions (for example, stringency requirements for ballast water treatment and inspection on ships). The researchers’ approach to assessing ecosystem-scale effects of invasive species also provides a template for evaluating policy and management alternatives to prevent, or mitigate, many kinds of environmental damage. (*Excerpted from ‘Research shows invasive species cost the Great Lakes millions’, by William Gilroy, March 29, in Notre Dame News*)

Snail and Parasite Overcome a Temperature Barrier. A small aquatic Asian snail, *Melanoides tuberculatus*, collected from the Guadalupe River in Texas, is highly competitive, and tends to displace native snail species. But the bigger concern is that it is the sole host of a parasitic Asian flatworm that infects many native fish species. Endangered fountain darters in the Comal River have suffered greatly since the parasite first appeared there in the 1990s, and minnows and game fish such as bass and catfish are also susceptible. The snail



(Photo by David Huffman)

struggles to survive when water temperatures drop to 18⁰ C (64⁰ F), and rapidly dies off when temperatures dip to 15⁰C (59⁰F). Until recently, this effectively contained them, and the parasitic flatworm they host, to within the relatively warm, spring-fed waters of the Comal. But in 2009, David Huffman, a Texas State University parasitologist, began finding snails thriving in the much colder waters of the Guadalupe River, and by 2011 they had spread both upstream and downstream, through Lake Dunlap and as far as one mile into Lake McQueeney. In January 2012, Huffman found hundreds of snails near Dunlap Dam, in water that had been between 11-13⁰C (51-55⁰F) for weeks, temperatures that should have killed the snails within two or three days. “[The snail] hadn’t gotten into any surface-fed streams to reproduce there because it couldn’t make it through our winters,” Huffman said. “But suddenly, in New Braunfels, Texas, the snail seems to have busted out of its temperature limitation.”

The lack of mature fish in the pristine Comal River indicates the impact of the snail-borne parasite, but the invasion has gone largely unnoticed, due to the lack of dramatic fish kills that virulent parasites are expected to cause. The fish kills may not be noticeable because the flatworm encysts on the fish gills, interfering with the fish’s ability to oxygenate the blood. This makes the fish slow and sluggish, and they become easy prey for predators long before the parasites can kill them outright. “This snail is known to support 37 different kinds of flukes, and 11 of those are human parasites in some areas of the world,” Huffman said. “We haven’t seen any human parasites from the snail here yet, and the snail’s been here for more than 50 years, but we also hadn’t seen the snail survive in cold water for the past 50 years, either.” (*Excerpted from ‘Invasive snail, parasite threaten Central Texas fish stocks’, January 25, 2012, in Texas State, The Corridor by Brad Rollins.*)

MD Puts Bounty on the Snakehead. Anglers who catch a snakehead fish could win prizes worth up to \$200 in the Maryland Department of Natural Resources’ (DNR) second annual snakehead contest. Anyone who removes at least one of the invasive, non-native fish from the Chesapeake Bay’s watershed has the chance to walk away with prizes from Bass Pro Shops at Arundel Mills, the Maryland Park Service, the Potomac River Fisheries Commission and the U.S. Fish & Wildlife Service. A video on the on the snakehead can be found at [<http://www.dnr.state.md.us/fisheries/bass/index.asp>.] For the full DNR press release on this story, go to [<http://www.dnr.state.md.us/fisheries/bass/index.asp>]. Read more at: [<http://www.foxnews.com/us/2012/04/05/maryland-puts-gift-card-bounty-on-fish-from-hell/?test=latestnews#ixzz1rGxlfTDY>].

[The Great Lakes Carp Saga Continues...](#)

Supremes Again Refuse Emergency Carp Measures. Bighead (*Hypophthalmichthys nobilis*) and silver (*H. molitrix*) carp have advanced up the Mississippi River to within 55 miles of Lake Michigan. In February, the U.S. Supreme Court again refused to order emergency measures that might prevent the Asian carp from reaching the Great Lakes, despite a warning that they pose a “dire threat” to the region’s environment and economy. Michigan and the neighboring states of MN, WI, OH and PA wanted the Army Corps of Engineers to install nets in the Little Calumet and Grand Calumet rivers, and to expedite a study of permanent steps to head off an invasion. The justices’ ruling, issued without comment, was their fourth rejection of the states pleas for interim steps, including closure of navigational locks in the Chicago waterways, while their lawsuit against the Corps is pending in a federal district court. The Corps of Engineers says it will complete a study of ways to prevent migration of fish and other species between the Great Lakes and Mississippi watersheds in 2015, but the five states and environmental groups say that’s not fast enough, because it could take many additional years to carry out the study’s recommendations. They advocate placing barriers in the Chicago-area waterways to block a link between the watersheds that was created more than a century ago when engineers reversed the flow of the Chicago River, to flush the city’s sewage toward the Mississippi. A recent report by groups representing Great Lakes states and cities proposed three methods for permanent separation, with estimated costs as high as \$9.5 billion. But because permanent separation could take nearly two decades to complete, the states are suing for

short-term actions. *(Excerpted from 'Supreme Court won't order emergency measures to prevent Asian carp from reaching Great Lakes', in the Washington Post, February 27.)*

2012 Carp Cost: \$50 Million. The federal government expects to spend over \$50 million in 2012 fighting Asian carp. This will include sampling the Detroit River, Saginaw Bay, western Lake Erie and southern Lake Michigan for any sign of carp DNA. There is no evidence that the fish exist in those areas, but they are places where the fish could probably survive and thrive. If Congress approves the latest budgets for Asian carp as part of the larger Great Lakes Restoration Initiative, the federal government will have spent \$156 million since 2010 trying to contain the fish. The money also will continue funding carp control experiments, including a promising one that uses a female sex pheromone from Asian carp to lure males into traps or away from crucial areas. Scientists have successfully isolated such a chemical, and plan to test it this year in the field, said Leon Carl, director of the USGS Great Lakes Science Center in Ann Arbor. The USGS also is working on a carp-specific poison. Last month, a privately funded study showed that closing off the Chicago waterways to Lake Michigan would be the most effective way to stop the carp, but would cost billions of dollars and take decades to complete. *(Excerpted from 'U.S. to spend \$50M to fight invasive species', February 26, 2012, in the BattleCreekEnquirer.com)*

Carp Seizures. It has been illegal to possess live Asian carp in Ontario, Canada, since 2005. On January 25, five tons of Asian carp, some still alive, were seized on the Canadian side of the Ambassador Bridge linking Detroit, MI, and Windsor, Canada. This was only two weeks after nearly 1.2 tons of live Asian carp were seized at the border on January 9, while being trucked from the United States to Toronto. "That's alarming", said Hugh MacIsaac, Director of the Canadian Aquatic Invasive Species Network. "The Americans have put \$78 million into trying to detect where the fish are and to make sure they don't get into the Great Lakes at Chicago, and here on the other hand we still have people shipping these things around as though it's legal and advisable, and it's neither." MacIsaac called for stiff fines for people who are ignorant of or willfully ignore the law. The largest fine so far for possessing live Asian carp was \$60,000 on a second offence. **AND** then, on the Feb. 28, the Canadian border patrol agents at the Ambassador Bridge confiscated 14,000 pounds of live Asian carp. *(Excerpted from 'Invasive Asian carp seizure called alarming', by Sharon Hill, Postmedia News, January 27, 2012; and 'Smuggling of live Asian carp becomes Great Lakes threat, by Jim Lynch, The Detroit News, March 27, 2012)*

A 'Biobullet for Carp?' USGS Biologist Jon Amberg has spent two years attempting to develop a poison pill that will kill Asian carp and leave other fish unaffected. In 2010, Amberg and colleagues began working with Advanced BioNutrition Corp. build a particle that would break apart inside Asian carp, but would remain intact if eaten by other fish. To do that, they had to first find something unique in the carp that could trigger the poison release. Attempts to chemically control Asian carp today would require dumping thousands of gallons of pesticide into waterways. By contrast, an Asian carp bio-bullet would theoretically deliver toxins specifically to silver and bighead carp in a digestible micro-sized particle about the width of a human hair. Built to mimic food, the pill would then break apart in the carp's intestine, releasing its toxin and killing the fish. If it works, Amberg and colleagues foresee similar elegant weapons designed to control many of the invasive species that are wreaking havoc in the Great Lakes and Mississippi River Basin. Preliminary work has already begun on zebra mussels as well as on fish eggs, which they think may be susceptible to electricity and to and nano-size silver that would be about a thousand times smaller than the Asian carp microparticle. But other experts question whether the targeted strategies will really work, and environmental groups see it as a distraction from a permanent solution to the invasive species problem. Still others wonder about unintended environmental consequences. Nano-size silver particles, for instance, have been shown to harm a range of species in laboratory experiments, according to Andrew Maynard, director of the Risk Science Center at the University of Michigan. "From a technology perspective, this is very inspiring," Maynard said. "But if you are releasing new particles into the environment, there are certain questions that you need to ask: What do they do? Where do they end up? How long do they last?" *(Excerpted from 'Scientists developing poison pill for Asian carp', by Cynthia Dizikes, in the Chicago Tribune, March 27.)*

Ballast Water & Other Pathways

Another EPA Ballast Water Lawsuit? In their long-running battle with the federal government, environmental activists are ready to take the issue to court for a fourth time to get the EPA to create stricter regulations on ballast discharge. They believe the proposed government standards to combat invasive species are too lenient, and that ships entering the Great Lakes should be forced to kill all organisms inside their ballast tanks. Researchers estimate the cost of dealing with problematic invaders like zebra mussels and spiny water fleas, at about \$200 million [a year]. The EPA is already under court order to rewrite its 2008 ballast rule this year; the new rule will become effective in 2013. They will most likely adopt recommendations from the International Maritime Organization (IMO) for treating discharged water. The current EPA standard requires ocean-going ships to exchange their ballast water with salt water while at sea, which will kill most freshwater species inside their tanks. However, environmental experts state that freshwater pockets and sediment will still harbor invaders, and they urge zero tolerance for invasive species in ballast water being discharged in the Great Lakes. They also want ballast treatment for ships that never leave the lakes, because these vessels can spread already established invasive species. Reducing, but not eliminating, species could still prove disastrous. Meanwhile the numbers continue to grow: recently, eight new invasive species were found in Lake Superior. (*Excerpted from 'Environmentalists Threaten Another Lawsuit Over Stricter Ballast Rules', February 22, 2012, in the Maritime Executive*) (Thanks to Keith Strieck, WDFW)

USCG Final Ballast Water Rule. On March 23, the U.S. Coast Guard announced a final rule regarding ballast water treatment standards. The standards adopt discharge limits proposed by the International Maritime Organization (IMO) in 2004, and they become effective June 21, 2012. The current IMO standard reduces the risk but does not eliminate all invasives, and some conservationists argue they are not strict enough to stop the influx of non-native species into the Great Lakes and other waterways.

Ballast water discharge standards (§ 151.2030 in the rule) state that ballast tank discharges must have:

- (1) For organisms greater than or equal to 50 micrometers in minimum dimension: Discharge must include fewer than 10 organisms per cubic meter of ballast water.
- (2) For organisms less than 50 micrometers and greater than or equal to 10 micrometers: Discharge must include fewer than 10 organisms per milliliter (mL) of ballast water.
- (3) Indicator microorganisms must not exceed:
 - (i) For toxicogenic *Vibrio cholera* (serotypes O1 and O139): A concentration of less than 1 colony forming unit (cfu) per 100 mL.
 - (ii) For *Escherichia coli*: a concentration of fewer than 250 cfu per 100 mL.
 - (iii) For intestinal enterococci: a concentration of fewer than 100 cfu per 100 mL.”

Vessels are also required to install water treatment systems such as UV radiation, electrolysis, or centrifugation, following their first dry dock after 2014. "Some groups are disappointed that the standard is not stricter," Lorne Thomas, external affairs division for the U.S. Coast Guard 9th District, said. "But, we are getting into pretty small quantities with this. It's equivalent to allowing organisms in one part per trillion of water." The ballast water standards can be increased over time; 2016 is the first year that could bring stricter regulations. The EPA also proposed limits based on the IMO in its initial draft Vessel General Permit until 2017. A decision is expected later this year whether or not to adopt the proposed limits. Current ballast water exchange and flushing practices will continue to be enforced by Transport Canada, the U.S. Coast Guard and Saint Lawrence Seaway. Commercial vessels must exchange ballast water or flush empty tanks with salt water, and monitor activity with tests for saline in the tanks. The later-phased standards are a complicated subject, and will be a separate rulemaking. They make take the USCG a long time to reach. So watch the Federal Register and visit the USCG ballast water website periodically, for updates on those. To see the entire Federal register, go to [<http://www.gpo.gov/fdsys/pkg/FR-2012-03-23/pdf/2012-6579.pdf>]. (*Excerpted from 'U.S. Coast Guard*

adopts ballast water standards to combat invasive species, by Mackenzie Berger March 27, in M live, a USCG press release March 16, and thanks to Randy Marshall, pers. Comm.)

Vessel Inspection Regulations Add an IAFS Certificate. The Coast Guard published a Final Rule amending its vessel inspection regulations to add the International Anti-fouling System (IAFS) Certificate to the list of certificates, a recognized classification society may issue on behalf of the Coast Guard. This action carries out recently enacted legislation implementing the International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001. [<http://www.gpo.gov/fdsys/pkg/FR-2011-12-09/pdf/2011-31595.pdf>] (*Thanks to John Morris, USCG*)

New York Backs Off From Its Ballast Water Standards. New York state officials have backed away from tough ballast water regulations that the maritime industry says would bring international shipping in the Great Lakes to a halt. The rules, scheduled to take effect in August 2013, order cargo vessels to cleanse ballast water to a level at least 100 times stricter than international standards before releasing it. The shipping industry contends no technology exists to meet the New York requirement, although environmentalists disagree. Shippers say the policy would prohibit any cargo ship without the required technology from traveling through New York on the St. Lawrence River, the gateway to the Great Lakes, effectively shutting down commercial traffic between the lakes and the Atlantic. Industry reports 72,000 jobs and at least \$11.5 billion in annual business and tax revenue were at stake. New York's DEC said it was postponing the effective date of its rules until December 2013. Because they are tied to a federal permit that expires then, the state rules essentially are being canceled. "New York remains concerned about the introduction and spread of invasive species in the state's waterways, and we hope that a strong national solution can be achieved," said Joe Martens, the Department's commissioner. Maritime industry groups expressed relief, and Canada's transport ministry also praised New York's announcement, which came as the U.S. Environmental Protection Agency wrapped up a public comment period for its own proposed ballast regulations. They would require ships to meet the international standards, which the industry says are achievable.

The U.S. and Canada require vessels to exchange their ballast water at sea or rinse empty tanks with salt water, but because some organisms could survive inside residual water or sediment, regulators want ships to take the extra step of treating ballast water before releasing it. EPA is expected to decide in November whether it will adopt the clean-water limits set by the International Maritime Organization. It released a statement saying those standards are based on "the best available science" and would "substantially reduce the risk of invasive species entering U.S. waters and reduce water pollution from vessels." But environmental groups say the international standards are too weak, and want requirements 100 to 1,000 times stronger, to kill all organisms in ballast water. New York also wants EPA to strengthen its standards. If EPA refuses, New York has legal authority to reinstate its requirements. "They're still arguing for more stringent technology and that's a positive signal," said Thom Cmar, attorney for the Natural Resources Defense Council. (*Excerpted from 'New York drops ballast standards shippers fought', by JOHN FLESHER, in the Seattle PI, February 24, 2012.*)

Religious Releases as a Pathway: Release of animals for religious purposes is ancient practice in several religions of Asian origin, especially Buddhism and Taoism, and it can play an integral role in the establishment of breeding populations of nonindigenous species. Religious wildlife releases are well documented across Asia, already considered problematic in Canada and Australia, and are likely much more widespread than is known. A new paper, *'The influence of traditional Buddhist wildlife release on biological invasions'*, by Xuan Liu, Monica E. McGarrity, & Yiming Li, *in conservation letters* (0) 2012, evaluates the influence of Buddhist wildlife release events on establishment of feral populations of American bullfrogs (*Lithobates catesbeianus*, aka *Rana catesbeiana*) in Yunnan province, southwestern China, from 2008 to 2009. The study provides the first quantitative evidence that religious release is an important pathway for wildlife invasions, and has implications for prevention and management on a global scale.



Bullfrogs are large, generalist predators and disease vectors for chytrid fungus (*Batrachochytrium dendrobatidis*; *Bd*), a major cause of global amphibian decline. Authors previously detected *Bd* in feral bullfrog populations in Yunnan, and caution not to underestimate the significant threat invasive bullfrogs pose to native amphibians. Bullfrogs can also have significant negative impacts on native amphibians in Yunnan through predation and larval competition, and may have already been instrumental in causing the extinction of one salamander species. The study shows that the large number of propagules introduced during organized, religious events is highly conducive to establishment of the introduced species when the introduced habitat provides appropriate conditions. However, Buddhist ethics include deep respect for the environment, and authors feel Buddhists would not likely knowingly release invasive species that are detrimental to the native ecosystem. Survey results suggest that such releases could be prevented through education, and through promotion of responsible religious release activities (e.g., for conservation purposes). Authors suggest Governments or NGOs sponsor breeding programs for imperiled, native species and coordinate with local temples to hold ceremonial release or reintroductions events at designated water bodies as a means of reducing species introductions and establishment. (Thanks to Kevin Aitkin and others)

[Around the World](#)

North American Invasive Worm Benefits Baltic Sea Water Quality. A sea worm (*Marenzelleri sp.*) native to North America has been found to have a beneficial effect on the Baltic Sea. *Marenzelleria* first observed in the Baltic in 1985, brought in by ballast water. In the past ten years, it has become one of the most prolific species in the Baltic Sea. An article in the *Global Change Biology* series states the new species provides beneficial effects on the nutrient cycle at the bottom of the Baltic Sea, which has long suffered from hypoxia. The worm loosens the bottom sediments, increasing the oxygen content. It also binds phosphorous to the sediments, preventing its release into the water where it would promote summertime growth of toxic blue-green algae. Joanna Norkko, an assistant at the Tvärminne zoological station, says “On the other hand, we did not investigate...whether or not there would be harmful competition between *Marenzelleria* and other species.” A mature *Marenzelleria* is between four and five centimeters long, and is harmless to humans. “In the 1990s considerable investments were made in the Stockholm area in sewage treatment. The new study found that the improvement to the ecosystem caused by *Marenzelleria* was twice that of the benefits achieved through improved sewage treatment”, Norkko says. (Excerpted from *Invasive species appears to be beneficial for Baltic Sea*, in *Helsingen Sanomat*, January 12)

Carp vs. Crayfish in Kenya’s Invasive Species Battleground. Louisiana red swamp crayfish (*Procambarus clarkii*) and common carp (*Cyprinus carpio*) are two of the planet’s most invasive species. A study by scientists at Queen Mary, University of London, published in the journal *PLoS ONE*, investigated the interaction between the crayfish and carp in Kenya's Lake Naivasha, between 2001 and 2008. The crayfish were introduced to the Lake in the 1970s and have played a central role in the food web for more than 30 years, yet the carp, introduced a little more than a decade ago, appear to have driven the crayfish away. Lead author Dr Jonathan Grey said: "We first noticed the carp in our nets in 2003; by 2006 it was the dominant fish species in the Lake; and at the end of our research in 2008, carp completely dominated the system." Classical studies tend to focus on the effects of an invasive species on a native species; the reality is that many ecosystems receive multiple invaders, which interact not only with the recipient community but also with each other. The research team

used stable isotope analysis to determine how the two species react to each other. Gray said "Because the signal reflects diet over space and time, our approach offers an appropriate scale for the study of population niches, the 'space' that a species occupies in a food web." Carp and crayfish eat the same types of food from the lake bed, but with the carp's population increase, the crayfish were forced to eat a lower quality diet, including hippo dung. "The dietary niche of the crayfish has been squeezed to such an extent that it is now almost impossible to catch crayfish in the Lake anymore. "We know that the influx of carp has helped commercial fishing in the area, but with its continual dominance we don't know to what extent it will affect the lake's water quality and the wider ecosystem on which the thriving floriculture and agriculture industries rely," Grey said. (*Excerpted from Science Daily, March 6*)

Threats to Antarctica. As Antarctica melts, invasive species are considered one of its biggest threats. Now, a new paper published March 5, in the *Proceedings of the National Academy of Sciences* (PNAS), quantifies how many plant seeds came into Antarctica from tourists, scientists, and research-station crews in 2007-2008. Researchers vacuumed the clothes, boots, packs, and camera bags of more than 850 scientists, tourists, support personnel, and ships' crew. Results revealed most carried plant seeds, although the scientists were carried more. Disturbingly, 49-61 percent of the foreign plant materials that reach Antarctica are cold-adapted species that can withstand and colonize extreme conditions. The plants likely attach to cold-weather gear the travelers had used in other frigid climates prior to Antarctica; Arctic species such as chickweed and yellow bog sedge have both been found in Antarctica. Based on the nature of these foreign species and the present Antarctica climate, the areas at highest risk are the Antarctic Peninsula coast and surrounding islands. According to climate projections for 2100 from the UN Intergovernmental Panel on Climate Change, invaders may also take root in the coastal, ice-free areas to the west of the Amery Ice Shelf and, to a lesser extent, in the Ross Sea region. Rising temperatures along the Antarctic coast will likely aid these intruders' survival. Even so, "Much of it is still a very harsh place, and plants do not grow on ice, which still dominates the continent," said Steven Chown, lead researcher. (*Excerpted from 'Alien Species Invading Antarctica via Tourists, Scientists', by Charles Q. Choi in National Geographic News March 5, 2012, and 'Alien invaders threaten Antarctic fringes,' by Richard Black, BBC News, March 5.*)

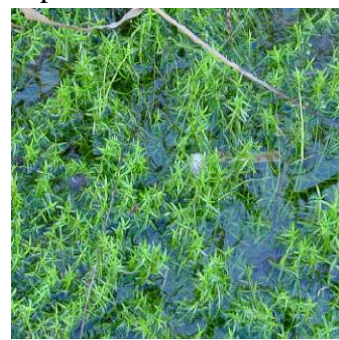
NZ Study Links Noise to Biofouling. Biofouling is one of the most significant maritime issues. When organisms attach to a hull they create significant drag on a vessel, which means more fuel is required, and cleaning the vessels is also expensive. The problem is also a significant biosecurity threat; two-thirds of introduced species in New Zealand arrived by hitchhiking on vessels. A New Zealand study led by Serena Wilkens and believed to be the first of its kind, has discovered that the noisier a vessel or port is, the more likely it is to attract unwanted sea pests. The research team used an underwater microphone to record the low-frequency hum created by ships generators used while in port, and replayed the noise back to mussel larvae in the laboratory. They found the larvae exposed to the vessel noise settled and attached to surfaces about 40% faster than larvae that were not exposed to the vessel noise. The researchers are now testing different underwater sounds and other species. (*Excerpted from 'NZ scientists link noise and marine pests', TV NZ, January 30*)

UK Uses Geographic Profiling to Predict Invasive Species Sources. Geographic profiling is a spatial modeling technique originally developed to prioritize long lists of suspects in serial crime cases, which uses the locations of linked crime sites to determine the area where a criminal lives. Police can then check suspects based on their "geoprofile," and move less-likely suspects further down on the list. Like criminals, invasive species are expensive to deal with, create large amounts of data for people to sift through, destroy habitats, and are often hard to keep track of. Because of these similarities, researchers at Queen Mary's School of Biological and Chemical Sciences in the U.K. decided to try using these same techniques on invasive species, with encouraging results. They found geographic profiling can correctly predict the sources of invasive species, using their current locations as input. Sites colonized by the invasive species were considered "crime sites," while the source of the invasion was analogous to the criminal's home. The team analyzed historical data from 53 invasive species in the U.K., including everything from the Japanese oyster to the Norway spruce tree. After

comparing geographic profiling results with other tracking techniques, they found that geographic profiling outperformed competing methods. The researchers state "Our study shows that geographic profiling can correctly predict the sources of invasive species, using as input their current locations. Crucially, it can also do so in the early stages of invasions with data that is possible to acquire quickly, and when control efforts are most likely to be effective. Geographic profiling outperformed other widely used spatial statistics such as the centre of minimum distance, spatial mean and spatial median in locating invasion sources." Considering that the U.S. expects to spend \$50 million in the coming year just fighting invasive carp, there's a dire need for better invasive species profiling techniques. This seems like a good start. (*Heavily excerpted from 'Tracking Invasive Species Like Criminals' at co.exist.com, March 2.*)

Vietnam Bans Breeding of Edible Snails. Vietnam has outlawed [and will] enforce the ban on farming edible snails, as rising numbers are threatening the local ecosystem, authorities said. Increasing numbers of golden apple snails (*Pomacea canaliculata*) are threatening the environment. According to the Agriculture Ministry, the snails destroyed 11,500 hectares of rice this year, worth several million dollars. The snails are indigenous to South America and were first introduced to Vietnam in 1988 as high-protein duck and fish food. A ban on farming the snails was introduced in 1992 but had not been thoroughly enforced. (*Excerpted from Vietnam Bans Breeding of Leeches and Edible Snails, McClatchy-Tribune Information Services, December 5*)

NZ Fights Pygmyweed. An invasion of New Zealand pygmyweed, (aka swamp stonecrop, *Crassula helmsii*), has appeared for the first time ever in Ireland canals, forcing the closure of part of the Grand Canal in Kildare.



The plant was probably introduced into Ireland through the ornamental /horticultural /aquarium trade. Waterways Ireland carried out a trial removal using matting to cover the bed of the canal. When this was unsuccessful, they de-watered and applied herbicide to this stretch of water. The top layer of silt and weed was removed across the full width of the canal to a depth of 10cm using a long-reach digger. *Crassula helmsii* is an extremely competitive succulent perennial native to Australia and New Zealand. It has established troublesome populations and in southeastern United States and throughout Western Europe, and has become an especially problematic invasive in the United Kingdom. It establishes dense, floating or submerged populations that displace native aquatic plants in depths up to 8 m. It decreases biodiversity; alters oxygen, pH conditions; causes flooding; obstructs water flow; and reduces recreational and aesthetic value of water bodies. It rapidly spreads via vegetative reproduction from plant fragments. Emerged populations can reach densities up to 45kg (99 pounds) fresh weight/m². *Crassula helmsii* is tolerant to a wide range of habitats, and may grow in oligotrophic and acidic, as well, as eutrophic and alkaline lakes and streams, and in temperatures of -6°C to 30°C. It is frost tolerant and typically does not die back in the winter, but it does not do well in very soft, easily disturbed silts. It is sold as a pond oxygenator and ornamental, and may still be purchased from many garden centers and other retailers. (*Excerpts from the Leinster Leader, March 31, and ISSG database.*)

[Ed. Comment: this sounds like the kind of weed that would just love the Pacific Northwest! We should be on the watch for it here as well!]

Australia's 'Weed's Network'. The Australian website 'Weed's Network' has been designed to help stakeholders in natural resource management and agriculture learn more about invasive plants and weed control

systems. The key aim of the site is to foster ongoing agro-ecosystem viability and resilience in an environment of changing human priorities. To hear about new research and control activity, risk assessments, available jobs, and more, go to: [<http://invasivespecies.org.au>]

Spain Adopts a Catalogue of Exotic Invasive Species. In November, 2011, after several years of consultation, the Council of Ministers approved a Royal Decree regulating a list and catalogue of Spain's invasive alien species. The list includes 200 species, some in a catalogue and others within a listing. Those in the catalogue are exotic species for which "scientific and technical information exists indicating that they constitute a serious threat to autochthonous species, habitats or ecosystems, agriculture or economic resources associated with the use of the country's natural heritage." (*Excerpted from Pet Product News International, 'Spain Adopts Catalogue of Exotic Invasive Species', February 22*)

Invasive Acacia Changes Nitrogen Dynamics. Ecologists Christiane Werner and team from Bielefeld University (Germany) and the University of Lisbon have developed a non-invasive method for quantifying the spatial impact of exotic species on the ecosystems they invade. They examined the Sydney Golden Wattle (*Acacia longifolia*), an Australian shrub that has established in Mediterranean climates worldwide, and found that it threatens native ecosystems not only through its prolific growth, but also by fertilizing the surrounding soil with nitrogen, an effect that markedly extends beyond the area it occupies. Most plants can only take up nitrogen from the soil. But the acacia uses nitrogen fixing bacteria to assimilate nitrogen from the air, giving it a large advantage over native non-nitrogen fixing species on nitrogen-poor soils. It not only uses more than its share of the limited nutrients and rainwater, but it shades out smaller plants in the understory, and the decomposing leaves pass large amounts of nitrogen fixed from the air, into the soil.

There are already massive encroachments of acacia on Portuguese coastal dunes at Tróia. Additional nutrients would potentially enhance the growth rates of neighboring native species and have problematic consequences for species diversity in the sensitive and slow-growing dune system. If the plants grow more quickly than usual, they use more water, and soils become drier, endangering the sensitive equilibrium in the native plant community. The team used nitrogen isotopes to test whether the acacia passes nitrogen from the air to neighboring plants that normally only use soil nitrogen. The most common stable isotope of nitrogen is N14; the less abundant 'heavy' isotope of nitrogen, is N15. The concentration of N15 in the air is higher than that in the soil of the Portuguese dunes, so if a species fixes nitrogen from the air, and neighboring plants take up this additional nitrogen, then the leaves of these neighboring plants should reveal a higher concentration of N15. The team took leaf samples in a section of the dunes while mapping the plant locations, analyzed the proportion of N15 in the samples, and compared the results with the plant distribution maps. The research confirmed that the Portuguese crowberry (*Corema album*), a native Portuguese coastal shrub, uses a significant amount of the nitrogen that the Acacia fixes from the air. "This showed that acacias influence the nitrogen level and the growth of native plants for a radius of up to eight meters outside their canopy. Although the acacia is present in only one-fifth of the study area, it changes the nitrogen dynamics in almost two-thirds of this area" said Werner. The procedure, called 'isoscaping', is normally used to pinpoint the landscape in which a material originates, by determining the isotope ratios in mineral or plant residues. The Bielefeld team is the first to downscale this procedure to a plant community. Werner points out that the new method is not only suitable for measuring the impact of non-native plants, but could also be used to study things such as the effect of factory effluents or agricultural fertilizers on ecosystems. Their innovative method (called '15N isoscapes') was published in the March 13 issue of the journal *Ecology Letters*. (*Heavily excerpted from 'Fertilization by Invasive Species Threatens Nutrient-Poor Ecosystems', in ScienceDaily, March 13, 2012*)

B.C. Phone App for Invasives. The Royal BC Museum's first iPhone/iPad app, *Aliens Among Us*, launched in December, and is available as a free download from the iTunes store. There are more than 4,000 alien species in British Columbia and detailed information – images, sound recordings, descriptions – for 47 of these is now available via the app or website. To explore the website and participate in the project go to: [<http://alienspecies.royalbcmuseum.bc.ca/>], or download the free *Aliens Among Us* app to an iPhone or iPad at

the iTunes store: [<http://itunes.apple.com/om/app/aliens-among-us-royal-british/id479083111?mt=8>]. (Thanks to Vern Holm and others)

Norway's New Quantitative Risk Assessment Method. Predicting how damaging an introduced species may become in a new environment has always been challenging, but now a coalition of Norwegian researchers spearheaded by Professor Bernt-Erik Saether at NTNU's Center for Conservation Biology (CCB), has created a unique quantitative assessment method that they say fills a vital international need for a quantifiable, uniform approach to assessing alien species. Currently, there is no commonly agreed-upon international approach to quantitatively assessing risks from alien species. Species are classified according to their reproductive ability, growth rate, individual densities, population densities, prevalence and effect, and then researchers plot the risks posed by each species on two axes. One axis shows the likelihood of the species' dispersal and ability to establish itself in the environment, and the other shows the degree to which the alien species will affect native species and habitats. Based on the combined values of the two axes, the species are placed in one of five risk categories: *Very high risk species* (strong negative effect on the environment); *High risk species* (have spread widely with some ecological impact, or have a major ecological effect but only limited distribution); *Potentially high risk species* (very limited dispersal ability, but substantial ecological impact or vice versa); *Low risk species* (low or moderate dispersion and moderate to limited ecological effect); and *Species with no known risk factors* (not known to have spread and have no known ecological effects).

Norway's first official risk evaluation, the 2007 Norwegian Black List, described the risks posed by 217 of the 2483 then-known alien species in Norway. A new Black List, in summer 2012, will use the new evaluation method, and the number of species evaluated will climb to roughly 2600, says Lisbeth Gederaas, with the Norwegian Biodiversity Information Centre. The Biodiversity Information Centre (www.biodiversity.no) offers the existing list in a searchable, electronic version, along with detailed fact sheets for some of the most common or problematic species. (Excerpted from 'New Quantitative Method Enables Researchers to Assess Environmental Risks Posed by Non-Native Species', in *ScienceDaily*, December 26, 2011.)

Major Upcoming Invasive Meetings

April 24—27, 2012: Weeds Across Borders (WAB) 2012, Cancun, Mexico. International conference. For more information, go to [<http://www.weedcenter.org/wab/2012/index.html>] or email: <weedsacrossborders2012@gmail.com>

May 2-3, 2012. ANS Task Force Meeting, Annapolis, MD.
[http://www.anstaskforce.gov/meeting_5_2012.php]

May 22-24, 2012. Invasive Species Advisory Committee meeting, Portland, OR.
[<http://www.invasivespecies.gov/index.html>]

June 19-21, 2012: Fifth Sudden Oak Death (SOD) Science Symposium, Petaluma, CA. Call for Papers

June 24-28, 2012: International Congress on Marine Corrosion and Fouling (ICMCF). Seattle, WA. For more information, go to [<http://icmcf.org/Registration.aspx>]

August 20-22, 2012: International Terrestrial Invasive Plant Species Conference (TIPS) 2012, Sault Ste. Marie, Canada.

October 8-11, 2012: 18th Australasian Weeds Conference 2012, Melbourne, Victoria, Australia. For more information, go to [<http://www.18awc.com>].

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