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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 1-32, go to [http://www.aquaticnuisance.org/newsletters].

No, in case you are wondering, you did not miss a Nutshell issue.
It was on summer vacation.

This Quarter's Unusual News

"Weedrobes". Nicole Dextras, a Vancouver B.C. artist combines weeds and fashion. Her work consists of seasonal collections that make statements, usually about consumerism, nature or both. This summer, she created "Weedrobes"- clothes from plants commonly found in gardens. The result is a stunning display of eco-fashion. Granted you probably wouldn't wear these out and about, but Dextras said she's still trying to communicate a consumer-grade message: "Our future depends on the creation of garments made from sustainable resource." The dress below is made from invasive wild rose and dogwood, with a skirt of ivy woven with beads made from Japanese knotweed. The suit is made of laurel, magnolia and yucca. Check out copies of her "weedrobes" at [http://blog.seattlepi.com/thebigblog/2011/06/20/vancouver-artist-makes-clothes-from-weeds/#15]. *(Excerpted from the Seattle Post Intelligencer, June 22*).

Around The U.S. West Coast

OR Noxious Weed Small Grants. The Oregon Department of Agriculture (ODA) is requesting proposals for the control of noxious weeds. There is $60,000 available for the 2011-2012 small grants program, and awards

up to $8,000 are anticipated. The funds will be distributed through an open competitive process, the proposed project must control or support a control project for one or more Oregon State listed noxious weeds, and it must benefit state or private forestlands. Qualifying Applicants include State, County or Local Governments, Non-Profit Organizations, Watershed Councils, Private Landowners, and Tribal weed control entities. Qualifying projects should focus on treatment, surveys, inventory, education/outreach or coordination efforts. Projects that coordinate with ODA Project Plans, Oregon State Weed Board Grants, or USFS projects may receive higher priority for funding. Applications must be postmarked on or before December 30, 2011. For more information, contact Shannon Brubaker at <sbrubaker@oda.state.or.us>. The S&P Small Grants application is available at: [http://oregon.gov/ODA/PLANT/WEEDS/sandp_smallgrantsindex.shtml]

Risk Model. OSU has begun a new project that integrates anthropogenic introductions and habitat suitability, in order to predict risk of AIS invasions in the Pacific Northwest aquatic environment and help estimate the economics of early detection and rapid response. The project has three phases: estimate AIS dispersal risk; estimate damage and management costs of AIS; and produce a model for evaluating scenarios of AIS management, in order to minimize total costs and damages. (For more information, contact Sam Chan, at <samuel.chan@oregonstate.edu>)

Idaho Hydrilla Update 2011 (Idaho State Department of Agriculture). Hydrilla (*Hydrilla verticillata*) is one of the most aggressive and environmentally disruptive aquatic plants in the world. It forms dense monocultures that restricts water flow, degrades water quality, impedes recreation, and out-competes native species. Hydrilla has been referred to as the "perfect aquatic weed" for its ability to dominate aquatic systems.

Hydrilla was identified in the Bruneau River near Bruneau, ID in December 2007. Surveys found an infestation that extended twelve miles through the lower Bruneau River system. Repeated surveys of waters downstream of this area has found no hydrilla in CJ Strike reservoir or downstream in the Snake River.

The Idaho Department of Agriculture initiated an aggressive eradication program, treating with herbicide, diver dredging and hand removal. Following four years of treatment hydrilla populations have been significantly reduced. Areas that were hydrilla monocultures several years ago now have little or no hydrilla growth. The majority of the hydrilla that remains is now in low enough densities that it is typically removed by hand.

Twelve miles of river where were walked / snorkeled four times in 2011 to identify new hydrilla plants and to address any regrowth. Hydrilla plants were mapped using GPS, plant density and water temperature were recorded and then the plants were carefully removed by hand. Data from surveys this season found a 74% reduction in hydrilla distribution from 2010 to 2011.

Results from the 2011 season emphasize the need for a sustained eradication effort on the Bruneau River hydrilla population. Funds provided by BLM and USDA APHIS supported the 2010 and 2011 treatment efforts and support from BLM is expected to continue through 2015. Eradication continues to be the goal of this program and progress continues to be made pursuant of that goal. For more information on the progress of the hydrilla eradication program in Idaho please contact Tom Woolf, Aquatic Plant Program Manager: (208)-332-8564, thomas.woolf@agri.idaho.gov

'Threats To The West' Update. The popular pamphlet *Threats to the West* is being updated and reprinted, and will now include zebra/quagga mussels, invasive tunicates, didymo algae, and other invaders in the West that have gained more attention since the last version. The reprint will also include new sections on microscopic invaders and potential threats. The first printing should be available before March. For more information contact Paul Heimowitz at <paul_heimowitz@fws.gov>.

California Fisheries Collaborative Research Grants. CFR West, the California Ocean Protection Council, and California Sea Grant are now soliciting applications from collaborative teams of fishermen, resource managers and scientists, for projects to begin July 1, 2012. A total of $968,000 funding for applied research on California fisheries is expected to be available during the 2012–2014 biennium. It will fund up to six research projects. Projects must include at least a 25% match (cash and/or in-kind) from applicants. The maximum award size will be $242,000 over the two year period. Projects that are highly relevant to management, scientifically and technically robust, collaborative, and engage the broader community are the highest priority. Potential research topics include, but are not limited to biology; fisheries; methods, tools and technology; and conservation engineering. Letters of intent are due by midnight PST on January 5, 2012**.** Details and requirements are available at [www.csgc.ucsd.edu/FUNDING/APPLYING/CFR2012.html]

Ecotrust Decision Support Tool. The USFWS and Ecotrust are cooperating in development of an online, open-access decision support tool for prioritizing Pacific Northwest watershed restoration. A unique component of this system is vulnerability to invasive species (in addition to consideration of native fish population status, climate change, and watershed impairment). Watershed prioritization scores are affected by an invasibility index that reflects existing nonnative aquatic species (from USGS NAS database), pathway factors (e.g., presence of boat ramps), and watershed disturbance (e.g., presence of impoundments). In addition, users will be able to display watershed presence of a number of high-profile AIS, like nutria and Eurasian watermilfoil. A prototype version of the system should be completed by December 31. *(Thanks to Paul Heimowitz.)*

OR Nutria Studies (Updates). A number of nutria *(Myocastor coypus)* studies underway in Oregon have been featured briefly in *Nutshells* for several years. Some preliminary results are now available. Results from the *trapping study* show standard cage traps and multiple capture traps caught similar numbers of animals, but multiple capture traps caught significantly larger nutria than standard traps. Standard traps caught many, many more non-target species than multiple capture traps. Preliminary results from the telemetry/feeding study showed high activity after dusk (expected) and low activity before dawn (unexpected), as well as higher activity mid-day. Tail mount transmitters are remaining attached to animals for an average of about 2 months, although

after 3 months, the biodegradable neck collars have not yet detached from the animals. Feeding data have not yet been analyzed, but camera surveillance shows nutria (at least at one site) are becoming habituated to feeding stations. *Habitat suitability modeling*, conducted in concert with the USGS Fort Collins lab, is refining the initial Pacific Northwest model, and results will also be applied to a national model. The approach is based on minimum winter temperatures and proximity to water. Once rulesets are finalized, the model can be run based on future climate scenarios. *Disease Testing studies* show nutria in Polk County are testing positive for *Giardia.* The external parasite *Pitrufquenia coypus* is also present on 5% of animals, and this appears to be the first time this parasite has been documented on PNW nutria. For additional information on the nutria studies, contact Trevor Sheffels, at <sheffels@pdx.edu>.

New Pacific Salmon Virus Detected. Researchers in British Columbia said infectious salmon anemia virus (ISA), a lethal and highly contagious marine virus, has been detected for the first time in wild salmon in the Pacific Northwest. The virus has never had been previously confirmed on the West Coast of North America. Researchers from Simon Fraser University say the virus was found in two of 48 juvenile fish collected as part of a study of sockeye salmon in Rivers Inlet, on the central coast of British Columbia, undertaken after scientists observed a decline in the number of young sockeye. Richard Routledge, the scientist who leads the sockeye study, suggested the virus had spread from the province's aquaculture industry, which has imported millions of Atlantic salmon eggs over the past 25 years, primarily from Iceland and Scandinavia. Although he admits there is no direct evidence of that link, he noted the two fish tested positive for the European strain of ISA.

The virus could have a devastating impact on the region's farmed and wild salmon, as well as on the many species that depend on them for food, such as grizzly bears, killer whales and wolves. Farms [elsewhere] hit by the virus have lost 70 percent or more of their fish in recent decades. "No country has ever gotten rid of it once it arrives," he said. The only barrier between the salmon farms and wild fish is a net, opening the way for "pathogens sweeping in and out." No vaccine or treatment exists for ISA. Gary Marty, the fish pathologist for the province's Ministry of Agriculture, said the Canadian Food Inspection Agency would seek fish samples from the researchers and run its own tests. The British Columbia Salmon Farmers Association said fish health departments have tested for the virus regularly on the farms and never found a positive case. James Winton, who leads the fish health research group at the Western Fisheries Research Center in Seattle, called it a "disease emergency" and urged that research begin at once to determine how far the virus had spread. According to the federal Centers for Disease Control and Prevention, ISA virus morphed from a benign form in nature into a "novel virulent strain" when salmon stocks entered Norway's densely packed salmon farms. Rather than getting eaten by a predator, a sick fish would undergo a slow death in a crowded pen, shedding virus particles. Offshore saltwater pens supply most of the Atlantic salmon sold in the United States. Alexandra Morton, a researcher and activist who collected the sockeye samples, and an outspoken critic of salmon farming practices in British Columbia, called the virus "a cataclysmic threat" to both salmon and herring, which can also contract the the disease. The inlet where the samples were taken is 60 miles from the nearest salmon farm, the researchers said. *(Excerpted from 'Lethal virus detected in wild Pacific salmon', in the Seattle Times, November 30.)*

MORE ISA. On December 12, the Government of Canada in collaboration with the Province of British Columbia announced that it had "completed testing all samples related to the suspected infectious salmon anemia investigation in B.C. Based on the final results, there are no confirmed cases of the disease in wild or farmed salmon in BC. The CFIA has also conducted a preliminary review of an industry-led testing program for farmed species. The review found that there has been a significant amount of testing for viral diseases, including infectious salmon anemia, in farmed fish over the last 10 years. In recent years, the Government of Canada and the Province of BC have tested over 5000 wild and farmed salmon in BC for infectious salmon anemia. None have ever tested positive. Infectious salmon anemia poses no risk to people. Pacific salmon appear to be resistant to the disease. Under the CFIA's National Aquatic Animal Health Program, suspected federally reportable diseases, such as infectious salmon anemia, must be confirmed at the Fisheries and Oceans Canada national reference laboratory. For more information on infectious salmon anaemia, visit www.inspection.gc.ca/aquatic or call 1-800-442-2342."

AND MORE ISA. On 12/6 Paul J. Henderson, of the *Chilliwack Times* reported that "a seven-year-old unpublished report indicates 100 per cent of a sample of Cultus Lake, [BC] sockeye tested positive for a potentially deadly salmon [ISA] virus. The undated report (likely from 2004) produced at a Fisheries and Oceans Canada (DFO) station in Nanaimo, tested wild Pacific sockeye, chinook, and pink salmon from various locations, including Cultus Lake. Twenty-two per cent of the salmon, or 117 out of more than 500 samples, tested positive for ISA, with more than half of the positive tests from the Fraser River. And more than half of all the positive test results came from the 64 out of 64 samples of Cultus Lake sockeye found with ISA virus." To see the full story go to [http://www.chilliwacktimes.com/news/Shocking+Cultus+sockeye+report/5816391/story.html#ixzz1gKuxYhTy]

Alaskan Pike. On November 29, KTUU.COM (Anchorage) reported "Fish and Game biologists are back on Cheney Lake, where they've been battling invasive northern pike, which have decimated the native trout population in the urban fishing hole. "It's a lot of effort and a lot of resources that we have to put toward removing these things," said Dan Bosch, a fishery biologist. Their latest effort involves laying a dozen gill nets across portions of the lake, a particularly tricky task, given that the surface is frozen solid in 3 degree weather. The team drills dozens of holes in the ice, and then strings 120-foot-long gill nets under the surface. "Once they swim through basically their gills get stuck," said habitat biologist Krissy Dunker, holding the end of the net, which drapes down toward the bottom of the lake. Fish and Game thought it had eradicated the pike in 2008 after lacing Cheney Lake with rotenone, a chemical that kills any fish in the water. By then, pike were really the only species left, having eaten everything else. Biologists restocked the lake with trout the following spring, only to hear some pretty credible reports this past summer that the pike had returned. It is unclear whether the pike survived the poisoning, or someone dumped them illegally. That's why they're laying the nets, to get a better sense of what's down there, before they even think about pumping in another truckload of trout this coming spring. "Hopefully when we come out next week and we look we'll know then if we're catching anything," said Bosch." *(Excerpted from [http://www.ktuu.com/news/fish-and-game-fights-cheney-lake-pike-20111129,0,1441828.story?track=rss])*

Columbia Basin Pike. On August 26 the *Columbia Basin Bulletin* reported that Northeast Washington's Kalispel Tribe has mounted an effort to turn back a wave of invasive northern pike that has devastated local fish populations and warns that other areas of the Columbia River basin could suffer the same consequence. The tribe's executive director for Natural Resources, Deane Osterman, during a presentation in August to the Northwest Power and Conservation Council said that the introduction of northern pike to Box Canyon reservoir on the Pend Oreille River has quickly become "a long-term disaster to our native fisheries." Osterman also said with an all-out effort the tribe felt the pike population could be brought down to a manageable level within three or four years. To read the full article, go to [http://www.cbbulletin.com/411841.aspx].

WDFW Pike Proposal. Concerned about the spread of northern pike in Washington waters, the Washington Department of Fish and Wildlife (WDFW) is gearing up for a spring campaign to halt the advance of the voracious, non-native fish toward the Columbia River. In a December 13 press release, WDFW said **"**In the coming months, state fishery managers plan to enlist anglers to remove as many northern pike as possible from the Pend Oreille River, a conduit for pike moving downstream from Idaho and Montana. "Anglers can play a major role in this effort," said John Whalen, WDFW's regional fish program manager in Spokane. "Come spring, we're going to need their help to keep northern pike from invading the Columbia River." A new webpage (http://wdfw.wa.gov/ais/esox_lucius/) on WDFW's website outlines the rapid proliferation of northern pike in the Pend Oreille River since 2004 and the threat they pose to native fish species." To see the full press release go to http://wdfw.wa.gov/news/dec1311a/.

WA Lake Vulnerability Report. A new report by Mariana Tamayo and Julian Olden, *Prioritizing Management Efforts for Aquatic Nuisance Species in Washington*, predicts the vulnerability of 319 lakes in Washington State to the invasion of Eurasian watermilfoil (*Myriophyllum spicatum*), Brazilian elodea (*Egeria*

densa), and curly leaf pondweed (*Potamogeton crispus*). These species have expanded their distribution since the 1990s, and negatively affect recreational activities, lake property values, and freshwater ecosystems. The report assesses the likelihood of introduction and successful establishment, and predicts the distribution of these species as a function of lake attributes. The models showed a high predictive power for overall correct classification rate, high specificity (i.e., accurately predicting species' absence), and a lower but adequate sensitivity (i.e., accurately predicting species' presence). The variables predicting species presence differed with each plant. Eurasian milfoil distribution was predicted based on the presence of a public boat launch, lake area, maximum depth, elevation, and urban and farming/agricultural land uses. Curly leaf pondweed distribution was related to lake area, chlorophyll-a concentration, total phosphorus, elevation, urban land use, Secchi depth, and water temperature. Elevation and urban and farm/agricultural land use important predictors for Brazilian elodea. Overall, the models predicted that 54 of the 319 lakes were vulnerable to potential invasion by at least one of the three aquatic noxious weeds examined in the study. The lakes had a probability of occurrence ranging from 0.40-0.89 and included large lakes (> 1960 ha), lakes with high aquatic plant diversity (>20 native taxa), and lakes with threatened aquatic plants and fish. Although the vulnerable lakes occurred throughout Washington, most were concentrated along the Interstate-5 corridor, the Columbia Basin Irrigation Project, and the Okanogan River. *(Thanks to Julian Olden)*

WA Draft Aquatic Noxious Weed Management General Permit. The Washington Department of Ecology is reissuing their Aquatic Noxious Weed Management General Permit, first issued in 2008. The revised permit will replace the current permit in 2012. The permit regulates the use of pesticides and other products applied to manage State-listed noxious weeds and quarantine-listed weeds, where pesticides or other products may indirectly enter the state's surface waters via inadvertent and incidental overspray or dripping of chemicals from the treated plants. The permit covers all marine and freshwater activities that result in a discharge of herbicides, adjuvants, and marker dyes indirectly into streams, rivers, estuaries, marine areas, wetlands, along lake shorelines, and other wet areas. The permit also covers the treatment of noxious- and quarantine-listed vegetation for roadside/ditch bank management activities, where chemicals may indirectly enter the water. This permit does not apply to the in-water application of chemicals directly into lakes, ponds, streams, or rivers to manage freshwater noxious- and quarantine-listed weeds. The General Permit is the appropriate permit for any in-water projects. Ecology will issue the final permit after receiving and considering all public comments. Go to [http://www.ecy.wa.gov/programs/wq/pesticides/final_pesticide_permits/noxious/noxious_index.html] to see the permit. For questions, contact Kathy Hamel, (360) 407-6562, or <kathy.hamel@ecy.wa.gov>.

New Crayfish Fact Sheet. USGS has produced a new fact sheet on invasive crayfish in the Pacific Northwest. It has good photographs showing how to differentiate the signal crayfish (*Pacifastacus leniusculus*), rusty crayfish (*Orconectes rusticus)*, ringed crayfish (*Orconectes neglectus)*, and the red swamp crayfish (*Procambarus clarkia)*. See the fact sheet at [http://pubs.usgs.gov/fs/2011/3132/]. *(Thanks to Lisa Bruyeckere, OISC)* Also, check out a recent interactive and intuitive key published by the Royal British Columbia Museum. Click on characteristics, and the possible species are sequentially reduced until only one choice remains. See it at [http://taxonomy.royalbcmuseum.bc.ca/Taxonomy/key_toc.aspx] *(Thanks to Julian Olden, UW)*

♫ Successes & Lights at the End of the Tunnel ♫

Weed Sniffing Dogs. Previous *Nutshells* featured dogs that conduct zebra mussel inspections. Now there are weed-sniffing dogs! Dogs trained to sniff out invasive plants are the latest weapon in the war against weeds that threaten to choke off vast stretches of Western native forests and grasslands. Each of the eight dogs owned by Working Dogs for Conservation (WDC), a nonprofit company in southwestern Montana, can scent as many as five types of invasive plants, often in rugged brush-covered terrain where detection eludes the human eye. The dogs spot exotics before they become too established, targeting areas where native plants and grasses still predominate. The conservation dogs targets are narrow, since aerial surveys and even casual observation reveal major weed infestations. "If you've got a monster patch, you don't need a dog to find it," said Alice Whitelaw,

co-founder of WDC. It is the dogs' keen sense of smell that makes them especially valuable as weed detectors; studies show in some cases dogs are six times more likely to locate their quarry than trained scientists. In MT, Working Dogs are credited with uncovering previously unknown colonies of Dyer's woad (*Isatis tinctoria*), a weed of the mustard family, has run rampant in ID, WY, and WA, but in MT it is limited so far to just a handful of infestations. Marilyn Marler, natural areas specialist with the University of Montana, said the conservation dogs this June nosed out unseen clusters Dyer's woad in Missoula. "We used to pull out 500 Dyer's woad; we won't even reach 100 this year," she said. Invasive species are not expected to be eradicated from the landscape any time soon, but deploying dogs to scent isolated populations may preserve some areas. *(Excerpted from 'Dogs sniff out invasive plants on Western lands', from reuters.com, by Laura Zuckerman, June 25)*

EPA Approves Zequanox to Zap Zebras. On September 14, Marrone Bio Innovations (MBI) announced that EPA has approved Zequanox, the first biological product for controlling zebra and quagga mussels in water systems. Until now, there have been no environmentally safe, targeted solutions for treating the problem. Zequanox is derived from a common microbe found in soil and water bodies, and has significant benefits over current chemical treatments, which can be toxic to beneficial species. Zequanox is easier to use, less labor intensive, and requires shorter treatment time than chemical treatments. It can be used by power plants and raw water treatment facilities as an alternative to chemical treatments, such as chlorine, or as a complement to chemical products. In preparing the EPA submission, MBI worked extensively with the Bureau of Reclamation in a hydroelectric generation facility on the lower Colorado River, and the Ontario Power Generation's Niagara Plant Group. Zequanox will initially be launched in power generation and industrial facilities in late 2011, and will later expand into open water treatments. *(Excerpted from a Market Watch press release, Sept. 14, 2011). For more information on Zequanox, go to http://marronebioinnovations.com/products/zequanox/.*

Another Mussel Solution Also Underway. BioBullets, a product invented by two University of Cambridge professors, is undergoing testing in London, England, for its ability to kill zebra mussels without harming humans or other creatures. The "bullets" are tiny pellets made of salt-based toxins covered with fat, which kill zebra mussels that ingest them. David Aldridge, one of the product's inventors and co-founders of BioBullets Ltd., insists that pellets flushed through water pipes are an effective, environmentally-friendly way of battling mussels that clog them. *(Excerpted from 'BioBullets shooting a hole through zebra mussel invasion', from Great Lakes Echo, by Carol Thompson, September 12, 2011.) For more information on BioBullets, go to http://www.biobullets.com/.*

Zebra Mussel Damage Unexpectedly Low in Ohio River Basin. About 20 years ago, the first zebra mussels were found in the Ohio River. Based on the Great Lakes experience, it was expected they would coat water intakes, outfalls and almost every solid surface under the Ohio, Kanawha and other rivers, and cause millions of dollars of damage and lost productivity. But what has been a significant problem in the Great Lakes has turned out to be a minor nuisance in the Ohio River and its tributaries. "While the zebra mussel has been a little bit of a nuisance, it's not been a problem for us at all from an operational standpoint," said Chuck Minsker, a spokesman for the Huntington District of the U.S. Army Corps of Engineers. AEP spokeswoman Melissa McHenry said her company's installations on the Ohio and Kanawha rivers have had fewer problems with the mollusks there than elsewhere. The company developed ways of using water flow and temperature at its intakes and outfalls to prevent colonization, and it has been able to use biocides to clear out mussels that have attached themselves to underwater structures, she said. Jeff Kovatch, an assistant professor of biology at Marshall University, said it's not clear why zebra mussels didn't spread as much in the Ohio River basin as they did in the Great Lakes, but there are several theories. First is the nature of the Ohio River itself. Zebra mussels need to attach themselves to solid objects, but much of the Ohio River bottom is mud, and sedimentation can add to the mud already there. They can't move, and once they're buried, they die. And some predators like ducks, freshwater drum, and possibly catfish, find them tasty and easy to harvest. Muskrats like them too, and they are one of the main predators for freshwater mussels. One thing researchers have noticed is that most zebra mussels in the Ohio River are small, Kovatch said. In other waters, they can grow to a length of 3 to 4

centimeters. In the Ohio, the majority are the size of the nail in a small finger. *(Excerpted from 'Zebra Mussels: not the ecological disaster that was expected' by Jim Ross, in the State Journal, October 8).*

Other Western Zebra/Quagga Mussel News

New "Don't Move a Mussel" Education and training Video. The PSMFC and USFWS have produced a new two-part high definition video on DVD to replace the original 2008 video by the same name. The new 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 DVD has a 72 minute total running time, but both parts can be shown separately. Funding for this production was provided by the USFWS (Region I), produced PSMFC's Bill Zook and filmed by Videoland Productions of Lacey WA. Portions of the video 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>.

More Mussels in New Mexico? On December 2, the U.S. Bureau of Reclamation announced that preliminary tests show quagga/zebra mussels may have arrived in El Vado and Navajo reservoirs in northern New Mexico. The lab samples were collected in October. Possible signs of mussel contamination also were found in Sumner Lake in eastern New Mexico. Sumner had previously been the only lake in New Mexico that had shown possible signs of the arrival of the invasive mussels, which have caused problems in lakes and waterways across the country but had previously been absent in New Mexico. (*Excerpted from* "Quaggas may have reached El Vado, Navajo reservoirs" *(Excerpted from the Albuquerque Journal, December 2, by John Fleck).*

Advanced Watercraft Inspection and Decontamination (WIT) Training. Two Level Two WIT classes were held on October 12-13 and November 1-2, and additional spring classes will be held February 7-8, February 28-29 and April 3-4 at Lake Mead. The classes, administered by the PSMFC and funded by the Bonneville Administration and US Fish and Wildlife Service, are designed for individuals who are involved in setting-up or implementing watercraft inspection and decontamination programs for their respective agencies, organizations or businesses. Class size is restricted to 10-12 people. The class focuses on actual inspections of various types of watercraft and the use of several decontamination systems. The course is certified by 100th Meridian Initiative member agencies, and successful graduates will also be qualified as incident responders and Level One Trainers. This two-day, intensive, hands-on training is provided free of charge, and registration is on a first-come first-served basis. Attendees will be responsible for their own travel expenses. If you are interested in attending this class, contact Bill Zook as soon as possible at <Bjzook2@msn.com>. For further information go to [www. aquaticnuisance.org/wit].

Monitoring Shows Mussels Persist in Pueblo Reservoir. July testing confirmed the ongoing presence of quagga mussel veligers at the reservoir at Lake Pueblo State Park, CO. Although no fully developed mussels have been found at the reservoir, the presence of veliger larvae indicates mussel reproduction is occurring.

Testing originally found a zebra mussel veliger in Pueblo Reservoir in 2007. Monitoring also detected both quagga and zebra veligers in 2008 and 2009, but no veligers were found in 2010. The most recent quagga mussel veliger was collected during routine sampling in May, and confirmed by Bureau of Reclamation microscopy and DNA testing. Results were reported to Colorado Parks and Wildlife on July 6. *(Thanks to Elizabeth Brown)*

OR Boater Inspection Regulations Project. Regulatory and Outreach Strategies for Aquatic Invasive Species in Oregon. Oregon Sea Grant, in partnership with the Oregon Invasive Species Council and Oregon State Marine Board, has begun a project funded by the National Sea Grant Law Center to increase the effectiveness of AIS prevention programs, to identify changes that may be needed in the OR constitution, and to share findings with policy makers, implementers, and boating interests to inform actions that lead to improvements in AIS prevention. HB3399, passed in May, mandates boat inspections; the next step is to obtain approval for boater surveys (CRB AIS Team helped review survey questions), synthesize the findings, hold focus groups, interview the stakeholders, and analyze regulations in other states. The findings will be used to hold workshops for boater outreach, and lead to rules and regulations, to minimize AIS risk from boat and trailer movement. The project should be completed by June 30, 2012. (Thanks to Jennifer Lam)

Revised Columbia Basin Dreissenid Response Plan/NOAA Adds Signature. On September 21, an updated version of the Columbia River Basin zebra/quagga mussel rapid response plan was posted at [http://100thmeridian.org/Columbia_RBT.asp]. The new version includes minor updates in several sections of the plan, but does not change the basic framework or response strategy. It represents the first amendment since the plan was officially signed, and therefore reflects a new process to secure signatory approval. It is anticipated that subsequent amendments will be completed more rapidly. The amendments also reflect some changes requested by NOAA regarding their responsibilities under the Endangered Species Act as it relates to a dreissenid invasion. NOAA has now recently formally signed on to the rapid response plan as well. Agencies will continue to revise the plan as a living document, hoping that they will only have to implement it through mock exercises (see below) for the foreseeable future. For questions, or to suggest updates, contact Paul Heimowitz < paul_heimowitz@FWS.gov> or Stephen Phillips <stephen_phillips@psmfc.org>. *(Thanks to Paul Heimowitz)*

Quagga/Zebra Mussel Survival Report Released. Calcium and pH are essential in shell formation and survival of dreissenid mussels. A new report, *Examination of Calcium and pH as Predictors of Dreissenid Mussel Survival in the California State Water Project* (SWP), prepared by Renata Claudi and Katherine Prescott, discusses the suitability of the SWP to support long-term populations of unintentionally introduced quagga and zebra mussels. Ten years of calcium and pH data from 23 SWP water quality stations were analyzed, and SWP locations were classified into three groups: unable to support, potentially able to support, and able to support, long-term populations of dreissenid mussels. Understanding where dreissenid mussels may survive in the SWP will guide future management of this invasive species. A copy of this report is available at [http://www.water.ca.gov/environmentalservices/invasive_reports1.cfm]. For additional information on the Quagga/Zebra Mussel Monitoring and Management Program, contact Tanya Veldhuizen at <tanyav@water.ca.gov> or Jeff Janik at <jjanik@water.ca.gov>.

MN DNR Chemically Treats Zebra Mussel Infested Water. In October, the Department of Natural Resources took an aggressive step to stop the spread of zebra mussels in Rose Lake, MN. For the first time in the state, the DNR attempted to control a small population of zebra mussels by chemically treating the infested waterbody with copper sulfate. Commonly used to kill algae, this chemical has not been effective in killing large, established mussel populations, but DNR Invasive Species Specialist, Nathan Olson said the population in Rose Lake is juvenile and contained, so the chemical has a much better chance of working. "This is a very special circumstance," he said. The 10 acre area cost the DNR approximately $14,000 to treat. Although the price is high, Becker County Coalition of Lake Associations Vice President Terry Kalil said it will cost the

community much more if the spread isn't controlled. "We're not going to have a tourism industry left; it's that simple. Our property value is going to plummet. There's not going to be people coming to the lakes." The DNR said it will take several years of monitoring the lake to know if the treatment is successful. *(Excerpted from KSAX TV eyewitness news, October 6, by Emily Reppert.)*

CRB Rapid Response Exercise. The Columbia River Basin (CRB) Team of the 100th Meridian Initiative held its fifth rapid response exercise in October in Libby, MT. The event was hosted by the MT Fish Wildlife and Parks. The main focus was on monitoring and containment at Lake Koocanusa, and the purpose of this particular two-day mock exercise was primarily to address cross-border issues with Canada. There was good participation from the Canadian government. MTFWP also decided to make the exercises an annual event in Montana, to increase the state's response preparedness f A final report of the recent Lake Koocanusa invasive mussel response exercise has been completed, and is available at [http://100thmeridian.org/ActionTeams/Columbia/2011%20Lake%20Koocanusa%20invasive%20mussel%20exercise%20report.pdf] . *(Thanks to Paul Heimowitz,USFWS)*

Nevada Program Update: Lahontan Reservoir Tests Positive for Quaggas. After months of testing, the Bureau of Reclamation (BOR) and Nevada Department of Wildlife announced in July that quagga mussels have been linked to Lahontan Reservoir. This marks the first discovery of quagga mussels in Nevada outside of the Colorado River system. The BOR found quagga veliger larvae during testing in April, and subsequent tests indicated the mussels are present. The BOR used DNA and specialized microscope testing to determine if the suspected larvae were quaggas. Rye Patch Reservoir near Winnemucca was listed as "suspected" after rounds of testing. Results from Rye Patch were positive, except for one negative DNA sample. Lab results for Pyramid Lake, Wildhorse Reservoir, the Ruby Marshes and various lakes in the Sierra came back negative. However, in June and July, Lahontan tested negative, which may mean the quaggas won't adapt to the water. If water levels, temperature, calcium levels, and other conditions at Lahontan and Rye Patch aren't conducive to quaggas, the larvae may not attach. *(Excerpted from 'Lahontan Reservoir tests positive for quagga mussels' By Steve Puterski, Sierra Sun, July 31)* In May, the Governor also signed an AIS bill allowing establishment of a boat sticker fee, to be implemented in 2013. The state is now also working with the National Park Service to address the issue of boats slipping through the inspection and notification system at Lake Mead, and the Duck Valley Reservation has received USFWS funding for a portable decontamination unit. *(Thanks to Karen Vargas)*

ISDA Inspection Program Update. The Idaho Department of Agriculture inspection program operated 15 boat inspection stations in 2011. They made – 47,027 inspections, and intercepted 25 mussel-laden boats, compared to eight last year. Fifteen of the infested boats were coming from the Midwest, and others intercepted originated from federal waters in Nevada and Arizona. *(Thanks to Amy Ferriter, IDA). On 11/1 ISDA* issued a press release stating "Of the 24 mussel-fouled watercraft that were intercepted this year, nearly half originated from federal waters in Nevada and Arizona [note: an additional 25th boat from Michigan was intercepted on 11/22 by Idaho Port of Entry staff (Cotterel, ID)]. The Lower Colorado River system is known to be heavily infested with quagga mussels, and we know that many Pacific Northwest boats spend extended periods of time there. Given the proximity to Idaho, boats that have been in those waters are considered extremely high risk," said Idaho State Department of Agriculture Director Celia Gould. Most other western states also have initiated prevention programs in an effort to keep these species from being introduced on trailered watercraft. "Mussel-fouled boats continue to leave infested waters without proper decontamination. The federal government needs to do a better job of containing infestations in their waters and preventing the spread of these species to the Pacific Northwest states," said Gould. "We need all hands on deck as we work to protect our waters." The full ISDA press release can be found at [http://www.agri.idaho.gov/Categories/NewsEvents/Documents/PressReleases/2011/BoatInspectionsSuccessful111101.pdf]

Montana Inspection Program Update. Inspections greatly increased in 2011; highway and border checks inspected over 7000 boats (as opposed to 3000 in 2010). Three boats were found with mussels, and several

contained standing water or vegetation. The state is now working on an inspection plan for 2012. *(Thanks to Eileen Ryce, MTFWP)*

OR Inspection Program Update. In 2011, five roving teams conducted 2850 inspections from May to mid September (No dreissenid boats intercepted). This year, 3600 inspections were completed. The new HB 3399 provides authorization for mandatory stops at roadside inspection stations, and the first enforcement actions were taken on September 2. Twenty seven boats were chased down, but no citations issued, and seventy two boats were decontaminated. *(Thanks to Rick Boatner, ODFG)*

WA Inspection Program Update/Fouled Boat Intercepted 12/11. The number of boat inspection stations in Washington more than doubled this year, from 20 in 2010, to 46, and 1035 boats were inspected. *(Thanks to Eric Anderson, WSP).* On 12/11 WA reported that an infested commercially hauled watercraft was intercepted at the Spokane Port of Entry. The Wisconsin boat was heading to Shilshole Marina (Seattle). The mussels appeared dead presumed dead (but still being confirmed). The hauler was very cooperative and no citation was issued (only a written warning). This makes the fourth boat intercepted by WA this year *(Thanks to Carl Klein, WSP).*

Colorado Inspection Program Update. In 2011, Colorado boat inspectors and state-certified partners checked more than 420,000 boats for aquatic nuisance species at 112 sites statewide. Quagga or zebra mussels were found on eight boats, which were then decontaminated. None of the infested boats came from Colorado waters. The inspectors also decontaminated over 6,000 other boats because of suspected ANS or standing water in the boat. "The number of vessels that have been intercepted with invasive mussels has gone down each year, indicating that the state's boat owners inspect and clean their vessels before entering the state's waters." said Elizabeth Brown, Invasive Species Coordinator for Colorado Parks and Wildlife. Nineteen infested boats were intercepted in 2009, and fourteen boats were intercepted in 2010. In 2011, only eight were intercepted.

Scuba Monitoring Update. In 2010, USGS completed a procedures manual for conducting underwater searches for Zebra/Quagga mussels (USGS open file report 2010-1308). In 2011, they developed a needs assessment and training materials. Fifteen divers were subsequently trained at Hood River, OR, on September 9, 2011. Sufficient funding is available for one more training exercise in 2012, and some organizations have shown interest in supporting additional training *(Thanks to Noah Adams, USGS)*

New Mussel Detection Video. The USFWS also has a new short you-tube video on zebra/quagga mussel detection, highlighting collaboration with USGS to enhance regional capacity for underwater dive surveys. See *Eyes wide open-watching out for aquatic invaders*, on YouTube at [http://www.youtube.com/usfws#p/c/00CA362652FF8AB3/0/AH3HVJBo1vg]

PBS Newshour Runs Mussel Story. On 11/23 the newshour ran a story "Tiny Mussels Invade Great Lakes, Threaten Fishing Industry". To see the story go to [http://www.pbs.org/newshour/bb/environment/july-dec11/mussels_11-23.html]

In Case You Missed Them- Some New Zebra Mussel Publications (all *Aquatic Invasion* articles can be found at [http://www.aquaticinvasions.net/index.html]).

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* Britton D and Dingman S (2011). Use of quaternary ammonium to control the spread of aquatic invasive species by wildland fire equipment. Aquatic Invasions 6: 169-173
* Comeau S, Rainville S, Baldwin W, Austin E, Gerstenberger SL, Cross C, Wong WH. 2011. Susceptibility of quagga mussels (*Dreissena rostriformis bugensis Andrusov*) to hot-water sprays as a means of watercraft

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* Chen D. et al. (2011). Environmental factors affecting settlement of quagga mussel (*Dreissena bugensis*) veligers in Lake Mead, Nevada-Arizona, USA. Aquatic Invasions 6: 149-156
* Cross C. et al. (2011). Estimating carrying capacity of quagga mussels (*Dreissena rostriformis bugensis*) in a natural system: A case study of the Boulder Basin of Lake Mead, Nevada-Arizona. Aquatic Invasions 6: 141-147.
* Hickey V. 2010. The quagga mussel crisis at Lake Mead National Recreation Area, Nevada (U.S.A.). Conserv Biol. 24:931-937.
* Hosler D (2011). Early detection of dreissenid species: zebra/quagga mussels in water systems. Aquatic Invasions 6: 217-222
* Loomis E. et al. (2011). Abundance and stomach content analysis of threadfin shad (*Dorosoma petenense*) in Lake Mead, Nevada: Do invasive quagga mussels (*Dreissena rostrifomis bugensis*) affect this prey species? Aquatic Invasions 6: 157-168
* McMahon RF (2011). Quagga mussel (*Dreissena rostriformis bugensis*) population structure during the early invasion of Lakes Mead and Mohave January-March 2007. Aquatic Invasions 6: 131-140.
* Mueting SA et al. 2010. An evaluation of artificial substrates for monitoring the quagga mussel (*Dreissena bugensis*) in Lake Mead, NV-AZ. Lake Reserv Manage. 26:283-292
* Mueting SA and Gerstenberger SL. 2011. The 100th Meridian Initiative at the Lake Mead National Recreation Area, NV, USA: Differences between boater behaviors before and after a quagga mussel, *Driessena rostiformis bugensis*, invasion. Aquatic Invasions. 6:223-229.
* Mueting SA and Gerstenberger SL. 2010. Mercury Concentrations in Quagga Mussels, Dreissena bugensis, from Lakes Mead, Mohave and Havasu. Bull Environ Contam Toxicol. 84:497-501
* Reid NJ, et al. 2010. Distribution of quagga mussel veligers, *Dreissena bugensis*, in the reservoirs of the Colorado River Aqueduct Lake Reserv Manage. 26:328-355.
* Turner K, et al. (2011). Interagency monitoring action plan (I-MAP) for quagga mussels in Lake Mead, Nevada-Arizona, USA. Aquatic Invasions 6: 195-204.
* Wittmann ME, et al. 2010. Early invasion population structure of quagga mussel and associated benthic invertebrate community composition on soft sediment in a large reservoir Lake Res. Manage. 26:316-327.
* Wong WH, et al. 2010. Potential ecological consequences of invasion of the quagga mussel (*Dreissena bugensis*) into Lake Mead, Nevada–Arizona, USA. Lake Reserv Manage. 26:306-315.
* Wong WH, et al. (2011). A standardized design for quagga mussel monitoring in Lake Mead, Nevada-Arizona. Aquatic Invasions 6: 205-215.
* Wong WH and Gerstenberger SL (2011). Quagga mussels in the western United States: Monitoring and Management. Aquatic Invasions 6: 125-129.
* Wong WH, et al. (2011). Settlement and growth of quagga mussels (*Dreissena rostriformis bugensis*) in Lake Mead, Nevada-Arizona, USA. Aquatic Invasions, in press

(Thanks to David Wong, UNLV)

Around The U.S.

US Forest Service Takes Action to Confront the Threat of Invasive Species. On 12/5 the U.S. Forest Service announced that the publication of its first ever national-level direction on the management of invasive species across aquatic and terrestrial areas of the National Forest System. “Invasive species cost the American public an estimated $138 billion each year. They deplete water supplies, destroy recreation opportunities and damage landscapes across the country,” said U.S. Forest Service Chief Tom Tidwell. “We are taking this bold approach to better protect our nation’s forest and water resources from the threat of invasive species.”While the Forest Service has long had a Forest Service Invasive Species Program, this policy adds new requirements for agency-wide integration of invasive species prevention, early detection and rapid response, control, restoration, and collaborative activities across all National Forest System lands. “The integrated nature of this new approach will make the Forest Service able to more effectively manage invasive species in the context of environmental issues such as adaptation to climate change, increasing wildfire risk, watershed restoration,

fragmentation of habitats, loss of biodiversity, and human health concerns," said USDA Undersecretary Harris Sherman. "At the same time, we will be engaging the public, including participation by Tribes, in these programs and benefits."

The proposed policy was published on June 3 in the Federal Register for a 60-day public comment period. The final policy published in the Federal Register reflects the consideration of comments received from a wide variety of stakeholders in the public and private sectors, including non-government organizations, state and local government agencies, private individuals, and other Federal government agencies. To see the final policy go to http://www.gpo.gov/fdsys/pkg/FR-2011-12-05/pdf/2011-31090.pdf.

New National State-Based Listserve. In July, a new State-Invasives-L listserve, was established to enhance communication on invasive species issues *relevant to state-focused programs and policies*. Feel free to post questions and information of this nature to the list. Possible topics to address could include development and adaptation of tools and programs in the state context; examples of state policies and plans focused on invasive species or aquatic nuisance species; experiences in the establishment of state councils/working groups; opportunities for federal funding and training, and regional collaboration for prevention and management of invasive species. Subscriptions to the list are filtered by the list managers, but postings by subscribers are not moderated. Refer more scientific or theoretical discussions to other appropriate lists. Post messages to <State-Invasives-L@ncsl.org>. To unsubscribe from the list, or for additional questions, contact Scott Hendrick <scott.hendrick@ncsl.org> or Stas Burgiel, NISC <stas_burgiel@ios.doi.gov>. *(Thanks to Craig Martin)*

Status of State Felt Wader Regulations. For some time, felt-based waders used by fishermen have been noted to contribute to the spread of aquatic species, such as the New Zealand mudsnail *(Potamopyrgus antipodarum).* Alaska, Idaho, Maine, Maryland, Missouri, Montana, New Mexico, New York City, Oregon, and Vermont all have regulations either passed or in progress. For a website that allows you to view the status of all state regulations on these waders, go to [http://www.stopans.org/Felt_Bans.htm].

Draft NPDES General Permits for Vessels Now Available. The 2013 draft Vessel General Permit (VGP) and Small Vessel General Permit (sVGP) are now available at [http://www.epa.gov/npdes/vessels]. The draft VGP, set to replace the current 2008 VGP when it expires in December 2013, would continue to regulate the 26 specific discharge categories that were contained in the 2008 permit, and for the first time, it authorizes the discharge of fish-hold effluent. The draft permit also contains numeric ballast water discharge limits for most vessels, more stringent requirements for exhaust gas scrubbers, and the use of environmentally acceptable lubricants. EPA will be taking comment on the potentially more stringent requirements for bilgewater requirements. The draft sVGP would be the first Clean Water Act permit to regulate discharges incidental to the normal operation of commercial vessels less than 79 feet in length. The draft Permit would go into effect at the conclusion of a moratorium enacted by Congress exempting all incidental discharges from vessels less than 79 feet, and commercial fishing vessels, with the exception of ballast water, from having to obtain a permit until December 18, 2013. The draft permit specifies best management practices for several broad discharge management categories including fuel management, engine and oil control, solid and liquid maintenance, gray water management, fish-hold effluent management, and ballast water management. EPA plans to finalize the permits in late 2012, and they will take effect in December, 2013. For WA guidance on EPA's Vessel General Permit, and vessels in general, go to: [http://www.ecy.wa.gov/programs/wq/permits/VGP/index.html].

Vessels Required to Meet Both State and Federal Permit Conditions for Wastewater Discharges. For those of you new to the issue of the vessel general permit, get more detail and some background history at [http://www.martenlaw.com/newsletter/20110906-incidental-wastewater-discharges?utm_source=Marten+Law+News&utm_campaign=c2e7f67b3f-Marten_Law_News_September_6_20119_5_2011&utm_medium=email] *(From Marten Law, September 6) (Thanks to Stephen Phillips)*

House Approves Ballast Water Bill. The U.S. House of Representatives has approved a bill [**H.R. 2838, The Coast Guard and Maritime Transportation Act of 2011**] that would set a national policy for cleansing ship ballast water to kill invasive species, while prohibiting states from imposing tougher requirements. The measure that passed the Republican-controlled chamber in November would adopt an international standard [per the International Maritime Organization] limiting the number of live organisms in ballast water. Vessel operators would have to install technology to comply. The shipping industry says an existing patchwork of more than two dozen state and tribal policies is unworkable because vessels move constantly from one jurisdiction to another. New York rules scheduled to take effect in 2013 would be 100 times tougher than the House bill standards. Environmentalists say the House measure isn't strong enough to prevent more invasive species from reaching the Great Lakes, and say they hope to derail it in the Democratic-controlled Senate. *(Excerpted from 'House OKs bill setting national ballast standard', November 15 in the Wall Street Journal.)*

Ballast Water Discharge Monitoring Guidebook. A new guidebook, *A Ballast Discharge Monitoring System for Great Lakes Relevant Ships: A Guidebook for Researchers, Ship Owners, and Agency Officials,* (Allegra Cangelosi et al.), prepared by various members of the Northeast-Midwest Institute and the Lake Superior Research Institute, was completed in November, 2011. It can be downloaded at: [http://www.nemw.org/GSI/BallastDischargeMonitoringGuidebook.pdf]. *(Thanks to Allegra Cangelosi)*

Federal Ballast Water Discharge Standard. The proposed US Coast Guard's Ballast Water Discharge Standard rulemaking package has begun Office of Management and Budget review. On OMB's website, click "DHS" on bar graph and select [http://www.reginfo.gov/public/jsp/EO/eoDashboard.jsp]. Note the rule's earlier publication date of July 2011 is outdated, and will be updated in the Fall Regulatory Agenda. *(Thanks to John Morris, USCG)*

EPA Aquatic Pesticide Permit Is Final. On October 31, 2011, EPA issued a final NPDES Pesticide General Permit (PGP) for point source discharges from the application of pesticides to waters of the United States. (This permit is modeled closely after the Washington permit.) The action was in response to a 2009 decision by the U.S. Sixth Circuit Court of Appeals (*National Cotton Council, et al. v. EPA*), in which the court vacated EPA's 2006 Final Rule on Aquatic Pesticides and found that point source discharges of biological pesticides, and chemical pesticides that leave a residue, into waters of the U.S., were pollutants under the Clean Water Act. As a result of this decision, NPDES permits are generally required for these types of discharges as of October 31, 2011. While the permit requirements must be met as of October 31, Operators will be covered automatically under the PGP without submitting a Notice of Intent (NOI) for any discharges before January 12, 2012. To continue coverage after January 12, 2012, Operators who are required to submit NOIs will need to do so at least 10 days (or 30 days for discharges to National Marine Fisheries Service Listed Resources of Concern) prior to January 12. For the first 120 days that the permit is in effect, EPA will focus on compliance assistance and education of the permit requirements, rather than on enforcement actions. This general permit will provide coverage for discharges in the areas where EPA is the NPDES permitting authority (the states of AK, ID, MA, NH, NM, and OK, Washington, D.C., most U.S. territories, Indian Country, and many federal facilities). The remaining 44 states and the Virgin Islands are authorized to develop and issue their own NPDES pesticide permits. A Fact Sheet and other information are available on the EPA website at [http://cfpub.epa.gov/npdes/home.cfm?program_id=410]. NMFS has also released a Biological Opinion on the permit, which is available at [http://www.nmfs.noaa.gov/pr/pdfs/consultations/biop_epa_pgp2111014-1.pdf]

LA Nutria Program Gets Creative. Nutria-fur fashion and dog treats are some of the products that will be launched to help battle invasive species in Louisiana marshes. The program, now in its sixth year, provides grants of $2,500 to $8,000 for community-based projects aimed at controlling or managing invasive species, promoting native species, or educating the public about the risks of invasive species and the importance of native flora and fauna. Michael Massimi, invasive species coordinator with the Barataria-Terrebonne National Estuary Program, said the group gave out three grants this year. They will pay for nutria-fur fashion, dog treats made from nutria, and a documentary on invasive species. The nutria (*Myocastor coypus*), a large South

American rodent, was introduced into Louisiana in the 1930s to be farmed for fur. It escaped into the marshes and produced a population explosion that had a drastic effect on wetland grasses, nutria's food of choice. The nutria eat the roots, converting marshes into open waters. Before state control programs were implemented,

nutria destroyed an estimated 80,000 acres of LA wetland. Andrew Elliott, a filmmaker with Ensemble Arts, received a $7,500 grant to shoot a documentary for the Barataria-Terrebonne National Estuary Program, titled "Reclaiming the Bayou". Check out this video at [http://www.helpholycross.org/2010/09/reclaiming-bayou-bienvenue-video.html]. *(Excerpted from 'Dog treats, fur coats could help spell nutria's doom', in the DailyComet.com, by Nikki Buskey September 12.)*

Nutria Rodeo. Golden Meadow, Louisiana held a Nutria Rodeo on December 3. The invasive destructiveness of the nutria has led Louisianians to do *interesting* things with them, including eating and making ridiculous looking hats. According to the organizers, the Rodeo is "a creative way to control invasive species. The Nutria Rodeo was organized by Sassafras Louisiana, an advocacy group created by South Lafourche High School students working for preservation and restoration of South Louisiana's wetlands. But despite the name, the Nutria Rodeo isn't just about nutria; rodeo participants can also compete in Asian carp, feral pigs and coyote, with prizes given for the largest caught in each category, plus an additional prize for the nutria with the most orange teeth. A hunting license is needed to actually kill nutria, but even for those not wrangling rodents, it sounds like there will still be enough food and music to make a big Cajun fest for a good cause. ." Rumors also say it had nutria spaghetti, plus all sorts of more normal Cajun food *(Excerpted from 'Inaugural Nutria Rodeo is Happening, Seriously', by Alexander Hancock November 30, 2011, in Eater New Orleans.)*

New Monograph on Florida Herps. *'A Runaway Train in the Making: The Exotic Amphibians, Reptiles, Turtles, and Crocodilians of Florida'*, by Walter Meshaka, 2011. (Monograph 1. Herpetological Conservation and Biology 6:1-101) is now available. Download this free large (10MB) file at [http://herpconbio.org/Volume_6/Monograph_1/Meshaka_2011.pdf] or go to [http://www.herpconbio.org/]. *(Thanks to R. Bruce Bury, OR USGS)*

Sea Squirt Conference papers. Volume 6 issue 24, of the open access online *Journal of Aquatic Invasions* is now available at [http://www.aquaticinvasions.net/2011/issue4.html]. This special issue includes papers from the 3rd International Invasive Sea Squirt Conference held in Woods Hole, MA, USA, on April 26-28, 2010. The conference provided a venue for the exchange of information on the biogeography, ecology, genetics, impacts, risk assessment and management of invasive tunicates worldwide. *Contents:*

Articles in press

* Induced spawning and culture techniques for the invasive ascidian *Didemnum vexillum* (Kott, 2002) (Lauren M. Fletcher and Barrie M. Forrest,)
* The role of *Didemnum perlucidum* F. Monniot, 1983 (Tunicata, Ascidiacea) in a marine fouling community (Laura P. Kremer and Rosana M. Rocha)
* Abundance and diversity of ascidians in the southern Gulf of Chiriquí, Pacific Panama (Stephan Bullard, Mary Carman, Rosana Rocha, Jennifer Dijkstra and Anne Goodwin)
* Non-indigenous tunicates in the Bay of Fundy, eastern Canada (2006–2009) (Jennifer Martin,

Murielle LeGresley, Bruce Thorpe and Paul McCurdy)

* Potential of the invasive colonial ascidian, *Didemnum vexillum*, to limit escape response of the sea scallop, Placopecten magellanicus (Jennifer A. Dijkstra and Riley Nolan)
* Pressurized seawater as an antifouling treatment against the colonial tunicates *Botrylloides violaceus* and *Botryllus schlosseri* in mussel aquaculture (Collin Arens, Christine Paetzold, Aaron Ramsay, Jeff Davidson)
* Ascidians at the Pacific and Atlantic entrances to the Panama Canal (Mary Carman, Stephan Bullard, Rosana Rocha, Gretchen Lambert, Jennifer Dijkstra, James Roper, Anne Goodwin, Mimi Carman, Elisabete Vail))
* Monitoring for invasive tunicates in Nova Scotia, Canada; 2006-2009 **(**Dawn Sephton, Benedikte Vercaemer, Jean Marc Nicolas and Joanne Keays)
* *Ciona intestinalis* environmental control points: Field and laboratory investigations (communities (Benedikte Vercaemer, Dawn Sephton, Jean M. Nicolas, Stephanie Howes and Joanne Keays)
* Ascidians in the succession of marine fouling (Frederike Lindeyer and Adriaan Gittenberger)
* Settlement and possible competition for space between the invasive violet tunicate *Botrylloides violaceus* and the native star tunicate *Botryllus schlosseri* in The Netherlands ((Adriaan Gittenberger and Jean Jacques Simeon Moons)
* Artificial structures in harbors and their associated ascidian fauna (Adriaan Gittenberger and Ron C. van Stelt)
* Predicting larval dispersal of the vase tunicate *Ciona intestinalis* in a Prince Edward Island estuary using a matrix population model (Lisa Kanary, Andrea Locke, James Watmough, Joël Chassé, Daniel Bourque and André Nadeau)

Short communications in press:

* Managing invasive *Styela clava* populations: Inhibiting larval recruitment with medetomidine (Kate J. Willis and Chris M.C. Woods)
* The effect of high-pressure spraying for tunicate control on byssal thread characteristics in the cultured blue mussel (*Mytilus edulis* Linnaeus, 1758) (Collin J. Arens, S. Christine Paetzold and Jeff Davidson)
* Biology, ecology and trials of potential methods for control of the introduced ascidian *Eudistoma elongatum* (Herdman, 1886) in Northland, New Zealand (Michael J. Page, Donald J. Morrisey, Sean J. Handley and Crispin Middleton)
* Generalized regional spatial patterns of larval recruitment of invasive ascidians, mussels, and other organisms along the coast of Maine (Douglas C. McNaught and Wendy S. Norden)

(Thanks to Stephen Phillips)

New Invasions

Virginia Customs Seizes Invasive Beetles. Acting on a tip from the USDA, a CBP agriculture specialist in Norfolk, VA, intercepted two shipping containers at the Port of Virginia found to contain live larvae of the khapra beetle, *Trogoderma granarium*. The containers, which originated in India, held hundreds of sacks of safflower seeds contaminated with the larvae and cast skins of the beetle. The beetle is hardy and resistant to many insecticides, and considered one of the 100 most-invasive pests in the world. It is native to India and can survive long periods without food. The pest was eradicated from the United States in the 1950s and 1960s after a costly government effort. But an increasing number of beetles are now turning up in the nation's seaports.

During the last nine months of its 2010 fiscal year, customs agents intercepted 177 infested shipments, compared with three to six per year in 2005 and 2006, and ~15 per year from 2007 to 2009. In response to the upswing, the USDA restricted rice imports from countries known to have the beetle. The October seizure in Hampton Roads marked the first time the pest has been discovered there. "The results of specialized training can be seen in this critical interception," said Mark Laria, CBP's Area Port Director. "Left undetected, this destructive pest could potentially cause grave damage to U.S. agricultural interests in Virginia and the nation." *(Excerpted from 'Customs Agents Seize Port Shipment containing invasive beetles', by Peter Frost, in the Dailypress.com, October 13, 2011)*

Another Florida Invasion: Giant Land Snails. The Florida Department of Agriculture and Consumer Services has positively identified a population of giant African land snails (*Achitina fulica*) in Miami-Dade County. The snail is one of the most damaging snails in the world, because it consumes at least 500 different types of plants, can cause structural damage to plaster and stucco (it eats them for the calcium it needs to build its shell), and it can carry a parasitic nematode that can lead to meningitis in humans. *A. fulica* is one of the largest land snails in the world, growing up to eight inches in length and more than four inches in diameter.

A snail can live as long as nine years. It contains both female and male reproductive organs, and after a single mating session, each snail can produce 100-400 eggs. In a typical year, every mated adult lays about 1,200 eggs. It is originally from East Africa, and has become established throughout the Indo-Pacific Basin, including the Hawaiian Islands. This pest has also been introduced into the Caribbean islands of Martinique and Guadeloupe with recent detections in Saint Lucia and Barbados. The last reported outbreak and eradication of the African land snail in Florida occurred in 1966, when a boy smuggled three snails into Miami as pets. The boy's grandmother released the snails into her garden, and seven years later, more than 18,000 snails were found, costing more than $1 million and taking an additional 10 years to successfully eradicate this pest from Florida. (This is the only known successful giant African land snail eradication program.) Giant African land snails are illegal to import into the United States without a permit, and currently no permits have been issued. Anyone who believes they may have seen a giant African land snail or signs of its presence should call the Department of Agriculture and Consumer Services toll-free at 888-397-1517 to make arrangements to have the snail collected. To preserve the snail sample, put the snail in a zip lock bag, seal it and place it in a bucket or plastic container. Do not release or give these samples away. *(Excerpted from 'Florida DACS Identifies Giant African land snails in Miami Dade County, September 15.)*

Ed. Comment: When I lived in Guam, recipes for cooking these unappetizing snails appeared periodically in the newspaper. But they involved 3 days of unappealing cleaning and de-sliming, which effectively killed my appetite for ever trying the snails. But in London, there is now a much faster way! Now, to see an interesting

video showing how to cook these HUGE snails (said to be delicious…by some), go to [http://www.guardian.co.uk/lifeandstyle/wordofmouth/2009/jul/03/african-land-snails-video].

First Pythons, Now Monitor Lizards. The Nile Monitor lizard *(Varanus niloticus),* a lizard growing to more than seven feet in length, has been spotted in West Palm Beach, FL, and there are unconfirmed sightings in Central Broward. Nile monitors are native to Africa and, like pythons, are generally are released into the wild by pet owners who grow tired of them. Wildlife officials fear the carnivorous, invaders are spreading in the

state's man-made canals They can swim under water for as long as an hour and run 15 or more miles per hour above ground. "This is a high-priority species for us," said Scott Hardin, coordinator of the FWC's Exotic Species Coordination Section. "We plan to go after them aggressively." The FWC began observing the animals in and around the C-51 canal along Southern Boulevard in West Palm Beach, and biologists counted nine Nile Monitors. The commission is working closely with the South Florida Water Management District to survey South Florida canals. The FWC discourages attempts to capture the lizards since they can get nasty; they have long tails that they can use like whips, and sharp teeth and claws. The commission also is concerned about the large, predatory Nile monitors destroying bird rookeries or other native animals. Report sightings of Nile monitors to 888-IVE-GOT1 (888-483-4681). *(Excerpted from 'Wildlife group warns of invasion of the Nile Monitor lizards' by Nadege Green in the June 28 Miami Herald)*

The Positive Side to Invasives?

A Cancer Cure from Giant Salvinia? Researchers at the Stephen F. Austin State University's National Center for Pharmaceutical Crops (NCPC) have now discovered that giant Salvinia, *Salvinia molesta,* has promising medical potential. Giant Salvinia is a fern species native to Brazil. Since 1939, it has invaded lake and river systems in warm climates, and currently it is one of the most widespread and environmentally, economically and socially destructive invasive plant species in the world. Giant Salvinia forms dense mats on still waters and can double in number and biomass in less than three days in optimal conditions. It can regenerate even after severe damage or drying. The explosive growth of giant Salvinia not only adversely affects the natural ecological systems, but it also causes considerable economic damage and sanitation problems. Salvinia-infested waters cannot be used for boating or other recreational purposes. Dense mats of Salvinia reduce dissolved oxygen levels and block all sunlight from penetrating the infested water body, killing macrophytes and microscopic algae that form the base of the food chain. The animals up the food chain that feed on the algae then may die too. This pest also threatens cultivated aquatic crops, and it can clog irrigation and drinking water lines and foul hydroelectric plants. Since 1980, the tiny salvinia weevil (*Cyrtobagous salviniae),* introduced into most regions invaded by giant Salvinia, has successfully controlled it for years in some regions.

(Texas Parks & Wildlife representatives remove giant salvinia from B.A. Steinhagen Lake near Jasper --and yes, that IS water around the boat, not a meadow)

But there is a positive side. Researchers have now discovered that extracts of giant Salvinia can effectively inhibit growth of human tumor cells with minimum damage to normal cells. To date, more than 30 different compounds, including four new compounds, have been isolated from the giant Salvinia. Further tests of the bioactive compounds isolated from giant Salvinia are ongoing at the M.D. Anderson Cancer Center in Houston. "Our research opens a new door to positive control of noxious invasive plants, [and] our elucidation of the chemical composition of giant Salvinia will help researchers better understand the molecular mechanism of invasion," said Dr. Shiyou Li, research professor and director of the Center. Li has developed the first high-yielding cultivar of anti-cancer camptotheca, and trichome management technology to induce drug production. Both the cultivar and the technology have been granted patents. Li and his colleagues at National Cancer Institute, the M.D. Anderson Cancer Center, the New York Botanical Garden and the University of Puerto Rico, have developed the concept and principle of pharmaceutical crops. With the support of a team of international leading scientists, most recently, they launched Pharmaceutical Crops, the only international peer-review journal in the field. For more information on the NCPC, visit [www.ncpc.sfasu.edu]. *(Excerpted from an SFA News Service Press Release KTRE9, 'Pesky water plant could treat cancer, SFA researchers say', July 9.)*

The Great Lakes Carp Saga Continues...

'Reversing the River' Gains Traction. In the 19th century, the Chicago River emptied into Lake Michigan, washing sewage into the cities' drinking water supply in Lake Michigan. Chicago solved the problem by reversing the river's flow direction, connecting the Great Lakes and the Mississippi River, two great waterways that had always been separate. But the unexpected price of this was invasive species. The new threat has civic leaders considering an audacious fix: un-reversing the river. And it is starting to seem a lot less far-fetched. "In June, 2010, just down the Calumet River from Lake Michigan, we actually saw a live Asian Carp here right in Lake Calumet," said Joel Brammeier, president and CEO of the Alliance for the Great Lakes. Carp DNA had already been showing up in the Chicago waterways for a while, but this was a live three-foot long, 20-pound fish. It was not clear how it got on the wrong side of an electric barrier meant to contain it, but it inflamed fears that carp are continuing their march up the Mississippi, through these man-made connections, into the Great Lakes. Many feel separating these two systems is needed because the technology barriers simply aren't a long-term solution. Long-time U. S. senators are asking [the Army Corps of Engineers] to study separation," says Brammeier. "We're past the point of determining whether this is a crazy idea or not. The push to take that idea seriously came, in part, when other Great Lakes states sued to force Chicago to shut down the lakefront locks. The suit has stalled in court, but the idea of un-reversing the river, a more permanent solution, has gained support. Former Chicago Mayor Richard Daley called it a "great project." "We do not have the luxury of time in dealing with the Asian Carp, and the potential damage they could cause in the Great Lakes is astronomical," said David Ullrich, an EPA official and head of the Great Lakes and St. Lawrence Cities Initiative. He's co-leading another, fast-tracked study of basin separation, on behalf of Great Lakes cities and states. Most proposals being considered would basically dam the Chicago River somewhere and block the water's escape route to the Mississippi system. But depending on barrier location, Ullrich says there could be a dead-end for

barges and tour boats, toilet waste in the lake, or flooding in downtown Chicago. “We’re trying to find those locations that create the least problems for all of those,” he said.

The cost of un-reversing the river is still unknown, but it would go well beyond just engineering and construction; cutting off a hundred-year-old shipping lane would have serious consequences for industry. Lockport alderman Pete Colarelli said. “If the canal is closed, a number, if not all of the businesses here, would close down.” But the more difficult problem might be the water itself; severing the connection to the Mississippi could leave storm water with no escape route, risking major floods in downtown Chicago and elsewhere, and new infrastructure to deal with the water could make a giant project even bigger. Ullrich struggled to think of another public works project on this scale. “Comparing it with other projects, I don’t know. The pyramids?” But he’s pretty sure he’ll live to see this water flow the other direction. “Chicago makes no small plans. And I’m confident that this is another big plan that can be a reality,” (*Excerpted from ‘Un-reversing the Chicago River’ by Gabriel Spitzer, in WBEZ91.5 Front&Center, July 12.)*

The Electric Barrier…Again. Barely a week after the U.S. Army Corps of Engineers increased the current in the electric barrier network in the Chicago Sanitary and Ship Canal, designed to keep Asian carp out of the Great Lakes, they reduced the power because it might be interfering with nearby railroad operations. The Corps say the barrier is doing a good job of blocking the carp's northward migration, but critics disagree. The Corps raised the power from 2 volts per square inch to 2.3 volts on Oct. 11, after research raised questions about whether the force field was strong enough to prevent small fish from getting through, and they revised the duration and frequency of pulses as well. But after technicians said the barrier might be causing a railroad crossing gate about 200 feet from the barrier to malfunction, the Corps restored the previous setting. It also might be interfering with signals that indicate whether trains are approaching, said Lt. Col. David Berczek, of the Corps' Chicago office, and "public safety must be the primary concern with the operation of the barrier." Technicians are trying to find a way to operate the barrier at the higher levels without affecting the railroad, but it is too early to say how long that could take. Meanwhile, MI, MN, WI, OH and PA have filed a federal lawsuit, contending that the only way to stop fish and other organisms from moving between the Great Lakes and Mississippi watersheds is to physically separate them. “The railroad problem is an example of the electric barrier's shortcomings”, said Joel Brammeier, president of the Alliance for the Great Lakes, an environmental advocacy group. "This is why there has been such a clamor for a permanent solution," he said. "We'll probably keep finding these hurdles as long as we rely on interim steps like the barrier.*" (Excerpted from ‘Army Corps reduces power on Asian carp barrier’, in the Wall Street Journal, October 19)*

Or…How About Nets? Five Great Lakes states are asking the U.S. Supreme Court to require nets in Chicago area waterways to stop the spread of Asian carp. "We need to close the Asian carp superhighway and do it now," Michigan Attorney General Bill Schuette said. "Time is running out for the Great Lakes, and we can't afford to wait years before the federal government takes meaningful action." The Supreme Court previously declined two requests from Michigan to close Chicago area waterways to block Asian carp from Lake Michigan. In August, a federal appeals panel upheld a district court decision rejecting the request of MI, MN, OH, PA and WI to close Chicago navigational locks. But the 7th U.S. Circuit Court of Appeals cautioned that the issue could be revisited if ongoing efforts to stop the advance of the invasive species stall. Attorneys General for the five states appealed to the Supreme Court to overturn the panel’s decision. The petition specifically asks the U.S. Army Corps of Engineers to install nets in the Little Calumet and Grand Calumet rivers, and expedite its study examining the permanent separation between the Great Lakes and Mississippi River basins (currently not due out until 2015). The Seventh Circuit viewed the block nets as ‘potentially the most effective element of the proposed relief’ aimed at stopping the carp’s migration, and acknowledged that the Corps has received criticism for taking too long to conduct the five-year study. *(Excerpted from ‘States ask high court to order nets on Chicago waterways to curb Asian carp’, by Cynthia Dizikes in the Chicago Tribune, October 27, 2011)*

New Video. An interesting ten minute video, with some great carp and kudzu footage is available at: [http://www.cbsnews.com/video/watch/?id=7386464n&tag=contentMain;contentBody] *(Thanks to Kevin Aitkin)*

Tools & More Publications

Software for Predicting Lionfish invasions. A Nova Southeastern University researcher has invented software that helps predict invasion patterns of non-native species including the lionfish (*Pterois volitans*). Matthew Johnston, a researcher at Nova's Oceanographic Center and its National Coral Reef Institute, has created InvasionSoft, a computer program that helps scientists track lionfish and other invasive species by providing models and maps showing where authorities should focus their control efforts. Based on historical data, the computerized maps show the likely origin of the lionfish invasion and potential areas where it has spread. It is very accurate on a large scale. Johnston is producing a free public-use version of the software for the Internet. Native to Northern Australia, Indian Ocean, and Indonesia, the lionfish populations have mushroomed in South Florida's tropical waters when pet owners released them into the wild from aquariums. The lionfish is a ravenous predator and has been devouring juvenile fish, which in turn, disrupts the food chain and the ecosystem. "I think we can control the lionfish population," Johnston said. "But I don't see how it's possible to get rid of them. Hopefully, there will be more natural predators preying on them, and smaller fish will eventually learn that the lionfish is a threat." To see InvasionSoft's lionfish tracking data, go to [http://www.kramer.mattspace.com/index.php/lionfish/lionfishanimations]. ***(****Excerpted from* ***'****Researcher Invents Software to Predict Lionfish Invasion', in Newswise, Nova Southeastern University. June 19)*

New Lamprey Control Method? Attempts to manage the sea lampreys (*Petromyzon marinus*) that are eating their way through the Great Lakes have relied in part on pheromones that attract them. After being trapped, the lampreys are either killed or sterilized and released. But these approaches are not always effective. Now there may be a new approach. Scientists noticed that dead lampreys in a tank caused live ones to 'freak out' and try to escape. So researchers extracted chemical compounds from 10 putrefying lamprey carcasses, and exposed live ones to either the smell of dead lamprey or an ethanol control. They didn't react to the ethanol, but when they

smelled death, they quickly swam the other way. It took a remarkably small dose (1 part per 373,000) of extract to drive the lampreys. This effect lasted throughout the entire time the scent was present, even when the smell was highly diluted. The scientists say their finding could be used to drive lampreys into an area where they could be captured and killed. Next summer they will conduct field trials and attempt to block migration into channels by adding the extracted odor of dead lampreys. If it works, they will have demonstrated the potential use of the odor. To read the whole article, see '*A deathly odor suggests a new sustainable tool for controlling a costly invasive species,* by C. Michael Wagner, Eric Stroud and Trevor Meckley, in the *Canadian Journal of Fisheries and Aquatic Sciences*. *(Excerpted from 'Extract of rotten flesh may send them swimming the other direction', By Dan Egan of the Journal Sentinel, Oct. 16, 2011)*

Listen to a podcast on this at [http://www.scientificamerican.com/podcast/episode.cfm?id=sea-lampreys-flee-death-smells-11-08-10].

USDA Workbook Lists FY2012 Grants for Invasive Species .. A new workbook, *U.S. Department of Agriculture Grant and Partnership Programs that Can Address Invasive Species Research, Technical Assistance, Prevention and Control - Federal Fiscal Year 2012*, contains basic information on USDA programs that could be used to fund and support invasive species-related projects. The list is a helpful place to start a search for technical and financial resources for invasive species activity, but it may not include all potential invasive species funding opportunities. See the workbook at [http://weblogs.nal.usda.gov/invasivespecies/archives/2011/11/usda_grant_and_1.shtml]

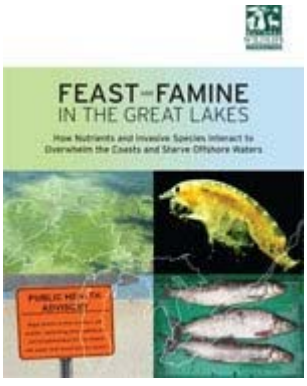
New Website Provides a "Gateway to Pest Identification". A collaborative effort between USDA's Center for Plant Health Science and Technology, and staff at Colorado State University, has recently produced *idsource*, a specialized search tool for identifying the global maze of over 1,400 vetted websites that focus on identification of plant pest insects, diseases, and weeds. The objective is to help users rapidly find trustworthy websites for screening, detecting, and identifying species among the multitude of existing sources. Users can access the massive database by alphabetical order, by specific class of pest, or by key words. For ease of use, an interactive link is listed for each included item, along with the name of the originating organization, the site's contents, the nature of the material included (e.g., fact sheets, screening aids, images), and individualized notes about the site. The original concept for *idsource* arose in 2006, and work was first launched at the Centre for Biological Information Technology at Australia's University of Queensland. To access the database, go to [http://idsource.colostate.edu/cwis438/websites/IDSource/Home.php?WebSiteID=11]. *(Thanks to Kevin Aitkin)*

(Ed Comment: This sounds useful! Now…who wants to develop something like this for aquatic animal pests?)

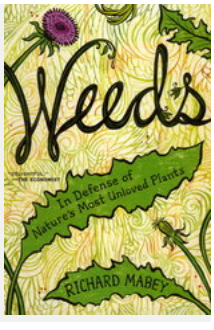
USN Literature Retrieval System Upgrade. The US Navy has announced a significant upgrade to their Literature Retrieval System (LRS), which now contains over 130,000 PDFs. The new system utilizes the Google search algorithm to index the online collection, and the search results are now integrated into the recently updated AFPMB.org webpage. You do not have to change your existing bookmark(s) to the LRS, as you will automatically be directed to the new site. The link is [http://www.afpmb.org/content/welcome-literature-retrieval-system] *(Thanks to Capt. Gregory Beavers, USN)*

New Vertebrate Introductions Paper. A new paper, *Vertebrate species introductions in the United States and its territories*, by Gary Witmeri and Pam Fuller, is now available in *Current Zoology* [57 (5): 559–567, 2011]. Abstract: At least 1,065 introduced vertebrate species have been introduced in the United States and its territories, including at least 86 mammalian, 127 avian, 179 reptilian/amphibian, and 673 fish species. Authors briefly review some of these species and the types of damage they cause, and review the basic physical, chemical, biological, and cultural methods used for control or eradication of each taxonomic group. They discuss some of the challenges in managing these species, including issues with the use of toxicants, land access, public attitudes, and monitoring difficulties. They also list some ongoing and future research needs, including improved detection methods, improved attractants, improved barriers, improved capture methods, fertility control, and risk assessment methods See the paper at [http://www.actazool.org/temp/%7B99CD9C02-779E-4BB9-81B1-5C6DD4C303EA%7D.pdf] *(Thanks to Kevin Aitkin)*

Invasive Species and Nutrient Interactions. A new report '*Feast and famine in the Great Lakes; how nutrients and invasive species interact to overwhelm the coasts and starve offshore waters*, is available at [http://www.nwf.org/News-and-Magazines/Media-Center/Reports/Archive/2011/Feast-and-Famine-in-the-Great-Lakes.aspx]



New Weed Book. *Weeds: In Defense of Nature's Most Unloved Plants*, by British nature writer Richard Mabey, sounds interesting. For example, he points out that some fat-hen weed seeds sprouted after being uncovered in an archaeological dig dating 1,700 years ago. "Dormancy is an insurance policy, the botanical equivalent of savings put away for a rainy day," he explains. Mabey offers a potpourri of weed-related philosophy, literature, theology, magic, science and history. The first issue, of course, is how to define "weed."



Ecco, 324 pp. $25.99

"How and where we classify plants as undesirable is part of the story of our ceaseless attempts to draw boundaries between nature and culture, wildness and domestication," writes Mabey. But some plants, the so-called superweeds, evolved to thrive in challenged landscapes such as unstable mountain scree or flood plains. Humans open up opportunities for them when we clear forests, plow, or otherwise disturb ecosystems. Perhaps the worst example is in Vietnam, where American military planes dropped Agent Orange, a powerful exfoliant, trying to reduce the number of hiding places for Viet Cong. Rain forests withered, and a tough local grass called cogon surged into the vacuum. Four decades later, botanists still have not been able to beat back the cogon and restore a more diverse environment. But "Weeds" is not a book of woe. Mabey believes that most infestations may abate if people stop creating disturbances and let plant communities re-establish their own order. He doesn't berate weeds for taking over soil ripped open by man or nature; if weeds hadn't been around to fill the empty spaces when humans first started practicing agriculture, all the soil may have just blown away. Mabey pulls readers into the continuum of those who have puzzled over and complained about weeds for centuries. *(Excerpted from an AM book review by Kristin Ohlson, July 12, in Cleveland.com.)*

Forest Invasive Species Field Guide Released. The recent Forest Service's Pacific Northwest Research Station release, *Nonnative Invasive Plants of Pacific Coast Forests: A Field Guide for Identification,* is a concise and well-illustrated field guide for both novice botanists and managers. The final species list focused on species believed to be most prevalent or problematic for use in strategic forest inventories, said Andrew Gray, principal author. The 91-page color guide provides detail on each plant in nontechnical language, and photos of different stages of plant development are included to allow reliable identification in the field at different times of the year. To download the guide, visit [http://www.fs.fed.us/pnw/pubs/pnw_gtr817.pdf]. To order a hard copy send

an e-mail to <pnw_pnwpubs@fs.fed.us> and ask for PNW-GTR-817. *(Excerpted from a USFS Press Release, July 13-2011). (Thanks to Sherri Richardson Dodge, USFS)*

Climate Change & Invasives

Tree Migration. A huge "migration" of trees has begun across much of the Western U.S. due to global warming, insect attack, diseases and fire. Many tree species are projected to decline or die out in regions where they have been present for centuries, while others move in and replace them. In an enormous display of survival of the fittest, the forests of the future are taking a new shape. In a new report, scientists outline the impact that a changing climate will have on which tree species can survive, and where. The study suggests that many species that were once able to survive and thrive are losing their competitive footholds, and opportunistic newcomers will eventually push them out. As climatic conditions change, species that have been established for centuries or millennia will lose their competitive edge, and slowly but surely decline or disappear, said Richard Waring, professor emeritus at Oregon State University and lead author of the study. "In some cases the mechanism of change is fire or insect attack, in others it's simply drought. The forests of our future are going to look quite different."

The large, four-year remote sensing survey compared 15 coniferous tree species widely across much of the West in Canada and the United States, and explored impacts on 34 different "eco-regions" ranging from the Columbia Plateau to the Sierra Nevada, Snake River Plain and Yukon Highlands. It projected which tree species would be at highest risk of disturbance in a future that's generally expected to be 5-9 degrees Fahrenheit warmer by 2080, with perhaps somewhat more precipitation in the winter and spring, and less during the summer. Among the findings: Some of the greatest shifts in tree species are expected to occur in both the northern and southern extremes of this area, such as British Columbia, Alberta, and California; large declines are expected in lodgepole pine and Engelmann spruce, and more temperate species such as Douglas-fir and western hemlock may expand their ranges; many wilderness areas are among those at risk of the greatest changes, and will probably be the first to experience major shifts in tree species; some of the mild, wetter areas of western Oregon and Washington will face less overall species change than areas of the West with a harsher climate; and more than half of the evergreen species are experiencing a significant decrease in their competitiveness in six eco-regions. Conditions have become more favorable for outbreaks of diseases and insects. Warming will encourage growth at higher elevations and latitudes, and increased drought at the other extremes. Fire frequency will continue to increase across the West, and any tree species lacking drought resistance will face special challenges.

"Ecosystems are always changing at the landscape level, but normally the rate of change is too slow for humans to notice," said Steven Running, the University of Montana Regents Professor and a co-author of the study. "Now the rate of change is fast enough we can see it." Waring said. One of the best approaches to plan for an uncertain future, the researchers said, is to maintain "connective corridors" as much as possible so that trees can naturally migrate to new areas in a changing future and not be stopped by artificial boundaries. The study is being published in two professional journals, *Ecological Modelling* and *Remote Sensing of Environment*. *(Excerpted from 'Climate Change Causing Massive Movement of Tree Species Across the West', in ScienceDaily, November 3, 2011)*

Antarctic Deep Water Crabs Spreading. King crabs, *Neolithodes yaldwyni,* with their crushing claws and ecosystem-altering habits, have shown up in the warming waters of a deep basin in the Antarctic continental shelf, raising worries they will impact other species there. This species of crab is known to populate Antarctica's Ross Sea, south of New Zealand. "It looks like a pretty negative consequence of climate warming in the

Antarctic," said Craig Smith, a professor of oceanography at the University of Hawaii. Smith led the research into the new crab population, estimated at 1.6 million, in the Palmer Deep, a pocket in the relatively shallow continental shelf that lies south of South America. The Palmer Deep is located near the West Antarctic Peninsula, an area experiencing rapid warming. Below 2,625 feet, temperatures have been increasing at a rate of about 0.018 degrees F per year, for almost 30 years. The deeper the water, the warmer it is. This is the result of warmer water coming in from the north that is saltier and denser, so it sinks below the cooler waters.

The discovery of a king crab population in the Palmer deep suggests that, after millennia of apparently being held at bay by the cold water of the continental shelf, the crabs can now cross it, threatening the unusual, isolated animal life established on the seafloor of the shelf. Researchers saw evidence of this when used a remotely operated vehicle to survey the Palmer Deep, and saw that the crabs had disturbed sediment on the basin seafloor by digging for worms and other creatures, an alteration that affects other animals' habitat. The predatory crabs also feed on other invertebrates like sea lilies and basket stars. These and other creatures were absent from depths below 3,117 feet, where the crabs were found. Given the warming trend, researchers believe these crabs could move up onto the shelf within one to two decades. The crab population in the Palmer Deep "is likely to serve as an important model for the potential invasive impacts of crushing predators," authors write in most recent issue of the journal Proceedings of the Royal Society B. *(Excerpted from 'Warning: King crabs encroaching on Antarctica', in Science on MSNBC.com, by Wynne Parry, September 7.)*

The Arctic: Now a New "Suez Canal" for Invasive Species. Pacific and Atlantic counterparts are now poised for their first meeting in several million years. Pacific salmon have begun showing up off the Arctic coast of Alaska, and Atlantic salmon are appearing near Iqaluit. It is "inevitable" the two species will eventually collide, says Ron O'Dor, global scientific director with the Halifax-based Ocean Tracking Network. And many of these east-west encounters will occur in the waters surrounding Newfoundland and Labrador. Set loose by an ice-free Northwest Passage, an invasion force of Pacific sea creatures is moving east to Atlantic waters. "The Arctic is getting easier to navigate … organisms that don't even swim are getting through," says Eric Solomon, director of conservation strategy at the Vancouver Aquarium.

A pod of killer whales sighted at the north end of Baffin Island. (By Gretchen Freund)

In June, British researchers announced that a plant extinct along the East Coast for more than 800,000 years, has begun to reappear there after migrating through the Arctic Ocean. Researchers at the U.K.-based Sir Alister Hardy Foundation for Ocean Science have called the discovery of a microscopic west coast plant on the east coast a "harbinger of an inundation of the North Atlantic with foreign organisms." It marks the first time an organism has completed a trans-Arctic crossing in modern times without a set of fins. Last summer, a grey whale appeared off Israel – the first time a grey whale had been spotted in Mediterranean waters since it was

hunted to extinction in the 1700s. At the time, researchers speculated that the Pacific Ocean whale had made its way east through the ice-free Northwest Passage. And killer whales have been capitalizing on the melting Arctic since at least 2007. Faster and smarter than the North's large, lumbering sea creatures, killer whales have been enjoying free reign over Arctic populations of narwhals, belugas and seals, and packs of killer whales have also been seen taking down bowhead whales twice their size. Wary of the ferocious newcomers, bowhead whales, narwhal and beluga have all been spotted staying near shore and swimming in unnaturally tight formations. The Humboldt squid, once seen only off the South American coast, has gradually worked its way north into ice-filled waters off Alaska. Soon, researchers suspect, the 45 kilogram squid could begin charting its own cross-Arctic trip. "It used to be that the primary consideration for staying alive in the Arctic was being able to breathe through a hole in the ice, and that's not going to be true anymore," says O'Dor.

The Ocean Tracking Network, headquartered at Dalhousie University, is deploying millions of dollars of equipment to the High Arctic to track the west-east migrations. "There's going to be some reshuffling of the ecosystems," says O'Dor. "Whether that's good for humans or bad for humans is yet to be determined." But the invasion is already bad news for Newfoundland's ravaged Atlantic cod. While the decimated cod stock may no longer be threatened by fishing nets, they are "facing a potentially mutating ecosystem with the arrival of these different species," says Julian Dodson, a marine biologist at the University of Laval. He notes Arctic char are already facing tough competition for food by schools of east-moving capelin, a small forage fish. Following the construction of the Suez Canal, says D'Or, the Mediterranean Sea became overcome with invasive species swimming over from the Red Sea. "The Arctic is going to turn into a giant Suez Canal," he says. *(Excerpted from 'Pacific species migrating through warmer Northwest Passage', by Tristin Hopper June 28, 2011, National Post.*)

Mountain Pine Beetles May Impact Snow Accumulation and Melt. Mountain pine beetles *(Dendroctonus ponderosae)* have killed more than 4 million acres of lodgepole pine trees in CO and southern WY since 1996, the most severe outbreak on record. A new University of Colorado Boulder study indicates the beetle infestation across the West could potentially trigger earlier snowmelt and increase water yields from snowpack that accumulates beneath affected trees. CU-Boulder doctoral student Evan Pugh led the study near Grand Lake, CO, in an area devastated by mountain pine beetle attacks in recent years. Pugh's team monitored eight pairs of tree stands, consisting of one live stand and one dead stand roughly an acre each in size. The stands were located adjacent to each other, and shared the same topography, elevation and slope. The team monitored the two distinct phases of pine beetle tree death during the three-year study: the "red phase", in which dead trees still retained red needles, and the "gray phase", in which all of the tree needles and some small branches had been shed. There was roughly 15 percent more snow accumulation under the gray phase stands than under living stands or red phase stands, likely due in large part to a lack of snow interception by needled tree branches, that can cause snowflakes to sublimate into gas and return to the atmosphere, he said. Gray phase trees also allow more solar radiation through their canopies than live trees and red phase trees, increasing the potential for earlier melt. Snowmelt rates were highest under red phase trees, with snow disappearing up to a week earlier than snow in adjacent, healthy stands even though both received the same amount of snowfall at their bases. The earlier snowmelt in red phase tree stands is due in large part to the amount of needles and branches that drop or is blown from the trees onto on the snow surface, decreasing its solar reflecting power, or albedo, and causing it to absorb more of the sun's radiation and heat up slightly. A paper on the subject was published online June 8 in the peer-reviewed journal, *Ecohydrology*.

While mountain pine beetle infestations are natural events, climate change probably has played a role in the most recent outbreak. Drought conditions in the West in recent years have caused living pines to absorb less water, decreasing their ability to produce enough sap to "pitch out" beetles that are attacking them. Water managers in Salt Lake City have reported extra water in river basins that hydrologic models had not predicted, an indication beetle-killed trees are having an impact on meltwater. With the exception of two British Columbia studies looking at the effects of beetle- killed lodgepole pine trees on snow accumulation and melt, research regarding the hydrologic impacts of mountain pine beetles has largely been speculative, said Pugh.

"This is the first study to look at the potential effects that different stages of mountain pine beetle tree death may have on snowmelt. What we are seeing is earlier snowmelt and more snow accumulation in dead forests." *(Excerpted from ScenceDaily.com, June 8, 2011*

Pathways

Chytrid Fungus: Created by the Amphibian Trade? The global amphibian trade spread the lethal chytrid fungus, which is decimating frogs around the planet, and it now looks like it may have created the disease in the first place. The team behind this finding is calling for an amphibian quarantine to help slow the disease's spread. Rhys Farrer of Imperial College London and colleagues sequenced the genomes of 20 samples of the fungus, *Batrachochytrium dendrobatidis* (*Bd*), collected in Europe, Africa, North and South America and Australia. They found that 16 of the 20 samples were genetically identical, belonging to a single strain called *Bd*GPL, which has spread to all five continents. Tests on tadpoles also revealed that the strain was extremely virulent. *Bd*GPL's genome showed that it had formed when two strains mated, sometime in the past 100 years. The best and simplest explanation is that 20th-century trade, which shipped amphibians all over the world, enabled the mating, says Farrer's supervisor Matthew Fisher. "We've got to restrict trade, or at least make sure that amphibians are not contaminated." One approach would be for countries to quarantine all imported amphibians and only allow them to stay if they are uninfected. When it emerged that trade was spreading chytrid, the World Organization for Animal Health made the disease notifiable, meaning that countries must report whether they have it or not. But that doesn't stop it spreading. The two places in most urgent need of protection are Madagascar and south-east Asia, says Fisher: "They're the last redoubts of uninfected amphibian species." Both are hotspots of amphibian diversity, and are clear of *Bd*GPL. Madagascar remains uninfected despite rampant *Bd*GPL in Africa, and a recent survey shows that Asian chytrid strains are not very virulent (*PLoS One*, DOI: 10.1371/journal.pone.0023179). If *Bd*GPL reaches these places, it could quickly devastate their frogs. Countries that already have *Bd*GPL should also institute quarantine, says Peter Daszak, president of EcoHealth Alliance in New York. "This research shows that recombination can occur and give rise to new virulent strains," he says. "Blocking introduction of new strains will cut down on this." Daszak adds: "It will be hard to stop the spread of new lineages of *Bd*, but if we look at the devastation that this pathogen has already caused, we desperately need to try." (Journal reference: *Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.1111915108) *(Essentially verbatim from 'Frog-killer disease was born in trade' by Michael Marshall, in the New Scientist November 7, 2011)*

WNV Transmission Linked to Land Use Patterns and 'Super-Spreaders'. After its initial appearance in New York in 1999, probably by an infected mosquito carried across the Atlantic in an airplane, West Nile virus (WNV) spread across the United States in just a few years, and is now well established throughout North and South America. The worst human outbreaks of West Nile virus in the United States occurred in 2002 and 2003. Both the mosquitoes that transmit it, and the birds that are important hosts for the virus, are abundant in areas that have been modified by human activities. As a result, transmission of West Nile virus is highest in urbanized and agricultural habitats. "The virus has had an important impact on human health in the United States, partly because it took advantage of species that do well around people," said Marm Kilpatrick, a biologist at the University of California, Santa Cruz. Although WNV can infect more than 300 species of birds and 60 species of mosquitoes, mammals, reptiles, and even amphibians, researchers have found that in most places, only a few key species of bird "hosts" and mosquito "vectors" are important in transmission of the virus. "… in any given location, only one or two species of mosquitoes play a big role, and only a handful of birds appear to be important in overall transmission rates," said Kilpatrick, who reviewed a decade of research on the ecology and evolution of West Nile virus in a paper published in the October 21 issue of *Science*.

According to Kilpatrick, the American robin (*Turdus migratorius)* is such an important host species in the transmission of West Nile virus across much of North America that Kilpatrick calls robins "super-spreaders" of West Nile virus. The reason is not so much the abundance of robins, but rather the feeding patterns of the mosquitoes that transmit

the virus. The mosquito species important in transmission seem to prefer robins over other, more abundant species of birds such as house sparrows. "The peculiar feeding habits of the vectors play a really important role in transmission, and this idea applies to many different diseases. It's one of the really interesting things we've learned from the past decade of research on WNV. Three species of mosquitoes are key vectors for transmitting West Nile virus in much of North America. Interestingly, these mosquitoes are not among the species that feed frequently on people. They are bird specialists that happen to bite people often enough to cause human infections. "The mosquitoes that bite humans most are actually not as important in transmission of West Nile virus to humans because they rarely bite birds and thus rarely get infected in the first place," Kilpatrick said. "Instead, it's the species that feeds mostly on birds and frequently gets infected, but occasionally feeds on people. "Millions of birds have died from West Nile virus infection, with dramatic effects on the populations of some species. "Robins were on a steady upward trajectory thought to be linked to human land use--they love lawns and agricultural fields," Kilpatrick said. "Crow populations were growing even faster. Now crow populations have crashed downward and robins have leveled off, and we suspect that's due to West Nile virus. (Excerpted from '*West Nile Virus Transmission Linked to Land Use Patterns and 'Super-Spreaders*', in ScienceDaily, October 20, 2011)

Snails Use Birds to Cross Continents . Osamu Miura from the Smithsonian Tropical Research Institute has found that horn snails crossed from the Pacific to the Atlantic Ocean around 750,000 years ago, while other individuals made the opposite journey around 72,000 years ago. And they probably flew inside birds. Miura has shown that other snails have used birds to spread over greater and seemingly impassable distances. He collected snails from both sides of North and Central America and used their genes to chart their relationships to one another. Miura found that the snails split into Pacific and Atlantic groups at the time when North and South America fused together at Panama, separating the Pacific from the Atlantic. But both groups managed to send delegates to the other. Today, both lineages include snails from both coasts. Miura found that Pacific snails made it into the Atlantic around 750,000 years ago, while the Atlantic snails crossed over around 72,000 years ago. They had to have flown over land; they only live in warm areas, so they couldn't have circled round the North American arctic or the South American cape. And their travels long preceded the construction of the Panama Canal in 1914, so they couldn't have stowed away on man-made vehicles. Instead, Miura thinks that the snails flew inside shorebirds, millions of which share their habitats and regularly fly over Central America.

Earlier this year, Shinichiro Wada of Tohoku University showed that *Tornatellides boeningi,* a species of Japanese snail, uses birds to cross Japan's islands. Even though the stowaways are awash in digestive fluids, many survive, enabling them to spread over a much larger area than their usual slow pace would allow. Some snail species can survive trips through fishes' digestive systems, but this is the first known to use avian airlines. After finding undamaged shells in bird droppings, Wada fed 174 live snails to Japanese white-eyes and brown-

eared bulbuls, and around 15 percent of them lived. “One of the snails even gave birth just after passing through the gut,” Wada says. The snails, average less than a tenth of an inch in length, and have compact shells, so they probably survive because of their small size. Wada suspects that they shield themselves with mucus or seal the gap between their body and shell to prevent digestive fluids from seeping inside. For the paper, see Miura, et al., 2011. *Flying shells: historical dispersal of marine snails across Central America.* Proc Roy Soc B [http://dx.doi.org/10.1098/rspb.2011.1599]. *(Excerpted from ‘Snails cross continents by flying inside birds’ by Ed Yong, in Discover Magazine, September 15th, 2011).*

Around the World

Jamaica Fights Lionfish. Jamaica may overtake the Bahamas as the Caribbean country most affected by the lionfish *(Pterois volitans).* Jamaica now averages about 100 individuals per hectare of reef, a situation which has pushed the University of the West Indies Discovery Bay Marine Laboratory (DBML) to fast-track its control efforts. Research to develop special traps for lionfish, has yet to bear fruit. The lionfish reproduction rate is impressive; it can reproduce every four days, all year round, and is capable of producing two million eggs each year. The threat posed by this invasive species frightening. DBML research found over 15 different species in the stomach of the lionfish, including numerous species of parrot fish, doctor fish, snapper, grunt, and crustaceans. Some of these species are commercially valuable, while others sustain the diet of commercially important fishes. Jamaican fisheries are already heavily impacted by overfishing and other threats. And the lionfish, which targets juvenile fish, does not seem to prefer any particular species; essentially, any fish or crustacean that can fit into its large mouth is under threat, said Dr. Dayne Buddo, who is spearheading the National Lionfish Project. The lionfish has been found on coral reefs as well as in mangrove lagoons, sea grass beds, on beaches, in rocky areas of the coastline and on artificial structures in the water such as piers, breakwaters, groins, and artificial reefs, and seen at depths of 335 meters (1,100 ft). Sizes up to 51 cm (20 inches) have been recorded in Jamaican waters. The ineffectiveness of natural predators such as groupers, moray eels, and sharks in checking the lionfish spread has led to a national campaign of 'Let's Eat It To Deplete It', to get Jamaicans to consume the lionfish. Buddo says "The success of this initiative is yet to be assessed, but it is far more important to promote rather than to do nothing. Simple but effective methods of handling and preparing the lionfish for consumption are important to teach during any campaign to use the lionfish for food when caught. And all lionfish, both the adults and the juveniles, are targeted for removal." *(Excerpted from ‘JA fast-tracks efforts to deplete lionfish stock’) by Christopher Serju, in The Gleaner July 10, 2011)*

Taiwan Bans Apple Snail Farming. In July, the Taiwan Council of Agriculture (COA) imposed a ban on apple snail farming in the country’s latest effort to curb the snail and prevent it from damaging crops. Channeled apple snails (*Pomacea canaliculata),* were introduced into Taiwan from Argentina in 1979, but their flavor failed to win over the Taiwanese consumers, and farmers abandoned their cultivation. The snails quickly spread out of control into farmland, damaging rice paddies and aquatic plants, and snails are now ranked among the top 10 most invasive species in Taiwan. Now, a new use for the mollusk has many interested in snail farming. Biotechnology companies in Taiwan have reportedly spent huge sums of money developing a technology that extracts astaxanthin — a natural antioxidant used in anti-aging supplements — from the snail eggs. The companies estimate the annual value of skincare and healthcare products that use the substance could reach NT$12 billion (US$417 million). However, the Council has responded with a ban on the farming of the snails. Fei Wen-chi of the Bureau of Animal and Plant Health Inspection and Quarantine, says her agency allocates NT$20 million annually to combat the spread of apple snails, and those who illegally breed channeled apple snails would be subject to fines of between NT$30,000 and NT$150,000, and would be required to destroy their stock. The Bureau said that biotech companies should purchase snails from farmers who catch them in their fields, which will reduce their numbers in the wild. *(Excerpted from ‘COA bans farming of invasive apple snail amid boom’, in the Taipei Times, July 9.)*

New Guam Invasive Species Council. The Department of Agriculture called the first meeting of the Guam Invasive Species Council on June 23. The new Invasive Species Council reviewed new Public Law 31-43

which created the Council, and elected a Chair and Vice Chair for the Council. For questions or more information on the Council, contact Mariquita Taitague at 735-3960 or email: <doagridir@yahoo.com> . *(Excerpted from a Pacific News Center news release, June 20*)

Guam Gets Navy Invasive Species Grant. On September 29, the Navy established a $1 million Cooperative Agreement with the University of Guam to conduct a peer review of the Micronesia Bio-security Plan (MBP) and develop a plan to protect the island's ecosystem. Jenn Farley, NAVFAC Marianas Natural Resources Specialist, said. "The MBP will analyze risks of various pathways, organisms, and species associated with the importation to, and exportation from Guam to other areas of Micronesia; the (strategic implementation plan) is a multi-tiered implementation plan which prescribes corrective actions for invasive species, pathways, and organisms that are identified as posing risks." The bio-security plan is being developed as a comprehensive regional approach. A kickoff meeting between the parties to the cooperative agreement was held in October. All work is expected to be completed in spring, 2013. *(Excerpted from Guam Pacific Daily News, October 5)*

Major Upcoming Invasive Meetings

February 7-10 2012. Mussel Early Detection Monitoring Methods and Quality Assurance Workshops. Texas Christian University, Fort Worth Texas. Two workshops addressing critical impediments to the expansion of Western early detection monitoring programs For more information go to http://www.musselmonitoring.com/.

February 28-March 2, 2012. OR AFS Conference, Eugene OR. Includes an AIS-focused session. (www.orafs.org/meeting2012/Annual12.htm).

February 26 - March 3, 2012. National Invasive Species Awareness Week, Washington, DC. http://www.nisaw.org/

April 2-4, 2011. Western Aquatic Plant Management Society (WAPMS), San Diego, CA. Submit abstracts until December 13.http://www.wapms.org/

HAPPY HOLIDAYS!!!!!!

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