



ISSUE 32

April-June 2011

## AQUATIC INVASIVE SPECIES NEWS IN A NUTSHELL

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*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 1-31, go to [http://www.aquaticnuisance.org/newsletters].*

### Something To Ponder

**Just What We Need: Another Adaptable Omnivore Being Shipped All Over the Country.** An article in the Santa Barbara Independent on Triops (*Triops longicaudatus*), also known as the “dinosaur shrimp” is a bit scary. Triops are sold as educational “pets,” and while they haven’t been on the market as long as ant farms and Sea Monkeys, they’re quickly becoming more popular. Like brine shrimp, *Triops* are crustaceans, but unlike the brine shrimp, they easily reach two-and-a-half inches long. *Triops* have three little eyes, which is how they got their name. These are truly ancient animals; they have changed little in the last 200 million years,



which is why they’re nicknamed “living fossils”. And what has made *Triops* so successful for all these years? They’ve become extremely well-adapted to living in little temporary ponds (AKA vernal pools, a rare wetland type). Usually during winter and spring, rain fills these pools and the *Triops* eggs hatch. They grow rapidly, and can reach two inches long in just a few weeks, molting their exoskeleton several times in the process. They’re omnivores, so they eat almost anything, from algae to brine shrimp, insects, and sometimes even their own siblings. After quickly reaching maturity, they lay eggs. They die when the water disappears, but can potentially live for about 50 to 90 days if water remains. The eggs remain in the dirt after the pond dries up, waiting for the next rain. *Triops* eggs can endure harsh conditions and wait a long time before they spring to life in their temporary habitat. The eggs can withstand freezing and temperatures over 200 degrees Fahrenheit for over half a day, and can normally survive in their dormant state for up to 20 years. (!) But because they’re so adapted to living in temporary water, the eggs need to completely dry out before they can hatch; they won’t hatch in a

permanent body of water. Their amazing lifecycle makes *Triops* one of the few species adapted to short-lived pools. The article states “[they are]... a true delight to watch grow and change over the span of several weeks. Moreover, understanding how the eggs’ prolonged dormant state is achieved may help researchers better understand how we can control the unwanted growth of our own cells, such as in cancer.” (*Excerpted from ‘Ant farms and sea monkeys’, in the Santa Barbara Independent, April 11*).

*[Ed Comment: After extolling the virtues of how adaptable these things are, the article then “helpfully” tells us all where to order them. These things ARE rather cute...so, unlike tiny brine shrimp, it will probably much harder for owners to dispose of them responsibly when they get tired of them. Just what we need: another adaptable omnivore being shipped all over the country, where it can eat near the base of the food chain. Is this really something anyone should be promoting? We have already seen the damage that crayfish and other crustaceans have done when they are released by well-meaning owners. Has anyone evaluated this animal? Maybe states should take a good look at this one. ]*

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

**Saltcedar Success In Jackson Hole.** Stewards of the Snake River watershed are calling their program to prevent saltcedar (*Tamarisk spp*) from establishing a success, though they acknowledge vigilance still is necessary. The Jackson Hole Weed Management Association (Wyoming) developed the Snake River Project in 2001, after saltcedar was discovered and treated along the banks of the Snake near Hoback Junction. The first saltcedar infestation was identified while doing weed mapping in 2000 and 2001. Knowing it was critical to act quickly, organizations of the weed management association in northwestern Wyoming launched an aggressive Early Detection Rapid Response program in 2001 to locate and treat the saltcedar before it could become widely established. Other species also were targeted, and GPS mapping was included to ensure all known infestations are monitored. Thanks to grant funding and support from other groups such as the Teton Conservation District, saltcedar detection and treatment has occurred every year since 2001. During the last 10 years, 125 saltcedar infestations were located, mapped and treated, and 356 locations of perennial pepperweed and many other noxious weed species were mapped. While the program is time consuming, the effort has kept saltcedar from establishing along the Snake River from Jackson Lake dam to Palisades Reservoir. During the 2009 and 2010 surveys, no new saltcedar infestations were located, and no prior infestations showed new plants. Jason Brengle, plant biologist at Grand Teton National Park, said “‘Eradicate’ is a word we don’t get to use much in invasive species management, so this level of successful treatment is encouraging, however, the area remains at risk to saltcedar colonization, so continued monitoring is essential.” (*Excerpted from ‘Weed warriors declare saltcedar vanquished’, in the Jackson Hole Daily, May 10.*)

**New Help For Forest Insect Management.** On April 11, Arborjet announced that EPA has approved an expanded label for TREE-age® insecticide, allowing its use in control of several invasive species including Western pine beetle, mountain pine beetle and other associated engraver beetles. Arborists, landscapers and city officials in cities like Milwaukee and Chicago have used TREE-age to treat tens of thousands of trees to protect their urban forests against the emerald ash borer. Injecting TREE-age directly into the tree's vascular system not only provides protection quickly, but it is apparently also highly effective in treating insects that feed under the bark. Arborjet trunk injection also seals the applied insecticide in the tree, thus limiting exposure of the chemical to the environment. "The expanded label for TREE-age will change forest management practices forever," said Russ Davis, President and Chief Operating Officer of Arborjet. "It's great news for landscapers, arborists and municipalities, who until now have struggled with the inability to control many highly invasive insects." TREE-age is applied through the Arborjet injection system where the formulation is sealed inside the tree, and unlike many other treatments, TREE-age provides up to two years of control for insects like Emerald Ash Borer and Mountain Pine Beetle. The effectiveness of TREE-age to control these insects is well supported by several years of independent research. A partial list of the insect species covered by the new labeling includes: Engraver Beetle, Pine Cone Seed Bug, Pine Cone Worm, Red Palm Mite, Red Palm Weevil, Western Pine Beetle Tussock Moth, Leafminer and the Eucalyptus Borer. For a full list of insect species covered, and

states where TREE-age is registered, or to learn more about TREE-age, go to: [<http://www.arborjet.com>].  
(From 'Insects Beware: Arborjet Announces EPA Approval of Expanded TREE-age Label for Treating Invasive Pests', PRNewswire, April 11, 2011.)

**Expanded Insect Laboratory Gives Hope To Florida**. *Melaleuca*, a native of Australia, once planted as an ornamental tree, has now taken over much of South and Central Florida. A single tree can reach 50 feet and drop millions of seeds at a time. For more than two decades, the Australian snout beetle (*Oxyops vitiosa*) has been used to stop *melaleuca* trees (*Melaleuca quinquenervia*) from spreading seeds and turning Florida sawgrass meadows into dense forests, altering the soil and water, limiting sunlight penetration, and crowding out native species. Now scientists at the Invasive Plant Research Laboratory (IPRL) in Davie, FL. are preparing to escalate the beetle's attack. They will raise and release tens of thousands of insects in about two years. Each female produces more than 300 eggs, so scientists expect the larger population to produce millions more. The scientists say insects play a vital role in restoring the damaged Everglades ecosystem by ridding it of invasive plants, and they are optimistic a concerted bug attack will produce clear victories. "Within 10 years, *Melaleuca* will be a non-issue," predicted Ted Center, research leader at the lab. Other invaders like Brazilian pepper, Australian pine and Old World climbing fern may require more time and a different set of bugs. "The bottleneck has been... the [lack of] capacity to readily build big populations in the field," said Center.



Now, to provide more space and resources, the IPRL is adding an annex, and hiring four more scientists and eight technicians. Construction will begin July 22, and completion is expected in September, 2012. The state and federal government will split the \$16.7 million cost of the expanded lab and mass production of beetles. Scientists will also be mass-rearing psyllids and midges, and importing and testing other bugs. "We've seen native plants increase dramatically as the *Melaleuca* declines," said Paul Pratt, who has been releasing bugs into the greater Everglades area for a dozen years. "We're seeing more Florida panthers, but also more native plants that host the panthers' prey." Scientists foresee a more vibrant Everglades, and predict the beetles will eventually eat themselves out of a food supply and die out when their host plant decreases to a point when it no longer sustains them. (Excerpted from 'Hungry beetles to be set loose on invasive Everglades plants', By William E. Gibson, May 29, 2011 in the SunSentinel.)

**Mystery of Didymo Blooms Solved**. *Didymospenia geminata*, (AKA Didymo, or "rock snot,") a mat-forming species of freshwater diatom, has taken over low-nutrient rivers in North America and Europe, and it has also invaded water bodies in the Southern Hemisphere, including those in New Zealand and Chile. Because its blooms alter food webs and have the potential to impact fisheries, Didymo presents a threat to the ecosystem and economic health of these watercourses. Algae blooms are usually linked with the input of nutrients that fuel plant growth, so Didymo's ability to grow prolifically in waters where nutrients such as phosphorus are in short supply, puzzled scientists. A paper just published in the journal *Geophysical Research Letters* (*Didymospenia geminata: algal blooms in oligotrophic streams and rivers*, by P.V. Sundareshwar et al.) finds *Didymo* is able to colonize and dominate the bottoms of some of the world's cleanest waterways precisely because they ARE so clear. Didymo is able to concentrate phosphorus from the water with help from bacteria, that live inside the algal mats, and allow Didymo to make use of nutrients like phosphorus.

The authors conducted their research in Rapid Creek, SD, an unpolluted mountain stream where Didymo was first observed in 2002. The creek regularly has Didymo blooms that cover 30 to 100% of the streambed over an

area up to ten kilometers (6 miles) long. Didymo thrives in Rapid Creek because of biogeochemical processes in biofilms in the mats. Didymo cells adsorb both iron and phosphorus on their surfaces. Then bacterial processes in the algal mat interact with iron to increase the biological availability of phosphorus. As Didymo mats form, new stalks develop at the surface, and older stalks which have already bound phosphorus are displaced to the mats' inner regions. The process results in abundant phosphorus for cell division, resolving the paradox of Didymo blooms in oligotrophic streams and rivers. "This study solves the puzzle of how Didymo can produce such large blooms in low-nutrient rivers and streams," said Tim Kratz, program director in NSF's Division of Environmental Biology. "It has uncovered the fascinating mechanism by which Didymo 'scrubs' phosphorus from a stream or river, then creates a microenvironment that allows microbes to make this nutrient available for Didymo's growth". The results will help scientists and managers to identify water bodies susceptible to Didymo blooms, and have the potential to lead to discoveries that may stem this organism's prolific growth in rivers around the world. (Excerpted from 'River Mystery Solved -- Scientists Discover how "Didymo" Blooms in Pristine Waters with Few Nutrients', NSF press release 11-109, June 2)

**Hidden Elm Population May Hold Genes To Combat Dutch Elm Disease.** American elms (*Ulmus Americana*) once lined the country's streets and dominated eastern forests until they succumbed by the millions after the fungi that cause Dutch elm disease (*Ophiostoma spp.*) arrived in the United States in 1931. The disease kills individual branches, and then eventually the entire tree, within one to several years. Yet elms are still one of the most important tree crops for the \$4.7 billion-a-year nursery industry, especially since the introduction of a very few new trees with some tolerance to the disease. American elms remain popular because of their stately beauty, their rapid leaf litter decay and their ability to stand up to city air pollution. Now two USDA scientists may have discovered a previously hidden population of elms that carry genes for resistance to Dutch elm disease. It has been accepted for 80 years that American elms are tetraploids, i.e., trees with four copies of each chromosome. But there have also been persistent but dismissed rumors of triploid trees which have three copies of chromosomes, and diploid trees, which have two copies. Now botanist Alan T. Whittemore and geneticist Richard T. Olsen with USDA's Agricultural Research Service (ARS) have proven beyond question that diploid American elms exist as a subset of elms in the wild. Their findings were published in the April edition of the *American Journal of Botany*. It was one of the disease-tolerant elm trees ("Jefferson") released jointly by ARS and the National Park Service in 2005 that started Whittemore and Olsen on the trail of the diploid. "Jefferson is a triploid. To get a triploid elm, we thought there had to be a diploid parent out there somewhere in the wild that had crossed with a tetraploid," said Whittemore. To settle the question, the two scientists tested elm trees from across the species' eastern and central U.S. range. About 21 percent of the wild elms sampled were diploid; some grew in stands with tetraploids, while others were larger groupings of diploids. The small amount of genetic data now available suggests that at least some tetraploid and diploid elm populations have diverged significantly from one another, which strengthens the possibility of the diploid trees having genes for disease resistance that the tetraploids don't have, Whittemore said. "We can't say yet whether this is a distinct race of *U. americana* or if we are really talking about a separate species," he said. "That's a job we will tackle this summer." (Excerpted from 'Hidden Elm Population May Hold Genes to Combat Dutch Elm Disease', *ScienceDaily* (Apr. 1, 2011)



## **Zebra/Quagga Mussel News**

To learn more about the western zebra/quagga mussel infestation (*Dreissena spp.*), visit the 100th Meridian web site at <http://www.100thmeridian.org>.

**Possible First Infestation In New Mexico.** Zebra and quagga mussels have been found in water bodies in states adjacent to New Mexico. Now, a routine test of Sumner Lake, NM, water has indicated the potential presence of Quagga mussel veligers (larva). The positive test result was initially made by the Bureau of

Reclamation, and confirmed by Pisces Molecular, a testing firm in Colorado. As a result, Sumner Lake was closed to all watercraft on May 27, 2011. On June 17, 2011, with a number of new watercraft decontamination procedures in place to ensure there is no spread of Quagga mussel larva, Sumner Lake was reopened. For further information go to <http://www.emnrd.state.nm.us/main/documents/PR-Parks-SumnerLakeBoating-update-6-11.pdf>

**Quagga Mussels In Lahontan And Rye Patch, NV?** On May 12, 2011 the Nevada Department of Wildlife reported that during routine quagga mussel monitoring, quagga mussels were believed found in Lahontan and Rye Patch Reservoirs, in Northern Nevada. Further veliger analysis results from the Bureau of Reclamation is expected soon. In addition, veliger analysis for Lahontan and Rye Patch by a California Fish & Game lab came back negative for microscopy and DNA analysis. However, Nevada still considers both lakes as “suspect” lakes for Quagga mussels. (*Thanks to Karen Vargas, NDOW.*)

**New Montana Invasive Species Legislation.** The 2011 Montana legislature increased funding for AIS prevention and control for the next two years. HB 621 provides \$898,000 to be split by Montana Fish, Wildlife & Parks, Department of Agriculture, and Department of Natural Resources and Conservation, which means the state has committed a total of about \$1.3 million toward protecting Montana waters from aquatic invaders, like zebra and quagga mussels. For more information on the legislation, go to [<http://laws.leg.mt.gov/>] and search for HB 621.

**Nevada AIS Bill Signed.** Nevada’s Governor has just signed AB167, that gives NV authority to conduct inspections, decontaminate, and hold watercraft suspected of containing AIS. It also provides officers with authority to fine individuals who knowingly introduce harmful or injurious AIS into NV (northern pike, quagga/zebra mussels etc.). The bill also includes provisions for an annual sticker fee for motorized & non-motorized watercraft to assist in funding the program. Non-motorized watercraft include canoes, kayaks and other larger watercraft, (but not float tubes). NDOW’s Wildlife Commission will determine the exact fee, which will become effective January 2012. (*Thanks to Karen Vargas, NDOW*)

**Oregon Mandatory Watercraft Inspection Bill Passed:** In June, the Oregon legislature passed a bill (HB 3399) that makes it mandatory for boaters to stop at roadside inspection stations. Stopping at inspection stations was voluntary prior to the passage of HB 3399, and the compliance rate for inspections was low. To read more go to [[http://www.oregonlive.com/politics/index.ssf/2011/06/oregon\\_lawmakers\\_vote\\_to\\_impro.html](http://www.oregonlive.com/politics/index.ssf/2011/06/oregon_lawmakers_vote_to_impro.html)].

**Inspection Program Interceptions –2011 Interceptions.** Highway and boat ramp inspection programs in OR, ID, CA and MT continue to find and detain boats with zebra/quagga mussels:

**Montana (2):** A quagga mussel was found on the bottom of a boat at a Flathead Lake check station in March. In June a contaminated boat from Michigan was intercepted at Plains, MT.

**Idaho (18):** Through June 28, Idaho has intercepted **18** watercraft infested with quagga/zebra mussels (while some of these were destined for Idaho, others were headed to Oregon, Washington and British Columbia. Some of the boats were commercially hauled and others were private boat owners).

**Oregon (1):** In May, a fouled watercraft was discovered by Oregon Department of Fish and Wildlife watercraft inspectors at the Ashland, Oregon Port of Entry on Interstate 5. The boat’s owner said he was transporting the boat from Arizona to his home in Everett, WA, and had stopped for a voluntary inspection at the port of entry. He said he did not know the mussels were present on the boat, in part because the boat was passed by inspectors as he traveled from Arizona into California. (*Excerpted in part from an article by Mark Freeman in the Mail Tribune.*)

**California (10):** From January 2007 – March 2011 California has intercepted **793** fouled watercraft at its border protection stations. In the first three months of 2011, they have intercepted 10 fouled watercraft.

**Mussel Dogs: A New Inspection Technique.** Debi DeShon had been training dogs to sniff out contraband for the last 15 years, and now she's training dogs to find quagga and zebra mussels. "Our dogs...sniff a boat before entering into the waterway to make sure the boat doesn't have these mussels on them (sic)," said DeShon, who demonstrated her brown labrador Popeye's ability at the Woodward Reservoir. DeShon is certified by California Fish & Game to handle a specimen of the mussels for training purposes. She hid a few inside the motor of a boat and then brought out Popeye to find the scent. Popeye picked it up in under a minute. "This is really a more efficient way of doing inspections," said DeShon. "A human might take 15 to 20 minutes thoroughly inspecting the boat, but a dog takes only a minute." Once the mussels or larvae are detected, the boat needs to be contaminated with a bleach and hot water solution before it can enter the water. Woodward Reservoir, CA, has a contract with DeShon and Mussel Dogs for boat inspections this summer. (*Excerpted from 'Dog trained to sniff out invasive mussels' in News10KXTV, by Leigh Paynter, April 23*)

**New Watercraft Inspection Training Video (Update).** The U.S. Fish and Wildlife Service's Pacific Region Fisheries Program has released an informational video on the dangers of quagga and zebra mussels spreading to Northwest waters via boats. The video focuses on the successful Watercraft Inspection Training (WIT) program, collaboration between FWS, Pacific States Marine Fisheries Commission, and other organizations. The program includes a "train-the-trainer" Level Two training that brings participants to Lake Mead for in-depth instruction on boat decontamination. Level Two hands-on training has produced several hundred graduates, each trained to intercept and clean mussel-infested boats. In turn, Level Two graduates have instructed hundreds of Level One trainings for audiences ranging from marina workers to state patrol officers. WIT trainings also make use of the 2008 "Don't Move a Mussel" instructional video, which is currently being remade to provide a more complete and comprehensive tool to broaden the reach of WIT beyond the hands-on classes. View the video at: [<http://www.youtube.com/usfws#p/c/00CA362652FF8AB3/0/Ntpumy975f0>].

**First Invasive Mussel Ordinance Prosecutions in California.** Two Sacramento boaters, cited minutes apart on April 16, appeared in Lake County CA Superior Court on May 23, each facing charges of launching a vessel into Clear Lake without a nonresident mussel sticker. Chief Deputy District Attorney Richard Hinchcliff said the two cases are the first such prosecutions to take place under the Lake County Water Vessel Inspection Ordinance. (*From the May 19 Stop Aquatic Hitchhikers/Habitattitude News* [<http://www.protectyourwaters.net/news/>])

**Mussel Invasion Triggers Water Conservation Plan.** Cities across the North Texas Municipal Water District service are being asked to voluntarily conserve water because a major source of water is unavailable to the district. Zebra mussels have invaded Lake Texoma, and they were found in Sister Grove Creek, which the water district uses to bring untreated water to Lake Lavon. The mussels bring increased operating and maintenance costs, so until the mussels are removed to prevent their spread, the plant is offline and not sending water to North Texas cities. Nearly a quarter of the district's water supply is now offline as a result. The District initiated its Stage 1 Water Conservation and Drought Contingency and Water Emergency Response Plan on April 19. The city's goal under Stage 1 water conservation is a 2 percent reduction of water use. They hope that through voluntary measures, tougher mandatory restrictions can be avoided by conserving remaining water supplies, although an ongoing drought could further affect water supplies. (*Excerpted from 'Zebra mussel invasion triggers water conservation plan in Richardson', by Ian McCann/Reporter, Dallas News Apr. 15, 2011*)

**New Great Lakes Study Shows Massive Ecological Changes.** Previous studies have linked zebra/quagga mussels to massive, ecosystem-wide changes in Lake Michigan's southern basin. Now a new University of Michigan-led study shows that the same dramatic changes are occurring in northern Lake Michigan and throughout Lake Huron, two of the planet's largest freshwater lakes, as well. "These are astounding changes, a

tremendous shifting of the very base of the food web in those lakes into a state that has not been seen in the recorded history of the lakes," said Mary Anne Evans, lead author of a paper published in the April 15 edition of *Environmental Science & Technology*.

The zebra mussel, although better-known, has largely been overshadowed in the past decade by the quagga mussel, which can thrive far from shore in deep, mud-bottomed waters. Each fingernail-size quagga mussel can filter about a quart of water a day, and billions of them now blanket the bottoms of lakes Michigan and Huron down to depths of nearly 400 feet. They feed on algae, including single-celled plants (diatoms), which are encased in glass-like shells made of silica. Until recently, the diatoms "bloomed" each spring in the Great Lakes, and the level of silica in upper lake waters dropped as diatoms built their protective shells, then sank to the lake bottom, taking the silica with them. The drop in silica levels due to the spring diatom bloom, known as the seasonal drawdown, has long been used as an indicator of overall algal production in the Great Lakes. Reviewing EPA records of silica levels in lakes Michigan and Huron collected over the past 30 years, Evans and her colleagues found that algal production throughout the two lakes was about *80 percent lower in 2008* than it had been in the 1980s. In Lake Michigan, the decrease in the seasonal drawdown coincided with an explosion in the quagga mussel population and its expansion to greater depths, which began in 2004. The same changes occurred a few years earlier in Lake Huron, where quagga mussels greatly increased in abundance between 2000 and 2003. NOAA's Fahnenstiel said "These changes are unprecedented...in terms of algal abundance and water clarity, lakes Michigan and Huron are now similar to Lake Superior." By filtering out the algae, the mussels are robbing other organisms of the food they need to survive. Of particular concern is the plight of *Diporeia*, a tiny shrimplike creature that was one of the pillars supporting the base of the Great Lakes food web. Nearly every fish species in the Great Lakes relies on *Diporeia* at some point in its life cycle. But *Diporeia* populations have crashed in lakes Michigan and Huron, and the change is already impacting Great Lakes commercial fisheries and the sport-fishing enterprise. "The big question now is how large the quagga mussel population will get," Evans said. "And when it gets as big as it can get, will it stay at that level or will it die back because it has decimated its own food supply? We don't really know what to expect at this point." The work was funded in part by a grant from NOAA's Center for Sponsored Coastal Ocean Research and the U-M's Graham Environmental Sustainability Institute. (*Excerpted from a U. Michigan News Service article, April 13.*)

**Spain Filtration System.** The Basque province of Álava/Araba, in northern Spain, has inaugurated the first water filtration station for the elimination of the zebra mussel on irrigated lands in Oion. Xabier Agirre, Chief Deputy of the province, said, "Despite the fact that, only a few metres away, other administrations have opted to do nothing to control the zebra mussel, the Álava/Araba provincial government has taken concrete measures. The latest and most pioneering decision was the water filtration station... to eliminate the zebra mussel population that has settled along the 47 kilometres of piping and the two regulating tanks of the Oion irrigation system". The project improved the current installations that receive and pump water for the Oion Community of Irrigators and control zebra mussel damage to the irrigation system in the Ebro basin. The new physical barrier impedes the entrance of the zebra mussel into the irrigation system with automatic 50 and 25 micron mesh filters. The project also involves the substitution of the three impulsion pumps, and the construction of buildings and ancillary public works. The 871,128 euros investment was 93% funded by the Department of Agriculture, through a direct grant and using investment interest rates. The rest came from the Community of Irrigators of Oion. (*Excerpted from a March 18 article 'First water filtration station for elimination of zebra mussel in Oion irrigated area (Araba/Álava)' in BasqueResearch.com.*)

**Special Aquatic Invasions Issue On Mussels.** A Special Issue, 'Quagga Mussels in the Western United States' (Vol. 6, issue 2, June 2011) is now available in the open access (i.e., free download) journal, *Aquatic Invasions* [<http://www.aquaticinvasions.net/2011/issue2.html>]. The articles:

1. Wong, W.H. and S.L. Gerstenberger, Quagga mussels in the western United States: Monitoring and Management. *Aquatic Invasions*, 2011. **6**: p. 1-5.

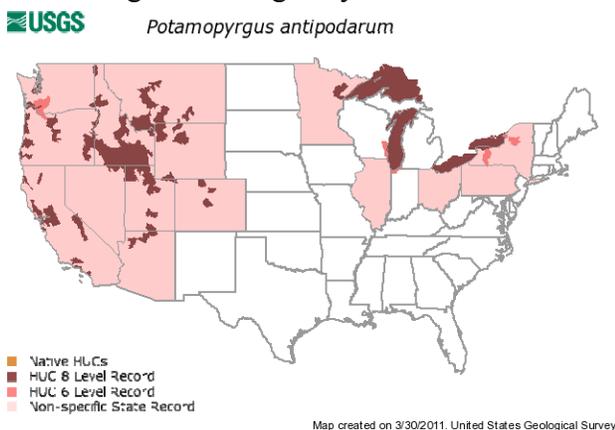
2. McMahon, R.F., Quagga mussel (*Dreissena rostriformis bugensis*) population structure during the early invasion of Lakes Mead and Mohave January-March 2007. *Aquatic Invasions*, 2011. **6**: p. 131-140.

3. Cross, C., W.H. Wong, and T.D. Che, 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*, 2011. **6**: p. 141-147.
4. Chen, D., et al., Environmental factors affecting settlement of quagga mussel (*Dreissena bugensis*) veligers in Lake Mead, Nevada-Arizona, USA. *Aquatic Invasions*, 2011. **6**: 149-156.
5. Loomis, E., et al., Abundance and stomach content analysis of threadfin shad (*Dorosoma petenense*) in Lake Mead, Nevada: Do invasive quagga mussels (*Dreissena rostriformis bugensis*) affect this prey species? *Aquatic Invasions*, 2011. **6**: p. 157-168.
6. Britton, D. and S. Dingman, Use of quaternary ammonium to control the spread of aquatic invasive species by wildland fire equipment. *Aquatic Invasions*, 2011. **6**:169-173.
7. Zhang, H., D.A. Culver, and L. Boegman, Dreissenids in Lake Erie: an algal filter or a fertilizer? *Aquatic Invasions*, 2011. **6**: p. 175-194
8. Turner, K., et al., Interagency monitoring action plan (I-MAP) for quagga mussels in Lake Mead, Nevada-Arizona, USA. *Aquatic Invasions*, 2011. **6**: p. 195-204.
9. Wong, W.H., et al., A standardized design for quagga mussel monitoring in Lake Mead, Nevada-Arizona. *Aquatic Invasions*, 2011. **6**: p. 205-215.
10. Hosler, D., Early detection of dreissenid species: zebra/quagga mussels in water systems. *Aquatic Invasions*, 2011. **6**: p. 217-222.
11. Mueiting, S.A. and S.L. Gerstenberger, The 100th Meridian Initiative at the Lake Mead National Recreation Area, NV, USA: Differences between boater behaviors before and after a quagga mussel, *Dreissena rostriformis bugensis*, invasion. *Aquatic Invasions*, 2011. **6**: p. 223-229. (Thanks to David Wong)

**Zebra Mussel Blog.** Check out Dan Hilburn's (Oregon Department of Agriculture) latest blog on "Calculating Our Chances of Getting Zebra Mussels" at [[www.oregoninvasivespecies.blogspot.com](http://www.oregoninvasivespecies.blogspot.com)]. (Thanks to Lisa DeBruyckere, OIC)

## [Around the West Coast](#)

**Mudsnails Detected In Thornton Creek, WA.** New Zealand mudsnails (NZMS) (*Potamopyrgus antipodarum*), have been detected in Thornton Creek, which flows into Lake Washington. This is not good news; they are tiny, very prolific, difficult to eradicate. They are known to reach densities up to 300,000 per m<sup>2</sup> and in such high densities, they have even been known to change the nitrogen cycle in streams. Recent water



quality monitoring and sample analysis, by the national USGS lab in Denver, came back positive for New Zealand mudsnails. The WDFW has independently confirmed both adult and juvenile NZMS at the mouth of Thornton Creek. This is the third confirmed detection of this invasive species in Washington; they were first discovered in the lower Columbia River in 2002, and then in Olympia's Capitol Lake in 2009. A NZMS *fact*

sheet with collection information, maps, and photos is on-line at [<http://tinyurl.com/NZMudsnailFacts>] and a photo gallery is on-line at [<http://tinyurl.com/NZMudsnailPhotos1>]. Links to more information include the USGS National Water-Quality Assessment–Puget Sound Basin [ <http://wa.water.usgs.gov/projects/pugt/> ]; the USGS Nonindigenous Aquatic Species Program [<http://nas.er.usgs.gov/> ]; the U.S. Fish and Wildlife Service [<http://www.fws.gov/invasives/> ]; and the Washington Department of Fish and Wildlife [<http://wdfw.wa.gov/ais/>]. (From a USGS news release, June 1)

**WA AIS General Permit Finalized.** The Washington Department of Ecology has finalized the new Aquatic Invasive Species Management General Permit on April 20. The permit is the regulatory tool that directs how chemicals or other control products are used to manage invasive aquatic animals and invasive marine algae in state waters. Ecology issues general permits in place of a series of individual permits when the permitted activities are similar. This permit does not cover invasive aquatic weeds, which are covered by other permits. Washington water quality statutes and regulations do not allow the discharge of pollutants into waters without a permit obtained from Ecology. Since algacides, herbicides, insecticides, molluscicides, piscicides and any other management chemicals or products are potential pollutants, they require a discharge permit before application to surface waters. The permit allows early treatment of localized infestations to eradicate or contain infestations in one area or site. State agencies must apply for coverage under this permit prior to conducting control activities for invasive aquatic animal or marine algae. For questions about the permit, contact Kathy Hamel at (360) 407-6562, or <[kathy.hamel@ecy.wa.gov](mailto:kathy.hamel@ecy.wa.gov)>. Download Ecology’s permit documents at: [<http://www.ecy.wa.gov/programs/wq/pesticides/invasive.html>]. (Excerpted from a Department of Ecology News Release - May 25, 2011)

**New Online Database Centralizes OR Invasives Data.** Oregon has just launched ‘iMapInvasives’, [<http://www.imapinvasives.org/orimi/map/>], an online, GIS-based invasive species reporting and querying tool. The database was developed through a partnership between The Nature Conservancy, NatureServe, the New York Natural Heritage Program, Florida Natural Areas Inventory, and Oregon Biodiversity Information Center. It will help land managers and planners to accurately and quickly record and track locations of all types of invasive plants, animals, fish, and diseases. iMapInvasives provides trained users with their own interactive GIS data base, where they can enter and retrieve site information, share data with partnering organizations, and plan for future activities. In the future, iMapInvasives will also allow users to record and retrieve treatment data. The initial list of species included in iMapInvasives was developed from the Oregon Department of Agriculture’s “A” and “B” noxious weed lists, the Oregon Invasive Species Council’s 100 Worst Invaders, noxious weeds listed in neighboring states, and any species that partner agencies are tracking. Thanks to the contributions of 24 users from 11 organizations, the database already has 95,298 observations spanning 148 species in iMapInvasives! With continued batch uploads, transfer of reports from the Oregon Invasive Species Hotline, and increasing numbers of direct reports to the iMapInvasives database, Oregon is well on the way to building a robust database! The Oregon Biodiversity Information Center is managing iMapInvasives, and will review each species before adding to the list to ensure the species is invasive and its taxonomy aligns with NatureServe’s standards.

One of the greatest benefits of iMapInvasives is that although organizations can batch upload large quantities of information at once, anyone with data entry access can add invasive species observations at any time. Instead of Oregonians using fifty-plus databases to manage invasives, there is now one central location where people can input data, share data with partners, and have access to real-time information. The public will be able to view general distribution data of invasive species, while those who request an account will be able to see point observation data as well as detailed assessment/treatment polygons, when this feature is added later this year. iMapInvasives is intended to complement ODA’s WeedMapper [<http://www.weedmapper.org>], a collection of spatial information of the distribution of noxious weeds in the state of Oregon. WeedMapper facilitates identification, reporting, verification, early detection, and rapid response for noxious weeds. An updated version of Weedmapper became available in May (see below). For more information on using iMapInvasives, visit Portland State University’s Oregon Biodiversity Information Website at [<http://orbic.pdx.edu/invasives.html>].

The site contains background information, frequently asked questions, and training videos.) (*Excerpted from an OISC News Release, and Lisa DeBruyckere, OISC*)

**New OR Weedmapper Maps Now Available.** The updated Weedmapper maps are now available for viewing. The update brings to our cooperators new county data maps, statewide data maps as well as the always useful and colorful general maps. ODA has now added a new color to the general maps (green), that indicates where previously known or historical sites have occurred, which will be helpful for survey purposes, if you are looking for weeds in these areas. The weed profiles have been eliminated, but each weed has been attached to the already existing and informative profiles located on the ODA website, and has photos for identification purpose. Users are strongly encouraged to also use weedmapper.org to submit new sites. Explore the new maps, use them to begin your field season...and remember to collect data for the 2011 map updates. Access Weedmapper at [[www.weedmapper.org](http://www.weedmapper.org)]. (*Thanks to Shannon L Brubaker, ODA*)

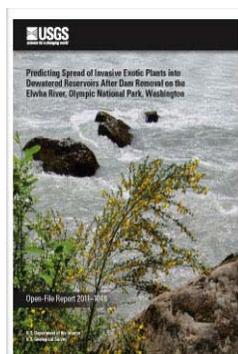
**WA Tunicate Funding Terminated.** The Washington 2011-2013 special session budget, terminates the funding Puget Sound Partnership has provided to WDFW for invasive tunicate response and management. The Department will continue to fulfill the contract commitments through June 30, 2011, including removal of *Styela clava* from recreational boat hulls in Blaine, Semiahmoo, Sandy Point, and Birch Bay. It is unclear at this time how much, if any, tunicate work will be feasible by the Department in the next couple of years. Remaining limited resources for AIS work will focus on the two other high priorities of ballast water and zebra/quagga mussels. (*Thanks to Allen Pleus, WDFW*)

**New Oregon Vessel Fees.** SB 81, establishing a vessel arrival fee to support ballast water management activities at Oregon DEQ, was signed into law on June 14, by Governor Kitzhaber. The Department will be conducting outreach with shipping agents and others in the maritime community during the coming months to prepare for implementation of the fee beginning January 1, 2012. (*Thanks to Rian Hooff, ODEQ*)

**PNWER Invasive Species Conference.** The Pacific Northwest Economic Region Summit meeting in Portland, OR, will include a one-day conference (July 20) on invasive species. Featured Keynote Speakers include Paul Heimowitz (“Coordinating regionally for zebra/quagga mussels”), Sarah Reichard, (“How do we harmonize noxious weeds lists in the region?”), and Alan Kanaskie (“The future of Sudden Oak Death control in the Pacific Northwest”). Topics include:

- Regional invasive species issues, prioritizing regional efforts, identifying and prioritizing significant obstacles;
- Cost-effective, proactive, shared regional strategies and commitments to adequately fund and implement the highest priority invasive species control and prevention efforts in the region; and
- A shared understanding and support for legislation that will provide the Pacific Northwest with adequate protections from invasive species. To register for the session, contact <[megan.egelhoff@pnwer.org](mailto:megan.egelhoff@pnwer.org)>, or go to [<http://www.regonline.com/Register/Checkin.aspx?EventID=941063&lbrd=1&rtypeid=198604>]

**New Publication: Predicting The Spread Of Invasive Plants Following Elwha Dam Removal.** Removal of the two dams on the Elwha River in Olympic National Park, WA, may allow movement of exotic plants into the dewatered reservoirs and inhibit the restoration of native vegetation. A new report identifies high-priority areas



to treat prior to dam removal, and areas thought to be at risk after dam removal. The study, *Predicting Spread of Invasive Exotic Plants into Dewatered Reservoirs After Dam Removal on the Elwha River, Olympic National Park, Washington*, is available at [<http://pubs.usgs.gov/of/2011/1048/>] (Thanks to Andrea Woodward, USGS)

**WA Noxious Weed List Proposals**. The Washington State Noxious Weed Control Board proposals is proposing eight changes to next year's state noxious weed list:

- **Tree of Heaven** (*Ailanthus altissima*); an allelopathic fast-growing small tree, and prolific seeder that forms dense thickets to rapidly outcompete native plants;
- **Japanese Eelgrass** (*Zostera japonica*); found on WA Coast beaches, mudflats and tidal areas; shellfish growers are concerned about the its impact on the productivity of shellfish beds;
- **Common Teasel** (*Dipsacus fullonum*); a rapidly spreading perennial weed sometimes used in horticultural plantings and dried flower arrangements. Each plant can produce 2000 seeds a year;
- **French Broom** (*Genista monspessulana*); an aggressive pioneer species. In CA, large infestations displace native plant species and significantly increase the costs of reforestation in commercial timberlands.
- **Italian Arum** (*Arum italicum*); a perennial, herbaceous plant with tuberous roots. All parts of the plants are poisonous and the plant sap is a skin irritant. It is hard to get rid of once established, and is most likely to spread from yard waste piles or old garden sites. It also produces seeds.
- **Oriental Clematis** (*Clematis orientalis*); a perennial vine, with seeds widely dispersed by the wind. The impact of this species is similar to the common invasive old man's beard (*Clematis vitalba*), although it seems more likely to spread in drier climates such as in eastern WA. It was discovered invading in Yakima.
- **Common Barberry** (*Berberis vulgaris*); a deciduous 8-10 foot shrub, forming spiny dense stands, and also an alternate host for wheat rust. It produces a large number of seeds that are transported to new locations by birds and small mammals.
- **Russian Thistle** (*Salsola tragus*); AKA tumbleweed, it becomes conspicuous as it breaks from the soil and is blown across highways and fields. In agricultural areas, it can reduce yield and quality of numerous crops, particularly alfalfa and small grains. It depletes soil moisture, interferes with tillage operations, and can also threaten native plant ecosystems in dry climates.

The Noxious Weed Board will make a final decision on changes to the weed list before the end of the year. This year, the Board will also be codifying its listing guidelines into WAC 16-750, including the process by which the resubmission of previously rejected proposals will be handled. (Excerpted from, *King County Weed News*, May 2011, thanks to Sasha Shaw, KC)

**Didemnum Now In Alaska**. Maine became the first state to detect *Didemnum vexillum*, a colonial tunicate (sea squirt) in 1993. The species was probably introduced by ships dumping their ballast water. Since then, the species has spread to other parts of New England. On the West Coast, California, Oregon and Washington also have infestations, so it is not too surprising to hear it is now in Alaska. The first sighting of was confirmed in a



harbor near Sitka last June. But what was new for me was the name. In Washington we just call it "Didemnum", but up there they have the appealing common name of "rock vomit". Divers searched the harbor

last fall, and again in January, and due to depth, deployed a remotely operated submersible to videotape much of the area around the harbor. There appear to be no big infestations outside the harbor, but officials will take a closer look when they review the video. Once that is completed, NOAA and state officials will launch an eradication campaign. (*Excerpted from 'Rock vomit' invades Alaska harbor,' in MSNBC.com, April 7*)

**Secondary Invasions May Be More Important Than Realized.** (*Taken almost verbatim from a Dan Hilburn Blog*) Years ago, the Oregon Department of Agriculture (ODA) responded to a call from a railroad company that reported a worker had been stung by ants. The train was stopped on a siding in Salem. One of the boxcars contained cotton seed destined for cattle feed. It took only a few minutes to find red imported fire ants (RIFA; *Solenopsis invicta*), in the cargo. There were a lot of them. The boxcar was sealed up and fumigated. RIFA is one of the old-guard invasive species in this country. Native to South America, these ants were introduced to Mobile, AL, in the 1930s, and have since spread throughout the entire southeastern United States. In the 1990s, they made the hop to southern California. Fire ants have a powerful sting, painful to humans and fatal to baby birds and newborn animals. The mounds they build interfere with machinery. RIFA is old news in the Southeast, but it is back in the scientific spotlight. Scott Bauer, a USDA researcher, has been studying the genetics of RIFA. He and his collaborators collected ants from 2,144 RIFA colonies in 11 countries, including newly invaded sites in the Caribbean, Australia, New Zealand, Taiwan, and China. Genetic analysis indicates these new invasions are coming from the United States, not RIFA's homeland in South America. (*Science News, March 26, 2011. Vol. 179(7) pg. 15.*) Nik Grunwald at Oregon State University is uncovering a similar hopscotch pattern of spread by sudden oak death (SOD; *Phytophthora ramorum*). There are three clonal lineages of SOD in North America: One was introduced into California, another first appeared in British Columbia or Washington, and a third hopscotched here from Europe. Amazingly, scientists have not yet found this pathogen's native range! It must be pretty inconspicuous at home. Another invasive species playing hopscotch is the granulate ambrosia beetle, *Xylosandrus crassiusculus*. Home for this wood borer is Africa and Asia, but it invaded the southeastern United States in the 1970s. In 2004, they were found in The Dalles. They weren't coming from Africa or Asia; they were hitchhiking in green railroad ties imported from the Southeast. It took a couple of years to eradicate them. Secondary invasions may be more important than we realize. Populations of invasive species are often much higher in invaded territories than in their native range, and those populations may be pre-adapted for playing invasive species hopscotch. (*From 'Invasive Species Hopscotch' April 3. See all of Dan Hilburn's blogs at [www.oregoninvasivespecies.blogspot.com].*)

**Freshwater Aquatic Habitat Decision Tool.** The USFWS Pacific Region has teamed up with Ecotrust to develop a freshwater aquatic habitat decision support system that in part will focus on impacts of invasive species. This will be an open-access web-based tool that managers can use to help determine priorities for investing in watershed restoration and conservation in OR, WA and ID. The invasive species component will have three facets: distribution of approximately 15 existing AIS in the three states (a mix of plants, invertebrates, and vertebrates), projected distribution of several potential AIS in the region (e.g., zebra mussels), and a generalized "invasibility index". The latter concept is still under development and will consider the vulnerability of a watershed based on degree of prior invasions, influence of pathways (e.g., connection to ports and boat launches), and general watershed conditions (e.g., extent of impoundment). Other components in the tool will focus on native species distribution and potential climate change impacts. The project aims to develop a working version of the tool by December, 2011. For more information, contact Paul Heimowitz at <paul\_heimowitz@fws.gov>.

**Japanese Eelgrass: A Controversy.** Japanese eelgrass, (*Zostera japonica*), a non-native seaweed on the West Coast, has both defenders and critics. Biologists believe shipments of oysters from Japan likely brought it to Washington decades ago. It has since spread north to British Columbia and south along the Oregon coast into California. Willapa Bay, WA, produces more shellfish than any other inlet on the West Coast, and shellfish companies say the "infestation" has reached "devastating" proportions; their yields are down and some companies have simply abandoned some clam beds. Shellfish growers want Japanese eelgrass declared a noxious weed, so they can spray herbicide or mow the invader down. (California has already done so.) But

some marine scientists, state agencies and conservationists argue against this. "In most areas of the world, these plants are highly protected," said Sandy Wyllie-Echeverria, a marine biologist with University of Washington. "The ledger needs more examination. There are areas where Japonica (the scientific name) has been shown to be a valuable resource, and there are other areas where it is quite mixed." In the Northwest, he says waterfowl like to eat the eelgrass, and a suite of smaller creatures probably live and feed among it. It might also stabilize eroding beaches. The Sierra Club opposes eradication even though the eelgrass is non-native, because it provides fish habitat, and more importantly, it feels there is a very high probability that efforts to eradicate Japanese eelgrass could eradicate native eelgrass (*Zostera marina*), and that would have a major impact on fish and birds. The Washington State Noxious Weed Control Board is caught in the middle. The Board's director, Alison Halpern proposes a possible compromise: list Japanese eelgrass as a noxious weed on commercial shellfish beds only. "It ...allow[s] us to acknowledge it is a problem in one area, but it is not considered a problem in the other areas." Halpern has gotten some positive feedback, but not everyone's on board yet. Shellfish growers say it's a good start, but worry the plan could require them to fight the non native sea grass in perpetuity. (Excerpted from 'Latest Invasive Weed Not Following Usual Script' by Tom Banse, NW News Network, June 15.)

**New Forest Service Website.** The Pacific Northwest Region (Region 6) of the US Forest Service contains 17 National Forests, a National Scenic Area, a National Grassland, and two National Volcanic Monuments, all within Oregon and Washington. Check out their invasives website at: [[www.fs.usda.gov/goto/r6/invasives](http://www.fs.usda.gov/goto/r6/invasives)].

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

**Sunlight Found to Decrease Golden Algae Toxicity.** Golden algae, members of the class Chrysophyceae (about 1,200 species) are found in both marine and fresh water. They are diverse in form, although most are primitive single-celled flagellates. Golden algae kill millions of fish in the southern United States every year. Experts believe several environmental factors influence toxin production, but new research from Baylor University has found that sunlight is a key component in the magnitude and duration of the toxicity of the algae to fish. The study found that the longer golden algae toxins are exposed to natural sunlight, the less toxic the algal toxin becomes to fish and other aquatic organisms. "What we think happens in terms of the large fish kills, is that sunlight only penetrates down so deep in a lake, so in a lake with golden algae blooms, fish located at greater depths may be exposed to more algal toxins," said study co-author Dr. Bryan Brooks, director of the Baylor environmental health sciences program. "Golden algae is aggressive and very unique because it can produce its own toxins, swim, photosynthesize and feed on other organisms. If we can figure out what stimulates and decreases the growth of the algae, we might be able to control it." Along the Brazos River in north and central Texas, at least seven-million fish have been killed since 1988 due to high golden algae levels, according to Texas Parks and Wildlife. In fact, in 2005 more than a million fish died in Lake Whitney over a three-month period. Officials believe large golden algae blooms contributed to the deaths, attacking the fishes' gills and causing them to suffocate. The study appears online in the *Journal of Plankton Research*. (Excerpted from 'Golden Algae Responsible for Killing Millions of Fish Is Less Toxic in Sunlight', *ScienceDaily*, June 16)

**Wheat and Poplar Rust Fungi Genomes Sequenced.** An international research team has sequenced the genomes of two fungal pathogens threatening global wheat supplies, production of a tree crop valued as a future source for biofuel. The study represents the first genome-wide characterization of any rust fungus, a diverse group of more than 6,000 species, according to Les Szabo, a lead researcher on the project. The sequencing of the genetic codes of wheat stem rust pathogen (*Puccinia graminis*) and poplar leaf rust pathogen (*Melampsora larici-populina*) is expected to help researchers develop control strategies to address worldwide threats to wheat fields and tree plantations. Wheat stem rust causes major epidemics of both barley and wheat worldwide. A strain known as Ug99 has spread across Africa and into Central Asia, and has been able to overcome most of

the stem-rust-resistant wheat varieties developed over the past 50 years. Poplar leaf rust can cause significant losses in poplar tree plantations. Poplar is an important crop for the wood industry and is becoming increasingly important to the biofuel industry in the United States and Europe because of its rapid and significant biomass production. Rust fungi depend on living tissue of their hosts for survival. The pathogens secrete proteins that enable them to block the host plant's defenses and steal nutrients. The research uncovered evidence that both pathogens have large numbers of such "effector" proteins, an indication that they likely co-evolved with their host plants. Because they need a plant host to survive, the pathogens can't be cultured in a laboratory and are notoriously hard to study. The team's sequence data has been released in GenBank, a genetic database administered by the National Center for Biotechnology Information at the National Institutes of Health. (*Excerpted from 'Genomes of Fungi That Threaten Wheat, Poplars Sequenced', in ScienceDaily, May 11, 2011*)

**Federal Ballast Water Discharge Standard (Update).** The draft Ballast Water Discharge Standard (BWDS) rulemaking package is currently in review. Once it is submitted to the Office of Management and Budget, OMB will post a summary on its website (<http://www.reginfo.gov/public/do/eoPackageMain>) and conduct an interagency review. The Coast Guard has revised its date for publication, and the rule is expected to publish in Summer 2011, rather than the original date of December 2010. For further information go to <http://www.uscg.mil/hq/cg5/cg522/cg5224/bwm.asp>.

**Ballast Water Reports:** Two new reports are available, one from the National Academy of Sciences (NAS) on approaches to setting ecologically protective numeric limits and one from EPA's Science Advisory Board (SAB) on the availability and performance of existing ballast water treatment technologies. These reports are mentioned in the Vessel General Permit settlement agreement. The NAS report on setting ecologically protective numeric limits is available at [[http://www.epa.gov/npdes/pubs/nas\\_final\\_report\\_prepublication\\_version.pdf](http://www.epa.gov/npdes/pubs/nas_final_report_prepublication_version.pdf)]. The SAB report on ballast water treatment technologies is available at: [[http://yosemite.epa.gov/sab/sabproduct.nsf/fedrgstr\\_activites/70D07AECBA62FADC852578A100731907/\\$File/Draft+Ballast+Water+Advisory+Report+for+Quality+Review-05-31-11.pdf](http://yosemite.epa.gov/sab/sabproduct.nsf/fedrgstr_activites/70D07AECBA62FADC852578A100731907/$File/Draft+Ballast+Water+Advisory+Report+for+Quality+Review-05-31-11.pdf)]. (*Thanks to Randy Marshall, Ecology*)

**Great Lakes Ballast Water Study.** The first scientific study of the Great Lakes Ballast Water Program reveals that the strategy is "very effective at protecting waterways from the introduction of new aquatic invasive species, which can have devastating effects on natural ecosystems." Since the introduction of the current regulations in 2006, no new invasive species attributed to ballast water release and transoceanic shipping in general have been recorded in the Great Lakes. The study, led by Fisheries and Oceans Canada scientist Dr. Sarah Bailey, was published on March 9, 2011 in the *Journal of Environmental Science and Technology*. For further information go to <http://www.dfo-mpo.gc.ca/science/publications/article/2011/06-13-11-eng.html>.

**EPA Implementation of Clean Boating Act (CBA):** The CBA is an amendment of the Clean Water Act (CWA). The CBA requires EPA to identify discharges incidental to the normal operation of recreational vessels for which management practices are reasonable and practicable to develop. These management practices can help to limit the amount of pollution discharged into our nation's waters. The CBA requires nationally applicable, reasonable measures to mitigate adverse impacts of recreational vessel discharges without using a CWA permit. The CBA applies to recreational vessels in all "waters of the United States," as defined in the CWA, and waters of the contiguous zone which extend to 12 miles from shore. This means the CBA applies to recreational vessels using internal waters, coastal waters, and waters out to 12 nautical miles from shore. The CBA has three phases of implementation:

**Phase 1:** EPA will determine the discharges incidental to the normal operation of recreational vessels for which it is "reasonable and practicable" to develop management practices and develop these practices.

**Phase 2:** EPA will enact regulations establishing performance standards for each management practice.

**Phase 3:** USCG will enact regulations that specify the design, construction, installation or use of management practices to meet EPA's performance standards.

EPA anticipates proposing the Phase 1 regulation in 2012. While it is difficult to project implementation timelines, the EPA anticipates that the Phase 2 regulations will take 18-24 months to complete, following finalization of Phase 1. After finalization of Phase 2 the USCG will develop the Phase 3 regulation. For further information go to <http://water.epa.gov/lawsregs/lawsguidance/cwa/vessel/CBA/about.cfm>.

**Wisconsin Uses Asian Wasps on the Emerald Ash Borer**. More than 1,000 tiny stingless wasps the size of a grain of rice were released at Riveredge Nature Center in Saukville, WI, in late May, in hopes of destroying the highly destructive emerald ash borer (EAB; *Agrilus planipennis*). The emerald ash borer was first detected in 2008 in nearby Newburg, and since then, it has been found in six additional locations. Riveredge was selected for the experiment because of its large infestation of the ash borer. This is the first time Wisconsin has experimented with wasps to kill emerald ash borers, and it will become the 10th state to try them. The first wasps used in a field trial were in Michigan in July 2007, and to-date, 180,000 wasps have been released in nine other states, including MI, IL and MN under USDA permits. The borer's larvae disrupt the flow of nutrients



USDA

beneath the bark, killing the tree over time. The EAB is considered to be the “most destructive forest insect ever to invade North America”, and nationwide the borers have killed over 60 million ash trees since they were discovered in Michigan, in 2002. Wisconsin has an estimated 700 million ash trees. The Wisconsin plan calls for release of two wasp species in May, and a third species in late summer or early fall. The three wasps, like the EAB, are all native to China. Hopefully, the wasp population will grow on its own and seek out and destroy the emerald ash borers. Officials believe it will take at least five years to determine wasp effectiveness. The first two species of wasps will be released when emerald ash borers are in their larval stage, living beneath the bark of ash trees. The wasps will insert their egg-laying appendage through the bark and lay eggs in emerald ash borer tunnels or larvae. Once the eggs hatch, they will eat the beetle larvae. Then later this summer or fall, the third species will be released when emerald ash borers are laying their eggs on the bark of ash trees. The wasps will lay their eggs on or inside the eggs of the beetle. Once the wasp larvae develop, they will eat emerald ash borer eggs. About 600 wasps of each of the first two species will be released, and later an undetermined number of the third species will be released. The wasps are reared in a U.S. Animal and Plant Health Inspection Service laboratory in Brighton, MI. (*Excerpted from JSONline ‘State to send wasp hit squad after emerald ash borers’ by Lee Bergquist of the Journal Sentinel May 5, 2011 and [http://www.emeraldashborer.info/biocontrol.cfm]. For a nice video on the ash borer, go to: [http://www.emeraldashborer.info/biocontrol.cfm]*)

**Hawaii's Deer Problems**. Hawaii has confirmed the presence of axis deer (*Cervus axis*) on parts of the Big Island, a discovery that poses grave implications to native Hawaiian ecosystems. Axis deer were first introduced to Moloka'i and O'ahu in 1868, to Lana'i in 1920, and to Maui in 1959, but they were never

historically introduced to the Big Island of Hawai‘i. They are considered a serious problem with far-reaching economic and environmental impacts to agriculture and native island ecosystems. Axis deer have already caused extensive problems for the agriculture in Maui County; the population has grown six fold over the past 10 years, and today numbers over 12,000 animals. State officials say deer populations have become established in places where they cannot be safely or easily hunted or controlled. On Maui, deer grazing in herds of hundreds have moved into farmed and urban areas, causing millions of dollars in damage to farm lands.



Pineapple and grape vine, both eaten by deer. (TNC and DNLN photos).

Conservation agencies are also concerned about the impact to forest and native ecosystems. The existing fences on the Big Island are below the 8 foot height needed to keep deer out, and retrofitting more than 300 miles of fences could cost tens of millions of dollars. On Maui, the axis deer population also compounded the island’s drought problems. “Axis deer definitely compete with livestock for forage, particularly under drought conditions,” said J. Scott Meidell, of Haleakala Ranch Company. Meidell said the forage tanked in July/August, earlier than expected, as the combination of drought and deer kicked in. “The concentrated deer damage under those conditions rendered our drought plan useless and caused significant losses from supplemental feed, destocking, death and premature sales,” he said. Axis deer also de-bark trees, which frequently results in death of the tree. Tedeschi Vineyards on Maui lost an estimated 6 tons of grapes for production, which would have wine revenue of approximately \$150,000,” said Paula J. Hegele, President of Tedeschi Vineyards, Ltd. The vineyard plans to put deer fencing around the entire 23 acre property to prevent future losses to next year’s crop. “Many farmers cannot undertake the high cost of entirely fencing their property to keep out herds of deer, and may literally lose a crop overnight,” said Maui Mayor Alan Arakawa. “Based on our own experiences, we would urge Big Island authorities to act swiftly to eradicate this pest, which has the ability to multiply very quickly, and impact vast areas.” The Big Island Invasive Species Committee is now working with trackers and using game cameras to survey and confirm locations of axis deer across the island, and DLNR crews are expanding surveys and developing a response and removal plan. Meanwhile, Big Island residents, are asked to report sightings of deer or any other unusual new or introduced mammal to the BIISC Hotline at (808) 961-3299. (Excerpted from ‘Axis Deer Threat on Maui Brings Perspective to Big Island’ May 27, 2011, by Wendy Osher.)

**Corps Flood Relief May Help Spread Invasives.** Mississippi state marine officials expect the oyster industry to suffer extreme losses when record amounts of freshwater heading down the Mississippi River reach the Mississippi Sound. But another outcome of all that fresh water is the threat of invasive species such as silver carp, grass carp, apple snails, zebra mussels, hydrilla, and salvinia making their way into coastal streams. The fresh water is coming from the Bonnet Carre Spillway, opened on May 9 with near record flows, said Scott Gordon, director of the Shellfish Bureau. The last time the spillway was opened was in 2008, when 160 of the 350 bays were opened, Gordon said. This year he expects all 350 bays to be opened. Officials look at 1983, when all 350 bays of the Spillway were opened for floodwaters, as a benchmark for predicting what will happen in the next few days and weeks. "I was here in 1983 for the spillway opening," Gordon said. "There was fresh water all the way to the Gulfport Ship Channel. Salinity levels were so low people were catching channel

catfish and largemouth bass off the beach in Waveland. I feel we'll have at least that effect this time." (*From 'Oysters may be wiped out in Mississippi Sound', in Bloomberg Business Week, May 18*)

**First North American Record: Bermuda Grass Stem Maggot.** The Bermuda Grass Stem Maggot, (*Atherigona reversura*), an invasive fly, has been found damaging Bermuda grass pasture and hay fields in Georgia. This is the *first record* of this Asian species in North America, and it may represent a new serious pest of Bermuda grass forage crops and turf. Bermuda grass is the most widely grown grass for forage, pasture and hay production in the coastal plain region of the southeastern U.S, and it is also widely used as a turfgrass in the Southern U.S. and elsewhere around the world. Bermuda grass represents the bulk of Georgia-grown sod, a crop worth an estimated \$116 million in 2009. In July, 2010, county agents in southern Georgia reported extensive damage to Bermuda grass pastures. Subsequent reports in August and September revealed that the pest is now found throughout Southern Georgia, in Northern Florida, and in parts of Alabama and South Carolina. Several on-farm trials with registered insecticides found that a single application only reduced infestations for a short time. UGA entomologists also observed a noticeable difference in damage levels among Bermuda grass varieties. Ongoing laboratory and field research studies next season will examine the biology and methods of control of this new Bermuda grass pest. (*Excerpted from a Lawn and Landscape Article, April 4, 2011, based on info from The University of Georgia College of Agricultural & Environmental Sciences*).

**Invasive Species Costs Outweigh Natural Disaster Costs.** An interesting article compares invasive species costs worldwide to the costs of natural disasters. Not surprisingly, for those who follow invasive species impacts, invasive species cost more than natural disasters. To see the article, go to: [<http://www.aibs.org/bioscience-press-releases/resources/current-press-release.pdf>]. (*Thanks to Glenn Dolphin, OR Marine Board*)

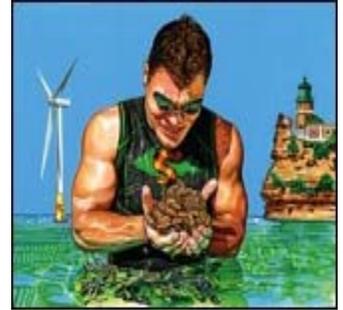
**New Forest Pest Publication.** A new FAO *Guide to implementation of phytosanitary measures in forestry*, (Forestry Paper 164, 2011), is the result of over a year's effort by many global forest pest experts. This important reference work, led by Gillian Allard of FAO, provides easy to understand information on International Standards for Phytosanitary measures (ISPM's) and how forest management practices can play a role in minimizing pest prevalence and spread. It is available in English, Arabic, Chinese, French, Russian and Spanish. Download it at: [<http://www.fao.org/docrep/013/i2080e/i2080e00.htm>].

**NPS Releases Assessment For Invasive Plant Management.** The National Park Service has developed a NEPA Environmental Assessment that presents two alternatives for addressing nonnative invasive plant management in ten national parks located in the northern Rocky Mountains. The national parks involved in the plan include: Big Hole National Battlefield (MT), City of Rocks National Reserve (ID), Craters of the Moon National Monument and Preserve (ID), Fossil Butte National Monument (WY), Golden Spike National Historic Site (UT), Grant-Kohrs Ranch National Historic Site (MT), Hagerman Fossil Beds National Monument (ID), Little Bighorn Battlefield National Monument (MT), Minidoka National Historic Site (ID), and Nez Perce National Historical Park, Bear Paw Battlefield Site (MT). Alternative 1 is a continuation of current management practices, while Alternative 2 (the preferred alternative) proposes a systematic 7-step process developed by the parks, to address the threat of nonnative invasive plant management. The preferred alternative will provide the parks with a flexible invasive plant management process, using Integrated Pest Management techniques and adaptive management, to direct nonnative invasive plant management activities and to prioritize management actions, target plants and resources. (*Excerpted from Little Chicago Review, March 2011*)

**Sooper Yooper- A New Childrens Book.** With our waters becoming increasingly important in the 21st century, "mankind will have to fight battles against the villainous issues of toxic and nutrient pollution, invasive species and habitat degradation". Authors Mark Newman and Mark Heckman have produced *Sooper Yooper*, a children's book about Billy Cooper, an ex-Navy SEAL and environmental superhero who lives in Michigan's Upper Peninsula and battles invasive species to protect the Great Lakes, along with his dog, Mighty Mac. The hero, Billy Cooper, is not your typical crime fighter, and the fact that he displays no apparent superpowers is

intentional; the authors felt it was important to underscore their belief that it is the average person – not someone endowed with X-ray vision or superhuman strength – who can make a difference when it comes to protecting the planet. Published by Thunder Bay Press, *Sooper Yooper* is a beautifully-illustrated hardback book that sells for \$17.95. Each of the detailed illustrations is actually a painting which took Heckman one to two months to create. Newman wrote much of the book around the artwork, which Heckman insisted include such Upper peninsula landmarks as the Mackinac Bridge and Castle Rock.

Sample illustrations:



The authors of *Sooper Yooper* also travel around the Great Lakes throughout the Midwest, from smaller towns in the Upper Peninsula to bigger cities in MI, WI, MN, IL, IN and OH, visiting schools, museums and libraries with a special show-and-tell presentation detailing the story of the Great Lakes and the hidden dangers of sea lamprey, zebra mussels, Asian carp and other invasive species. This program is *free* to schools through the support of the Wege Foundation. As of January, Newman had taken the Sooper Yooper story and message to close to 7,000 students. For more information, go to [<http://sooperyooper.com/book.html>]

**Cats Are An Invasive Species Too.** Cats are not native to North America; they were brought here long ago by settlers from Europe, and they are now the *most abundant carnivore* in North America. The International Union for the Conservation of Nature labels domestic cats as one of the "world's worst" invasive species, because they can devastate native wildlife populations, particularly on islands and in fragmented urban habitats. Pet owners may think that one little cat can't possibly make a difference in the balance of nature, but by some estimates, *outdoor cats in the U.S. kill more than one million birds every day* on average. Some studies put the death toll as high as *one billion birds* per year. And other studies show that cats kill about twice as many rodents, reptiles, and other small animals. While the number of free-roaming cats is rising (now between 117 and 157 million in the U.S.), nearly one-third of the more than 800 species of birds in the U.S. are endangered, threatened, or in significant decline. "Allowing free-ranging pet and feral cats to roam outside, breed unchecked, kill native wildlife, and spread disease, is a crime against nature," says Michael Hutchins, Executive Director/CEO of The Wildlife Society (TWS). As North America's largest scientific organization for professionals in wildlife management and conservation, TWS takes a strong stand in favor of keeping pet cats indoors and removing feral cats from the environment to protect wildlife from cat predation. The Spring, 2011, issue of the TWS magazine, *The Wildlife Professional*, has just released a package of articles titled *In Focus: The Impacts of Free-Roaming Cats*, which explores the widespread negative impacts of outdoor, stray, and feral cats. See the articles at [[http://wildlifeprofessional.org/Documents/cat\\_package.pdf](http://wildlifeprofessional.org/Documents/cat_package.pdf)] Growing numbers of cities and towns across the nation are adopting trap, neuter and release (TNR) programs to manage overabundant populations of stray, feral, and abandoned cats. Proponents of TNR claim that this approach will eventually reduce the numbers of unclaimed outdoor cats, but research shows otherwise.



To help educate policymakers and the public about this issue, TWS has created five fact sheets about stray, feral, and outdoor cats. Hopefully by understanding the impacts of outdoor cats, people on all sides of the issue will begin to develop solutions that benefit not only cats, but also the native wildlife we hope to conserve. To see the fact sheets, go to

[[http://joomla.wildlife.org/index.php?option=com\\_content&task=view&id=845&Itemid=183](http://joomla.wildlife.org/index.php?option=com_content&task=view&id=845&Itemid=183)]. (*Excerpted from a Jim Williams post in the Startribune.com, March 22, 201, based on information provided by Lisa Moore, Editor-in-Chief, The Wildlife Professional*).

**Climate Change And Invasives in Ohio.** Ohio's plants and insects are adapting to climate change by blooming earlier and staying longer, and in some cases the insects that eat them are also emerging from the soil earlier each spring. A change in the timing of insect emergence has led to crop damage before farmers have even sprayed pesticides to control them. A warming climate may also be favoring certain invasive species more suited to specific temperatures. Figuring out the 'when and where' in a changing natural equation is known as the science of phenology (literally, "the science of appearance"). Phenologists are looking at what they call the "de-coupling" of plants and insect emergence each spring, and even the arrival of insect predators like birds, to learn how local warming is changing the timing of when plants, insects and animals do what they do, in our backyards, our gardens and our farms. In the worst cases, migratory birds reach the arctic too late, after their food sources have already emerged and dispersed, could threaten extinctions. From the northward movement of plant-eating bagworms across Interstate 70, to the arrival of invasive kudzu in Ohio, to the coming scourge of European corn borer into southern Ohio and much of the nation's breadbasket, shifting ecosystems are showing the reality of climate change close to home. Out West, scientists are also tracking the bark beetle outbreaks, to determine whether there is a link to a warming climate. There are now national plant phenology efforts like Project Budburst, and one at Cornell charting the timing of bird migrations.

Phenology really came into its own in 2006, and stoked climate change discussions, when scientists studying the annual bloom date for lilac trees throughout the Northern Hemisphere concluded that spring has arrived 1.2 days earlier per decade since 1955. Later that spring, the Arbor Day Foundation released an online animation of the change in U.S. plant hardiness zones from 1990-2006, showing that every zone had moved northward. Plants like the southern magnolia, which once ranged only up to Virginia, were now able to grow into Ohio. But the northward shift of warmer temperatures appears to be bringing unwanted invaders, as well. "Kudzu, for example, is starting to crowd out native plants as far north as Columbus, OH, and there were people who thought they'd never see it here, because most scientists had believed Ohio winters too cold for it to survive," said OSU doctoral student Kellen Calinger. Other invasive plant species like garlic mustard are already here and thriving, in part due to warmer temperatures, Calinger said. "Not to mention how poison ivy is gaining an advantage because of warmer average temperatures. Entomology Professor Donald Hermes, at Ohio State University, still questions whether some changes, such as the buckeye tree allegedly moving north out of Ohio into Michigan, or the armadillo moving northward into southern Ohio, are just part of the natural migration of those species, and not necessarily part of climate change. "[But]... it's just ludicrous to argue that the world is not warming," Herms said. "You don't need thermometers when the physical evidence is overwhelming in the

natural world. Butterflies, plants, insects and animals have been responding to changes all along; only human beings question whether it's really going on." (*Excerpted from 'Ohio's plants and insects adapting to climate change in unexpected ways', by Michael Scott, in The Plain Dealer May 26, 2011.* )

**Python Taking A Toll On Florida Birds.** Everglades National Park in Florida is home to hundreds of species of native wildlife. It has also become the well-established home of the non-native Burmese python (*Python molurus bivittatus*), native to Southeast Asia. Now for the first time, scientists have conducted a detailed analysis of the avian component of the python's diet, and the negative impact the snakes may have on Florida's native birds. The pythons were first recorded in the Everglades in 1979, and thought to be escaped or discarded pets. There is now an estimated breeding population in Florida in the tens of thousands. As researchers investigate the impact of this snake in the Everglades, scientists from the Smithsonian Institution, South Florida Natural Resources Center and the University of Florida examined the snake's predation of the area's birds. They found that birds accounted for 25 percent of the python's diet in the Everglades. "These pythons are particularly hazardous to native bird populations in North America, because the birds didn't evolve with this large reptile as a predator," said Carla Dove, ornithologist at the Smithsonian's Feather Identification Lab in the National Museum of Natural History. "Conversely, the python is able to thrive here partly because it has no natural predator to keep its numbers in check". Between 2003 and 2008, scientists collected 343 Burmese pythons in Everglades National Park as part of their study. Eighty-five of these snakes had bird remains in their intestinal tract. From these remains, the team identified 25 species of birds, reflecting a wide variety of species, from the 5-inch-long house wren to the 4-foot-long great blue heron. Four of the species identified (snowy egret, little blue heron, white ibis and limpkin) are listed as species of special concern" by the Florida Fish and Wildlife Conservation Commission. The team also identified the remains of a wood stork, which is a federally endangered species. Dove said. "The python's high reproductive rate, longevity, ability to consume large prey and consumption of bird species are causes for serious conservation and control measures." The team's findings are published in the scientific journal *BioOne*, March 2011. For the whole paper, see: Carla J. Dove, Ray W. Snow, Michael R. Rochford, and Frank J. Mazzotti. Birds Consumed by the Invasive Burmese Python (*Python molurus bivittatus*) in Everglades National Park, Florida, USA. *The Wilson Journal of Ornithology*, 2011; 123 (1): 126 (*Excerpted from 'Non-Native Snakes Are Taking a Toll on Native Birds in Florida, Scientists Find', in ScienceDaily, March. 13, 2011.*)

**Another Python Picture.** Remember the picture of the "exploded python" a few years back, when the python tried to swallow an alligator, and both died? (Below, for those of you who missed it.) Well here's another one where the python apparently won; its ability to stretch is amazing! (*Hard to say what this one swallowed, but is there anyone still out there who doubts the danger these snakes can be to wildlife –or even humans?*)



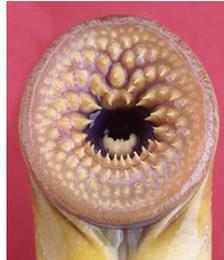
**Economic Value of Bats Quantified.** Since 2006, more than a million bats have died due to a fungal disease called White-Nose Syndrome (WNS) (See previous *Nutshells*). . At the same time, several migratory tree-dwelling species are being killed in unprecedented numbers by wind turbines, and scientists estimate that by 2020, wind turbines will have killed 33,000 to 111,000 bats annually, in the Mid-Atlantic Highlands alone. Some species such as the little brown bat (*Myotis lucifugus*) are likely to go extinct in parts of North America.

"Without bats, crop yields are affected, and pesticide applications increase. Even if our estimates were quartered, they clearly show how bats have enormous potential to influence the economics of agriculture and forestry," said Gary McCracken at the University of Tennessee.

McCracken and colleagues analyzed the economic impact on agriculture of the loss of bats in North America, and found it to be roughly \$22.9 billion a year, with extremes ranging as low as \$3.7 and as high as \$53 billion a year. According to the researchers, a single colony of 150 big brown bats in Indiana will eat nearly 1.3 million insects a year. McCracken's findings are published in the April edition of *Science*. "These estimates include the reduced costs of pesticide applications that are not needed to suppress the insects consumed by bats. However, they do not include the downstream impacts of pesticides on humans, domestic and wild animals and our environment," said McCracken. The disease has quickly spread from Canada to Tennessee, Missouri and Oklahoma, and actions to slow or stop it have proven unsuccessful. Why migratory tree-dwelling species are drawn to the turbines remains a mystery. Due to the economic and ecological importance of bats, the researchers urge policy-makers to avoid a wait-and-see approach to the issue of widespread bat population declines. "Not acting is not an option because the life histories of these flying, nocturnal mammals [is] characterized by long generation times and low reproductive rates, [and] means that population recovery is unlikely for decades or even centuries, if at all," said McCracken. McCracken feels solutions will only be fueled in the next few years by increased awareness of the benefits of insectivorous bats among the public, policymakers and scientists. (*Excerpted from 'Economic Importance of Bats in the 'Billions a Year' Range', in ScienceDaily, March 31, 2011*)

*[Ed Comment: Bats are losing their habitat, and given the spreading fungus, having colonies more spread out might help mitigate effects of WNF and preserve some populations. Designs are now available for highway projects to incorporate relatively cheap "bat-friendly" features into highway bridge construction, which can provide additional colony habitat. Why don't more regulators suggest this when they are involved with environmental reviews of such projects?]*

**Lamprey Control Without Chemicals.** Sea lampreys (*Petromyzon marinus*) found their way into the Great Lakes in the 1940s, and every spring, sea lampreys migrate into Trail Creek, Michigan, to spawn. Trail Creek produces 30,000 to 40,000 sea lampreys every three to five years, and for years, chemicals have been released in Trail Creek to control their numbers. Lampreys attach themselves to popular Lake Michigan game fish such as perch, trout and salmon, and eventually kill them by sucking out their body fluids. Michigan City now has a plan to control the lampreys without adding chemicals to the water. A 4-foot-tall barrier wall will stretch across



Trail Creek as a dam to keep sea lampreys from reaching their spawning area, meaning there will be no offspring produced by their migration, said Brian Breidert, a Lake Michigan fisheries biologist with the Indiana DNR. Sea lampreys don't jump, so they won't be able to make it over the dam, but the barrier will be designed to allow game fish such as trout and salmon to jump over it to reach their spawning areas. No contracts have been awarded yet for the construction. It is projected to cost about \$300,000, and funded by the Great Lakes Fisheries Commission. The barrier is expected to start going up late spring or early summer, and be completed within two months. (*Excerpted from 'DNR to air plan against lampreys', by Stan Maddux, South Bend Tribune, April 8, 2011.*)

**Farallon Islands Rodent Elimination Project.** Islands are biodiversity storehouses, with 3 percent of the world's land mass but 20 percent of the bird, reptile and plant species. But ninety five percent of all bird extinctions, 90 percent of reptile extinctions, 69 percent of mammal extinctions, and 68 percent of plant extinctions have occurred on islands, and most of these extinctions were caused by rats and other non-native invasive species. Once invasive species are removed, island ecosystems and species usually recover with little additional intervention. The USFWS, Island Conservation, and Point Reyes Bird Observatory Conservation Science, have now begun a long-dreamed-of project to eliminate non-native mice on the South Farallon Islands, CA. They will restore the islands' habitat and, especially, make the islands safe for a swallow-sized seabird, the ashly storm-petrel. About half of the world's small population of storm-petrels live in the Farallones, but their numbers have declined by about 40 % in recent decades. Removing the mice is key to bringing them back.

Island Conservation is one of two world leaders in planning and successfully carrying out this valuable conservation strategy. Its record of eliminating rats and other non-native species on islands includes dozens of successes and zero failures. In 2008, Island Conservation, the USFWS and The Nature Conservancy eliminated rats on an Aleutian island 50 times the size of the Farallones. (See previous *nutshells*) This likely caused the unfortunate deaths of 41 bald eagles, but the Aleutian eagle population numbers about 2,500. The long-term benefit is that the rat-free island is once again prime breeding habitat for hundreds of thousands of birds of many species. Mortality in non-target species cannot always be avoided, but it is always anticipated, and every project builds in ways to minimize it. The Aleutian project was carried out at a time of year when conditions for humans were challenging but the risk to non-target species was minimal. In January, Island Conservation also eliminated rats from several islands in iconic Galapagos National Park. (See *article on page 26*, below.) The challenging goal: kill every rat, but no Galapagos hawks, one of the world's rarest raptors. The hawks risked indirect poisoning from eating poisoned rats. Three months later, all indications are that the project is a success on both counts. Island Conservation and the Raptor Center of the University of Minnesota, world leaders in veterinary work with hawks, protected the 20 hawks on the islands by capturing them before helicopters spread rat poison bait, and holding them in captivity for five weeks until the poison bait had degraded. (*Excerpted from 'Mice, poison and the Farallones', by Burr Heneman, 05/24/2011, in the Marin Independent Journal.*)

**USFS Research Vision.** An interesting invasive species research vision by the Forest Service is now available in a 138 page document, *A Dynamic Invasive Species Research Vision: Opportunities and Priorities 2009–29*, (United States Department of Agriculture Forest Service Research and Development Gen. Tech. Report WO-79, May 2010, Edited by Mary Ellen Dix and Kerry Britton.) See it at [<http://www.treesearch.fs.fed.us/pubs/35867>]. (*Thanks to Helmuth Rogg, ODA*)

**What's Wrong With Good Old American Crickets?** (*Almost verbatim from Dan Hilburn's blog, 'Cricket Crisis'*) Crickets are raised by the millions for feeding lizards, snakes, and other pets. In addition, these insects have played an important role in Chinese, Japanese, and Native American cultures as a symbol of good fortune, vitality, and prosperity. In the United States, the pet store species is the house cricket (*Acheta Domesticus*). It is not a native species, but it is not considered to be invasive, even though feral populations occur in the United States. In recent years, cricket producers have been struggling to control a virus, *Acheta domesticus* densovirus AdDNV, which is spreading through their colonies. The virus is thought to have originated from Europe. European cricket producers have switched to other species not susceptible to AdDNV. Now the American cricket industry is pressuring the US Department of Agriculture (USDA) to allow them to import the field cricket *Gryllus assimilis* from Europe. Another non-native species, the field cricket has already become established in Texas and Florida. Two other alternatives are also under consideration: rearing field-collected *G. assimilis* from the United States or importing resistant *A. domesticus* from Europe. The USDA is conducting a risk assessment, and the alternatives being considered are low risk to agriculture and Oregon's natural environment, but bringing in stock from overseas is almost certainly how the virus arrived in the United States in the first place. What the cricket industry should be doing is developing rearing techniques for a native species. What is wrong with good old American crickets?



This situation is similar to what happened with honey bees and bumble bees. Commercial sales of these species have been little regulated because they are not considered “pests.” It is easy to order live bees via the Internet and have them shipped almost anywhere in the world. The downside of this convenience is that we’re sharing our bee production problems. Movement of bees has spread bee diseases and mite pests across continents and around the world. For the most part, the beekeepers that benefit from the convenience are the same people that suffer the consequences. The same would be true for cricket producers. Should we care? Does it matter if cricket farmers shoot themselves in the foot by importing exotic crickets? It would matter if the diseases spread to native species. A couple of species of bumble bees that used to be common in the Northwest are now quite rare. Could it be that imported bumble bees brought a disease that spread to the wild? Some scientists think so, but there is no proof. This summer, the Oregon Department of Agriculture (ODA) will be conducting the first ever statewide pollinator survey, thanks to a grant from USDA. We need baseline data on pollinator distribution and abundance. Without it, a species could disappear without anyone even noticing. We probably should be doing something similar with our native crickets—and perhaps other species that aren’t charismatic megafauna, but are vital to the health of our agriculture industry and natural resources.” (*Lifted nearly verbatim from Dan Hilburn’s Blog. To comment, or read Dan’s other blogs, go to [www.oregoninvasivespecies.blogspot.com]* )

**New Article: Impact of freshwater fishes.** A new article on the impacts of non-native freshwater fishes is available at [[http://www.fish.washington.edu/research/oldenlab/pdf/2011/Fisheries\\_2011c\\_Inv.pdf](http://www.fish.washington.edu/research/oldenlab/pdf/2011/Fisheries_2011c_Inv.pdf)] (*Thanks to Stephen Phillips*)

## **[The Carp Saga Continues](#)**

**USFWS Final Rule On Bighead Carp.** On December 14, President Obama signed the Asian Carp Prevention and Control Act (Pub. L. 111–307), which amends the Lacey Act (18 U.S.C. 42), by adding the bighead carp (*Hypophthalmichthys nobilis*) to the list of injurious animals in 50 CFR16.13. The listing prohibits the importation of all forms of live bighead carp, including gametes, viable eggs, and hybrids, into the U.S. and prohibits interstate transportation of these between States, the District of Columbia, the Commonwealth of Puerto Rico, or any territory or possession of the U.S., except by permit for zoological, education, medical, or scientific purposes. The rule became effective March 22, 2011. The final rule and supporting documents are available at [<http://www.regulations.gov>] Docket No. cFWS–R3–FHC–2010–0094. The bighead joins several other carp species already on the list. In October 2002, the U.S. Fish and Wildlife Service received a petition to add bighead, silver carp (*Hypophthalmichthys molitrix*), and black carp (*Mylopharyngodon piceus*) to the list of injurious wildlife. The Service added silver and largescale silver carp to the list in a final rule on July 10, 2007 (72 FR 37459), and added black carp to this list by final rule on October 18, 2007 (72 FR 59019).

**Corps Turns On Third Electric Fish Barrier.** The U.S. Army Corps of Engineers has turned on a third electric fish barrier on the Chicago Sanitary and Ship Canal. The new barrier is a twin to an existing one that was turned on in 2009. That barrier has now been put on standby and is scheduled for maintenance in the next couple of months. The barriers, referred to as IIA and IIB, are significant upgrades to the Army Corps'

"demonstration" barrier just upstream that continues to operate as an extra line of defense to protect Lake Michigan from an Asian carp invasion. Construction of the newest barrier was funded largely by the American Recovery and Reinvestment Act. The new barriers are designed to operate at a maximum of 4 volts per inch to repel carp from migrating up the canal and into Lake Michigan, although the Army Corps is only operating the barriers at about half strength - a voltage not strong enough to repel small juvenile carp. The Army Corps says it is completing safety tests for operating the barrier at a higher voltage. The agency does not believe there are any juvenile carp in the area of the barrier at this time, but officials have said if they get new evidence that juveniles are in the area, they will turn up the voltage. (*Excerpted from 'Corps Turns on Third Electric Fish Barrier on Chicago Canal', by Dan Egan in JOOnline, April 7.*)

**New Carp-Fighting Tool: Water Guns.** The annual Asian carp hunt around Chicago has begun again in earnest. But this year, federal and state officials said they have taken their battle against the fish to a new level, employing a handful of novel tools and strategies to detect and dispel the carp. New efforts include an underwater carp camera, fine mesh nets intended to catch larvae, and a large water gun that creates a barrier by emitting sound waves underwater, said John Rogner, assistant director of the Illinois Department of Natural Resources. This spring marks the third year of carp monitoring on Chicago waterways. The focus on larvae and smaller fish follows a finding in March that the Chicago Sanitary and Ship Canal's electric-dispersal barriers were effective for large fish, defined as 5.4 inches or longer. (*From 'New season, new weapons in Asian carp battle', Chicago tribune, By Cynthia Dizikes, May 23*)

**New Bighead Carp Record Set.** Gene Swope, of Excelsior Springs MO, set a Missouri State fishing record on April 23. Swope was snagging for paddlefish at Lake of the Ozarks when he snagged a 106-pound bighead carp (*Hypophthalmichthys nobilis*). It took the combined strength of three anglers 35-minutes to wrestle the 4-foot, 8-inch fish into the boat. Fisheries Management Biologist Tory Mason verified the fish's weight on a scale at the Lawson Agri-Services, and it easily eclipsed Missouri's previous record of 80 pounds for a bighead carp caught through snagging or other "alternative methods." Snagging is a legal method for taking nongame fish in Missouri, but it is not a method allowed under the rules of the International Game Fish Association. Consequently, Swope's fish does not qualify as a world record, even though it outweighs the existing record by 16 pounds. According to Fisheries specialist Andrew Branson, bighead carp are not known to spawn successfully in lakes or ponds because they need current to suspend their eggs in the water during development. So he feels the fact that anglers are not catching any young bighead carp at Lake of the Ozarks is a good sign. (*Excerpted from KansasCity InfoZine 'Record 106-pound Missouri Bighead Carp', May 26, 2011 by Jim Low*)

**First Grass Carp Found In Wisconsin River.** Grass carp (*Ctenopharyngodon idella*), have been found in the Wisconsin River for the first time. The 40-pound, 40-inch-long grass carp was caught on April 27, about three-fourths of a mile downstream from the Prairie du Sac dam. It was paired with a similar- sized carp, but DNR



personnel on the boom-shocking operation could only get one of the two in the boat. Finding it for the first time in the Wisconsin River is a worry. "Grass carp are voracious plant eaters," said DNR biologist John Lyons. "Just a few of them could eat all the aquatic plants in a region, and once they are in an area, they are very hard to get out." Asian carp (bighead, silver, grass, and black carp) were first introduced into the United States in the 1970s, to help catfish farms in the South. They ate planktonic organisms in the water, and less plankton in the farms meant healthier and better tasting catfish. But the fish escaped from the farms during floods. The grass

carp is still sold legally in some states to fish farms and enterprises such as golf courses, to keep aquatic plants in check, in their ponds, but it is banned in Wisconsin. "Grass carp have been seen in the Mississippi River for about 30 years, usually one or two being caught every year," Lyons said. "But now we are seeing numbers in the tens and hundreds per year over the past three or four years." Lyons said he doesn't think the carp found here are breeders, since the ones sold have an extra chromosome to make them essentially sterile. (*Excerpted from 'Grass carp found in Wisconsin River for first time, DNR official says', by Bill Knovak, the Capital Times, May 2, 2011.*)

**Carp Entertainment.** For additional Asian carp entertainment, check out this video. The website says "This is not the most intense video of carp problems; but it is the most intense video in response to the fish that I have seen...by a lot!" (Gladiators would have loved it.) See the short video at [[http://switchboard.nrdc.org/blogs/jmogerman/asian\\_carp\\_have\\_spawned\\_water.html](http://switchboard.nrdc.org/blogs/jmogerman/asian_carp_have_spawned_water.html)] (*Thanks to Kevin Aitkin, USFWS*)

## [Around The World](#)

**Tree Resins Record Ancient Insect Invasions.** A University of Alberta-led research team has discovered that insects that bored into trees leave information contained in the tree resin and on their bark. Resin is produced in large quantities by a tree when it's under attack by insects. Normally, to assess if a tree is under an attack from boring insects, researchers have sometimes had to rip patches of bark from healthy trees. But now forestry workers looking for the telltale sign of insect borings in tree trunks have a far less invasive method: they can just examine the resin that collects in clumps on the tree trunk. An attack by boring beetles typically affects trees in two ways. The boring action damages the phloem layer just under the bark, which cuts off the passage of nutrients within the trunk, and beetles often introduce a fungus that spreads into the woody xylem tissue of the tree and starves the treetop of water. A side-effect of insect invasion and water stress is a reduction in the tree's ability to absorb carbon dioxide from the atmosphere. The research team, headed by UA paleontology graduate student Ryan McKellar, looked for subatomic-sized isotopic evidence that indicates water stress levels in trees as a result of an insect attack. The team discovered a common marker in carbon isotopes found in the resin of living trees under insect attack, and in the fossilized resin, or amber, produced by ancient trees as far back as the age of dinosaurs: they both contain elevated levels of carbon-13. McKellar's group also found evidence of boring beetles and the increased presence of carbon-13 within amber fossils dating back in the geological record to 90 million years ago. The locations are as geographically removed as present-day New Jersey and the Dominican Republic. From this finding, the researchers suggest that two of the world's major amber deposits may have been produced by insect attacks like mountain pine beetle that are seen in modern ecosystems. This discovery will help researchers understand the history of insect infestations. McKellar's research was published March 23 (2011). R. C. McKellar, et al. *Insect outbreaks produce distinctive carbon isotope signatures in defensive resins and fossiliferous ambers*. *Proceedings of the Royal Society B: Biological Sciences, 2011; DOI: 10.1098/rspb.2011.0276* (*Excerpted from 'Tree Resin Captures Key Evidence of Current and Ancient Insect Invasions', in ScienceDaily, March 23, 2011.*)

**Pacific Oysters In European Waters.** Pacific oysters (*Crassostrea gigas*), introduced to European waters in the 1970s, are growing in numbers in what researchers have characterized as a 'harmless invasion'. French oyster breeders introduced the Pacific oyster to the Bay of Biscay to diversify the region's species and strengthen the commercial oyster industry. Unlike some invasive species, researchers say, the Pacific oyster plays well with other species. On the German coast of the Wadden Sea, the Pacific oysters, bigger than the native blue mussels, have outnumbered the native species. However, "Curiously, this invasion has not provoked any major harmful effects," said biologist Christian Buschbaum of the Alfred Wegener Institute for Polar and Marine Research in Bremerhaven. "The local species accepted it. Although the oysters and mussels both feed on plankton, and now compete for it, the two species coexist well. The local mussel is a bit smaller than it was before the arrival (of the Pacific oysters), but, other than that, there have been no other negative

impacts," he said. The new arrivals also brought with them a species of algae that has become a source of food for *Haliichthys taeniophorus*, a fish from the seahorse family, considered threatened with extinction for many years (*Excerpted from 'Pacific Oysters Spread in European Waters', in Science News at UPI.com, April 4.*)

[*Ed. Comment: That algae should be interesting...let's see if they feel the same about it in another 20 years.*]

**First Worldwide Analysis of Invasive Plant Impacts.** In May, the journal *Ecology Letters* published a synthesis of the ecological impacts of invasive plants worldwide. This global analysis is based on more than one thousand studies that in total describe the impacts of 135 invasive plant species. The lead author, Dr. Montserrat Vilà, a professor at the Spanish Higher Research Council adds: "This assessment would have been impossible to achieve ten years ago, because the evidence was anecdotal; it has only been in the last decade that well-designed field studies have been conducted". Twenty-four impact types are considered. Alien plants can, for example, affect the activity of animal species feeding on them and even the microorganisms in the soil where they grow. The most extreme impacts affect the resident vegetation. In invaded sites, the abundance of native plants is reduced more than 40%, and species diversity decreases more than 50%. These changes can have tremendous implications for the functioning of ecosystems, such as alien nitrogen fixers doubling soil N pools. This study shows that by the time changes in nutrient cycling are detected, major impacts on the performance of plant populations have likely already occurred. It is important to notice that even within an impact type, the magnitude and directions of the effect, are not always the same; an alien species can decrease the growth of one native species but increase the growth of another. These differences might be due to differences in the traits of the invasive species, but they might also depend on how dominant they are, how long they have been present in the invaded ecosystem, and even on the invaded ecosystem type. All these are aspects require more research, and highlight that the impact of invasions is highly context-dependent. (*Excerpted from a release by Pensoft Publishers, a partner in the European STEP FP7 project.*) See a related press release on STEP at: [[http://www.eurekalert.org/pub\\_releases/2011-05/pp-mep051611.php](http://www.eurekalert.org/pub_releases/2011-05/pp-mep051611.php)] May 20, 2011.

**Invasive Wasp Tosses Its Competitors.** An invasive wasp species in New Zealand has been observed picking up native ants that compete for protein-rich food supplies, and flying them away from the resource. This interference tactic, employed by the common wasp (*Vespula vulgaris*), represents a novel behavior that could help researchers understand the negative impact that introduced species have on native populations. "We have never seen this before, where a flying competitor carries a non-flying competitor away," said lead author Julien Grangier, a biologist from Victoria University in Wellington, New Zealand. "This is a behavior aimed to physically prevent the competitor from accessing the disputed resource." While it is well documented that social insects such as ants and wasps use interference behaviors to secure food supplies, researchers say this is one of the first accounts of direct physical interference between members of these two groups. According to the study published in *Biology Letters* more than 60 interactions were observed in which individual wasps physically removed the competition, carrying the *Prolasius advenus* ant upwards of eight centimeters before dropping them down, relatively unharmed. "The human equivalent would be about half the length of a football field," said Grangier, adding that the behavior is quite effective. "In about 50% of the cases the ants don't go back to the food resource, suggesting they are quite disturbed and disoriented." Researchers set up 48 bait stations in the beech forests of South Island using tuna to simulate a protein-rich food source such as a dead insect carcass. These stations were then filmed to observe the competitive interactions of wasps and ants. While wasps tended to avoid confrontation in the majority of the observed situations, they sometimes initiated physical contact, using their size and flight advantage to access the food. The frequency and effectiveness of these interference behaviors were observed to increase when the number of ants at a food site was greater, Grangier said. (*Excerpted from 'Invasive wasps carry the competition away', by Myles Gough, March 31, 2011 in Cosmos Online.*)

**Saskatchewan Bans Selling And Owning Invasive Fish.** Northern snakeheads (*Channa argus*) are very aggressive and will compete with native fish for food, quickly dominating a lake. Officials say snakeheads also carry a disease that can spread to other freshwater fish, and there's no effective way to get rid of them.

Saskatchewan's Environment Ministry is now banning the import, possession and sale of all aquarium fish deemed to be aquatic invasive species, like the northern snakehead. Environment Minister Dustin Duncan said



there are regulations that deal with other aquatic invasive species, but the regulations historically have not applied to aquarium fish, as most of them are tropical fish that will not survive in Saskatchewan's climate. The ministry is asking the public not to purchase the northern snakehead, which has been found at some pet stores (!) in the province, as well as telling pet stores not to import or sell them. (*Excerpted from the Canadian Press, March 30, 2011*)

**Global Invasive Species Programme (GISP) Goes 'Dormant'**. Sarah Simons, the Executive Director of GISP announced that due to the aftermath of the global economic recession, despite their best efforts, the Secretariat of GISP would close down on 31<sup>st</sup> March 2011. The GISP Partnership effectively entered a dormant phase, pending clarification on future funding. "Following its launch in 1997, GISP became synonymous with the global struggle to prevent, eradicate and manage invasive species through its outstanding publications, widely-acclaimed training courses and through recognition as being the authoritative voice on invasive species policy by the Convention on Biological Diversity (CBD). Sadly, despite these accomplishments, GISP was unable to attract adequate investment from donors or new partners. Nonetheless, it is important to acknowledge the valuable roles that have been played by GISP's current partner organisations; CABI, The Nature Conservancy and the Secretariat of the CBD, who have continued to provide GISP with solid financial and strategic support during this challenging period." (*Excerpted from a GISP announcement from Sarah Simons*)

**Tsunamis: Another Way To Spread Invasives**. The manager of the IUCN Invasive Species Specialist Group in Auckland, Shyama Pagad, says there are concerns that the tsunami generated by the earthquake off Japan could have introduced pests to nearby small island states in the northern Pacific. She says that coastal vegetation, sea grass beds and other fauna are likely to have suffered extensive damage. She says they are encouraging thorough assessments on coasts in order to prevent any invasive species of flora or fauna taking root. "The disturbance caused could allow gaps for invasive species to grow because invasive species are more aggressive than native species and they are able to adapt to a wider range of habitats and climates and grow quicker than native species, which can be slow to recover." (*Excerpted from 'Invasives species expert concerned tsunami may have spread pests in the Pacific', News Radio, New Zealand Internat., March 21 2011*)

**Galapagos Rat Extermination**. Earlier this year, ten tons of 'cookies' laced with poison bait, which entice rats but repulse other wildlife such as sea lions, birds, marine iguanas and sea turtles, were dumped from a helicopter during two fly-overs in the Galapagos Islands. Black rats and Norway rats, which were introduced to the islands via pirates' ships in the 17th century, pose a significant threat to several of the unique Galapagos species. They eat the eggs and hatchlings of turtles and Galapagos giant tortoises, spread disease, and are even capable of climbing to feed on the eggs of tree-nesting birds. In all the rats have endangered some 50 bird species, including the Galapagos petrel, a seabird that breeds in excavated tunnels on high islands only in the Galapagos. The Galapagos National Park Service launched the "full-scale assault" against the rats with help from other organizations, including the Charles Darwin Foundation. Scientists who carried out the helicopter



drops say the operation went "extremely well" and monitors have already identified dead rats on the rocky terrain. Bait was dumped on the small islands of Rabida, Bartolome, Sombrero Chino, and Plaza Norte and five islets in the Galapagos, 600 miles off the coast of Ecuador. Scientists will continue to monitor the islands for two years before declaring them rat-free, but plans are already underway to extend the program to larger islands in the archipelago. Preparations are underway to remove black rats from Pinzon Island, where they have stopped the Galapagos giant tortoise from breeding in the wild for more than a century, by eating eggs and hatchlings. Conservationists have sustained the tortoise population by hatching eggs and rearing the young until they are large enough to be "rat-proof". "This project is the first of its kind in South America, and a significant step in the ongoing program to protect the native species of the Galapagos," said Victor Carrion, technical coordinator for the national park. *(Excerpted from 'Scientists in Galapagos Islands launch rat-bait drop to save unique species' by Robin Yapp, March 29, 2011, in the Telegraph.)*

**Great Britain's Rapid Screening Risk Assessment.** Great Britain's Invasive Non-Natives Species Framework Strategy for calls for a preventative approach to invasive species. But 1,867 non-native plant species (excluding marine species) were named in the 2005 audit of non-native species in England, and thousands more non-native plants are available to buy for use in gardens, landscaping and ponds. The current mechanism for identifying potentially invasive plants in Britain involves a detailed risk assessment process that is both time and resource intensive. This project devised and implemented a rapid screening process designed to be applicable to larger numbers of plants. Based on the Australian Weed Risk Assessment, the screening consists of twenty-two questions relating to current status in the UK, evidence of weed status outside of the UK, undesirable (invasive) traits, reproduction, dispersal mechanisms, and persistence attributes. The results can be used to provide a shortlist of species for which more detailed assessment is considered imperative and/or prudent and a much longer list for which such assessment is deemed currently unnecessary. A total of 599 non-native plants (368 freshwater and 231 terrestrial plants) of potential invasive concern were assessed. Of the freshwater plants assessed, 33 (9%) were ranked Critical, 26 (7%) were ranked Urgent, 60 (16%) were ranked Moderate Risk; and 249 (68%) were ranked Low Risk. Of the terrestrial plants assessed, 59 (25.5%) were ranked Critical, 29 (12.5%) were ranked Urgent, 12 (5%) were ranked Moderate Risk, and 131(57%) were ranked Low Risk. As it requires less than thirty minutes to assess each plant, it is hoped that this screening process can be further developed into a tool that proves useful to land managers and the horticultural trades, as well as policy makers. *(Excerpted from an article in Pitchcare Magazine, Issue 36, April-May 2011, by Alan Spedding.)*

**Chromosome Number And Pairing Linked To Plant Invasiveness.** Researchers have found the strongest evidence yet linking a plant's evolutionary survival to the unique way its DNA structures are paired. The finding could prove critical to both tackling invasive plants and protecting endangered species. The research by Maharaj Pandit, of Delhi University, and two scientists from the UK, shows that the number and pairing of chromosomes indicate a plant's likelihood to proliferate or die out. "We now have a genetic model that is more robust than what was [previously] available," Pandit said. The researchers found plants with a higher number of identical sets of chromosomes (ploidy) in their cells and a higher chromosome count are more likely to be invasive than others in their known as genus with low ploidy and chromosome numbers. The scientists caution that it is appropriate only to compare plants within a genus. Their research findings have been published in the latest edition of *Journal of Ecology*. The challenge before India now is to find the

genetic composition of flora found in India, because the chromosome number of over 50% of the Indian flora is not yet known, Pandit said. (*Excerpted from 'Researchers find out secret to Delhi Ridge's ravaging plant', by Charu Sudan Kasturi, in the New Delhi Hindustan Times, April 10, 2011.*)

## [Major Upcoming Invasive Meetings](#)

**July 11, 2011.** Pacific Northwest Invasive Plant Council (PNW-IPC) workshop, Everett, WA  
[<http://www.invasiveplantcontrol.com/pnw-workshop/agenda.html>]

**July 15, 2011.** Pacific Northwest Invasive Plant Council (PNW-IPC) workshop, Eugene OR.  
[<http://www.invasiveplantcontrol.com/pnw-workshop-eugene/agenda.html>]

**July 20, 2011.** PNWER Invasive Species Conference, Portland, OR. Space limited; Contact  
<megan.levy@pnwer.org>. [<http://www.pnwer.org/WorkingGroups/InvasiveSpecies.aspx>]

**August 23-25, 2011.** 7<sup>th</sup> International Conference on Marine Bio-invasions, Barcelona, Spain.  
[<http://www.icmb.info/>]

**September 4-7, 2011.** American Fisheries Society meeting, Seattle, WA [<http://afs2011.org/>]

**October 5-6, 2011.** 7th Meeting of the Continental Dialogue on Non-Native Forest Insects & Diseases,  
Boulder, CO. <dlee@resolv.org>, 202 965-6381) or <bweaver@resolv.org>, 202-965-6211)

**October 12-14 2011.** Annual meeting, Western Regional Panel on Aquatic Nuisance Species, Oakland, CA.  
[<http://www.fws.gov/answest/>]

**October 18-19, 2011.** Invasive Plant Council of British Columbia (IPCBC) 2011 Research Forum,  
“Responding to Invasive Species” [[facebook.com/BIOLIEF](http://facebook.com/BIOLIEF)]

**October 26-28, 2011.** The North American Lake Management Society (NALMS) 31st International  
Symposium -- “Diverse and Sustainable Lake Management.” Spokane, WA [<http://www.nalms.org/>]

**November 21-24, 2011:** BIOLIEF 2011 - 2nd World Conference on Biological Invasions and Ecosystem  
Functioning. Mar del Plata, Argentina. [<http://www.grieta.org.ar/biolief/>]

*Aquatic Invasive Species News In A Nutshell:* Published by the Pacific States Marine Fisheries Commission, 205 SE Spokane Street, Suite 100, Portland, Oregon 97202 phone (503) 595-3100 fax (503) 595-3232. [<http://www.psmfc.org/>]. Executive Editor: Joan Cabreza (Consultant to the PSMFC), email <[joancabreza@msn.com](mailto:joancabreza@msn.com)>. Managing Editor Stephen Phillips, ANS Program Manager, Pacific States Marine Fisheries Commission, email <[Stephen\\_phillips@psmfc.org](mailto:Stephen_phillips@psmfc.org)>