



INVASIVE PEST

news & notes

IN THIS ISSUE

- [Can Insects take the Heat?](#) p. 01
- [Mediterranean Oak Borer](#) p. 04
- [Invasive News Highlights](#) p. 05
- [Recent U.S. Border Interceptions](#) p. 06

New Media

[Plum Curculio Fact Sheet](#)

[Invasive Nuisance Pests Webinar](#)

Helpful Links

[USU Extension Invasive Species Website](#)

[Utah Plant Pest Diagnostic Lab](#)

[Utah Department of Agriculture and Food](#)

[Pest Tracker](#)

[Don't Pack a Pest](#)

[Don't Move Firewood](#)

Extension
UtahStateUniversity.



Cooperative Agricultural Pest Survey Program & Utah Pests Winter 2024



Biological Scientist Xikui Wei sorts through cherries collected from USDA's Agricultural Research Service experimental farm in Wapato, WA, for steam heat treatment efficacy on western cherry fruit fly and the treatment's impact on fruit quality. USDA APHIS

Can Insects take the Heat?

One of the most common ways that invasive species spread to new areas is through the transport of goods such as firewood, wood pallets, agricultural crops, and produce. Combating these insect hitchhikers can be very hard. Often these insects can be difficult to spot as they have excellent camouflage or are living within the product being transported. This also makes them difficult to treat as most pesticides cannot penetrate the middle of a log or a piece of fruit.

In the past, methyl bromide has been a main way of combating invasive pests. Methyl bromide is an odorless, colorless gas used as a fumigant to control a wide variety of pests in agricultural and shipping, including fungi, weeds, insects, nematodes, and rodents. It is estimated that before 1997, about 38 million

pounds of active ingredient of methyl bromide was used in the United States. It protected the quality of stored commodities and perishable goods and helped many importers meet the sanitary standards of the Food and Drug Administration (FDA).

In 1987, the Montreal Protocol was finalized. This global agreement to protect our earth's ozone layer included phasing out the production and consumption of ozone-depleting substances such as methyl bromide. Under the protocol, the United States and other countries have been prohibited from producing or importing methyl bromide for domestic use since 2004 with exemptions for emergency quarantine treatments. Since this time, alternatives for treating invasive pests have been a necessary focus of research efforts.

ABOUT CAPS

The Cooperative Agricultural Pest Survey (CAPS) program supports the U.S. Department of Agriculture's Animal and Plant Health Inspection Service's (USDA APHIS) mission to safeguard the nation's agricultural and environmental resources from harmful plant pests and diseases. The Utah CAPS Committee is comprised of experts from multiple state and federal agencies as listed below. Members meet once a year to discuss and plan ongoing and future priorities and strategies.

Utah Department of Agriculture and Food, lead

U.S. Department of Agriculture, Animal and Plant Health Inspection Service

Utah State University Extension

Utah Weed Supervisors Association

U.S. Forest Service

U.S. Homeland Security Customs and Border Protection

Utah Division of Forestry, Fire & State Lands



invasives.usu.edu

Thank You!

This publication was made possible through funding from the U.S. Department of Agriculture- Animal and Plant Health Inspection Service- Plant Protection and Quarantine, under cooperative agreement #AP23PPQFO000C373.



Can Insects take the Heat?, Continued

For many years, the best available methods for treating wood and other products was to use harmful chemicals or extreme heat, but each of these comes with its challenges. The chemicals can be dangerous to workers and the environment, and extreme heat can damage goods.

The emerald ash borer has destroyed millions of ash trees in the United States since its discovery in 2002 in Detroit. These ash trees are economically and ecologically important and strict sanitation procedures have been established to reduce the spread of emerald ash borer and other forest pests.

Current United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) treatment standards require ash firewood to be heated to a core temperature of 160 degrees Fahrenheit for a minimum of 75 minutes. However, this approach requires a large input of energy, time, and money.

In 2014, researchers at Virginia Tech began testing alternative heat treatment options that would allow for easier transportation of firewood outside of existing quarantine zones. They investigated the effectiveness of using a vacuum and steam treatment to kill insects within ash firewood. They tested ash firewood infested with emerald ash borer and the vacuum and steam method took less than half of the time and 25% less energy than the USDA's treatment standards. Upon inspection, all emerald ash borer larvae in the treated samples were dead, while the control (untreated) samples still contained live insect larvae.



Emerald ash borer adult feeding on an ash leaf. USDA Forest Service, www.bugwood.org.



Adult emerald ash borers have a copper-red or purple abdomen.

David Cappaert, Michigan State University, www.bugwood.org



Ash logs undergoing vacuum treatment to kill emerald ash borer larvae. U.S. Forest Service

Are you interested in learning how you can help in the battle against invasive honey bee pests in Utah?



Small hive beetle is an invasive pest of honey bee and bumble bee colonies and can have a significant impact on apiculture and wild bee populations. While native to Africa, small hive beetle has been found in the United States since 1996 and was confirmed in Utah in 2016 in Washington and Davis counties.

This webinar will focus on small hive beetle and other invasive species like tropilaelaps mites, the northern giant hornet, and varroa mites that also threaten honey bee colonies.

JOIN US:

📅 Thursday,

February 29

🕒 12-1 PM MDT

Register for the
webinar [HERE](#)



The USDA APHIS Plant Protection and Quarantine (PPQ) program has also been looking into the option of vacuum and steam for treating commodities. Biological Scientist Xikui Wei and his PPQ Science and Technology colleagues built upon their previous research to build a small-scale vacuum steam treatment system in early 2020. The team increased commodity testing, conducted treatment development trials within quarantine zones, and evaluated vacuum steam's potential as a treatment for certain fresh commodities. They conducted preliminary tests on three infested fruits: loquat, guava, and lychee infested with fruit flies and mites. The results showed no live pests and no impact on fruit quality after treatment.

Since then, the team has focused mainly on steam heat trials. Scientists Xikui Wei stated,

“Vacuum steam is effective and can be useful for certain durable commodities, such as logs, tiles, or grain, but we determined it may not be a practical treatment for large volumes of fresh produce. So far, our trials show that steam alone can be an effective treatment, especially for internal pests like fruit flies in citrus, mango, guava, apple, and cherry.”

In February of 2023, they teamed up with PPQ's Insect Management and Molecular Diagnostic Laboratory staff in south Texas to evaluate steam heat on citrus varieties and determine lethal heat temperatures for Mexican fruit fly. They also collaborated with USDA's Agricultural Research Service scientists in Florida to assess treated grapefruit's quality, including visual appearance, taste, smell, and marketability. In July, Wei and his team spent a week in Niagara County, New York, running tests on European cherry fruit fly. They also traveled to Washington state three times during fruit harvest seasons to evaluate treatment effects on fruit quality and the western cherry fruit fly and apple maggot.



Biological Science Laboratory Technician Luis Bradshaw conducts apple maggot treatment trials using the stainless-steel vacuum steam prototype. USDA AHPIS

After all of this research, scientists are optimistic that steam heat could eventually become an acceptable treatment for fresh commodities. Scaling these methods up for commercial use will require additional research and many challenges may be ahead. Wei stated that his ultimate goal is to establish generic steam heat treatment schedules that retain a commodity's integrity, such as apples, cherries, mangoes, oranges, grapefruit, etc., and completely eliminate the targeted pests including many invasive species.

- Kate Richardson, Invasive Species Specialist

Mediterranean Oak Borer (*Xyleborus monographus*)

The Mediterranean oak borer (MOB) is a tiny ambrosia beetle invasive to the United States. These wood-boring beetles are native to Europe, western Asia, and northern Africa, where they primarily attack oak species.

MOB was first detected in Oregon in 2018 as a single beetle in a trap. The first true infestations were confirmed in valley oaks in Napa County, California in late 2019, followed by additional counties in early 2020. Large populations of MOB have likely been present and killing trees since at least the early 2010s. In 2022, several more beetles were captured in traps in Oregon followed by the discovery of about 30 infested trees in Wilsonville in 2023.

Female MOB are about 3mm long or about the size of pencil lead. The male beetles are smaller and are rarely seen because of their life history. Ambrosia beetles do not feed directly on the wood of trees that they infest, but instead inoculate the wood with symbiotic fungi and other microbes. The beetles then essentially farm and eat this fungal growth. Most female beetles mate with their brothers inside of the host tree galleries, and females leave the tree already mated and ready to infest a new tree.

The fungi that these beetles carry like *Raffaelea montetyi* and *Fusarium solani* are plant pathogens, and clog the water-conducting tissues of the tree, causing wilt in susceptible trees. While few beetles may not cause noticeable damage, after a few years, growing populations infesting a tree will kill whole branches, large portions of the crown, and eventually the tree itself.

The major hosts of MOB are oak (*Quercus*) species including Oregon white oak, red oak, valley oak, and blue oak. In its native range, MOB is known to attack a wide array of trees including maple, walnut, beech, elm, and cherry though to date, they have not been reported doing so in the United States. Currently, it is unclear if these beetles can attack and kill a healthy tree, but they are certainly taking advantage of the many trees that are under stress due to recent drought and other factors. Native oaks are particularly susceptible to MOB and oak wilt disease because they do not have a natural resistance to the pathogen.

The Oregon Department of Agriculture, the Oregon Department of Forestry, and the California Department of Food and Agricultural are all working together to research this beetle. There are currently trapping efforts and testing of multiple management strategies. As there are currently no control options once a tree has been infested; prevention methods are being recommended. These include keeping trees healthy so they are better able to resist or tolerate MOB and preventing the spread of this invasive. The majority of ambrosia beetles like MOB are spread by moving firewood and other infested materials so burn it where you buy it and don't move firewood. Officials from both Oregon and California are asking that signs or symptoms of possible MOB infestations be reported so that they can continue to monitor the invasion.

-Kate Richardson, Invasive Species Specialist



Top: Adult MOB female compared to the size of pencil lead. Curtis Ewing, CAL Fire

Middle: Black fungal-stained galleries in valley oak in California. Bob Rabaglia, USFS

Bottom: MOB boring holes present in an oak branch. Bob Rabaglia, USFS

Invasive News Highlights

Spotted Lanternfly



Adult spotted lanternfly found in Davidson County, Tennessee.
Tennessee Department of Agriculture

Spotted lanternfly is an invasive planthopper native to China that was first detected in the U.S. in Pennsylvania in 2014. Although it isn't known to occur in Utah, it has spread to many states. Up until 2023, populations had been found in 14 states. Recently three more states have been added to this list.

On September 18, 2023 a live spotted lanternfly adult was reported in Springfield, Illinois. State and federal officials conducted a site visit where they found a moderately populated area of spotted lanternfly.

In early October, a homeowner in Gallatin County, Kentucky, noticed an adult spotted lanternfly on their property and worked with local extension agents to get identification. The Kentucky Office of the State Entomologist confirmed the infestation, though no other counties have thus far reported lanternflies.

Tennessee became the 16th state to detect Spotted lanternfly in late September of 2023. A vigilant citizen reported the sighting in Davidson County. The State Entomologist and Plant Certification Section staff are currently studying the insect samples, carrying out surveillance, and conducting outreach.

For an updated map on the report distribution of Spotted Lanternfly in the United States visit the [Cornell College of Agriculture and Life Science page](https://www.cornell.edu/college-of-agriculture-and-life-science/).

Yellow-Legged Hornet

In August of 2023, the Georgia Department of Agriculture announced the detection of the first living yellow-legged hornet in the United States. The detection occurred when a beekeeper near Savannah, Georgia reported an unusual wasp to the Georgia Department of Agriculture. A few weeks later, an expert team of scientists and pest control specialists safely eradicated a nest in Savannah. Since then, officials have found and eradicated a total of five nests.

This hornet is indigenous to Southeast Asia and is a social wasp that can construct large nests of up to 6,000 workers. If allowed to establish in the United States, it could threaten domestic and feral honey bees as well as native pollinators, disrupting pollination of crops. It may also endanger populations of native bees which have been facing severe decline.



Top: Yellow-legged Hornet. Gilles San Martin
Bottom: Employee Grayson Richardson holds yellow-legged hornet nest following treatment and removal.
Georgia Department of Agriculture

Quagga Mussel Update



Quagga mussels on an Idaho license plate.
Idaho State Department of Agriculture

Quagga mussels are freshwater mollusks, originally from Eurasia, that pose a significant threat to western aquatic ecosystems. They out-compete native mussel populations and disrupt fisheries, hydro-power operations, and municipal water utilities.

In September 2023, the Idaho State Department of Agriculture (ISDA) confirmed the presence of quagga mussels in the Snake River. Since then, officials have spent approximately \$3 million in efforts to kill the mussels. This unparalleled effort involved treating a 16-mile section of the Snake River near Twin Falls with a copper-based chemical hazardous to mussels. State officials airlifted boats into otherwise inaccessible portions of the river and some state employees even camped on river banks for days to aid in the efforts.

In two rounds of post-treatment surveys, staff did not find any mussels in the treated areas. However, it won't be clear if they eradicated them successfully until the spring. Quagga mussel reproduction decreases during the cold winter months making them difficult to detect when they're not releasing millions of larvae.

An unfortunate result of the copper treatment is that most fish in the area were killed, as expected. It is unclear how long it will take the river ecosystem to recover and stabilize after the treatments, but officials are prepared to monitor the situation and restock fish as necessary.

Recent U.S. Border Interceptions

- October 2023- An Egyptian locust was found during container inspections at a rail yard in Detroit, Michigan. The cargo was inbound from Italy where this locust is found. It is commonly found throughout Europe but is considered an invasive species and is not known to occur in the United States. If not intercepted, this locust could greatly damage Michigan's agriculture. It is a voracious leaf eater and specifically threatens grapevines and vegetable crops. This is believed to be only the third time this port has encountered this species of Egyptian locust.
- December 2023- Tennessee recently had its first-ever state report of a species of treehopper bugs (Membracidae). The examination of a shipment from Mexico revealed 2 living and 2 dead *Metcalfiella monogramma* adult treehoppers on *Persea* sp. leaves. The shipment also included 2.175 kg beef, 1.995 kg pork, and 0.45 kg fresh *Persea* sp. leaves. The genus *Persea* includes about 150 species of evergreen trees belonging to the laurel family, Lauraceae. The best known member of this genus is the avocado and the import of these plant leaves was prohibited. The shipment was originally put on hold to be inspected because there were various food items listed on the manifest. There

was no documentation accompanying the shipment at the time of the exam, and no entry had been filed. All prohibited items were destroyed by steam sterilization. Treehoppers produce honeydew, which can promote the growth of harmful fungi, such as sooty mold on plants. These insects had the potential to become a dangerous invasive in the United States.

- December 2023- A first-in-port pest was discovered in basil leaves at the Dallas/Fort Worth International Airport. The shipment of fresh herbs contained a live pest identified as *Euschistus rugifer*. This pest is a species of stink bug belonging to the true bug family Pentatomidae. This particular species is known to be extremely destructive to plants as it feeds on the juices of fruits and other parts of the plant. True to their stink bug name, they eject a foul odor secreted from pores in their thorax when they are disturbed. Several prior discoveries of this pest have taken place in the United States including at the San Francisco Airport in 2014 and Progreso, Texas in 2013, but this is the first detected at a Dallas port of entry. Many stink bugs are considered severe agricultural insects, because they can create large populations, feed on many host plants, and can be insecticide resistant.

- January 2021 - A pickup truck was referred for secondary agricultural examination at the Colombia-Solidarity Bridge, a port of entry into Laredo, Texas. The driver had declared hunting trophies including whitetail deer antler racks and hides which can harbor harmful pests. The inspection revealed a total of 21 ticks (2 live, 19 dead) within the hides. The hides were refused entry due to the tick discovery and were abandoned by the driver at the port. The importation of hunter-harvested Mexican whitetail deer trophies is regulated by USDA APHIS and U.S. Fish and Wildlife to prevent the spread of pests. The most concerning potential disease is Bovine Babesiosis, commonly known as Texas cattle fever. This pathogen is often spread by the tick species *Rhipicephalus* (formerly *Boophilus*) *annulatus* and *R. microplus* which are known by their common name cattle fever ticks. Mexican whitetail deer is known to be a host of these ticks which are often unnoticed or ignored by hunters who may not understand their potential threat. Cattle infected by Texas cattle fever experience anemia, fever, and enlargement of the spleen and liver. The mortality rate is often up to 90%. USDA estimates that left uncontrolled, Texas cattle fever could cost the livestock industry approximately \$1 billion annually.



Egyptian locust found at a railyard in Detroit, Michigan.

U.S. Customs and Border Protection



Metcalfiella monogramma treehopper bug found on *Persea* sp. leaves.

U.S. Customs and Border Protection



Euschistus rugifer stink bug, a severe agricultural pest.

U.S. Customs and Border Protection

REFERENCES AND ADDITIONAL READING

- Campbell, F. (2022, October 12). Mediterranean oak borer—Don't Move Firewood. Don't Move Firewood. https://www.dontmovefirewood.org/pest_pathogen/mediterranean-oak-borer/, https://www.dontmovefirewood.org/pest_pathogen/mediterranean-oak-borer/
- CBP Dallas Discovers Harmful Stinkbug | U.S. Customs and Border Protection. (2023, December 22). U.S. Customs and Border Protection. <https://www.cbp.gov/newsroom/local-media-release/cbp-dallas-discovers-harmful-stinkbug>
- CBP Intercepts Invasive Locust in Detroit | U.S. Customs and Border Protection. (2023, October 25). <https://www.cbp.gov/newsroom/local-media-release/cbp-intercepts-invasive-locust-detroit>
- CBP Memphis intercepts state's first-ever treehopper bugs | U.S. Customs and Border Protection. (2023, December 1). U.S. Customs and Border Protection. <https://www.cbp.gov/newsroom/local-media-release/cbp-memphis-intercepts-state-s-first-ever-treehopper-bugs>
- Commissioner Tyler Harper Announces Eradication of Three Additional Yellow-legged Hornets Nests, New Biweekly YLH Newsletter | Georgia Department of Agriculture. (2023, October 27). Georgia Department of Agriculture. <https://agr.georgia.gov/pr/commissioner-tyler-harper-announces-eradication-three-additional-yellow-legged-hornets-nests-new>
- Davis, L. (n.d.). Steam and vacuum wood treatment for pests more efficient, less costly. Retrieved January 26, 2024, from https://news.vt.edu/content/news_vt.edu/en/articles/2014/09/090914-cnre-firewoodtreatment.html
- Discovery of Yellow-Legged Hornet Confirmed in Georgia for the First Time | Georgia Department of Agriculture. (2023, August 15). Georgia Department of Agriculture. <https://agr.georgia.gov/pr/discovery-yellow-legged-hornet-confirmed-georgia-first-time>
- Fernandez, L. (2014, January 9). Crop-Eating Stinkbug Found on Basil at San Francisco Airport; 1st for Bay Area. NBC Bay Area. <https://www.nbcbayarea.com/news/local/crop-eating-stinkbug-found-on-basil-at-san-francisco-airport-1st-for-bay-area/75321/>
- Laredo CBP agriculture specialists intercept 21 ticks in trophy whitetail deer hides at Colombia-Solidarity Bridge | U.S. Customs and Border Protection. (2024, January 10). U.S. Customs and Border Protection. <https://www.cbp.gov/newsroom/local-media-release/laredo-cbp-agriculture-specialists-intercept-21-ticks-trophy-whitetail>
- Lucik, S. (n.d.-a). USDA APHIS | PPQ Assesses Vacuum Steam Treatments for Fresh Fruits and Vegetables. Retrieved January 26, 2024, from <https://www.aphis.usda.gov/aphis/ourfocus/planthealth/ppq-program-overview/plant-protection-today/articles/vacuum-steam>
- Lucik, S. (n.d.-b). USDA APHIS | USDA Scientists Study Steam Heat as a Potential Treatment for Fresh Commodities. Retrieved January 26, 2024, from <https://www.aphis.usda.gov/aphis/ourfocus/planthealth/ppq-program-overview/plant-protection-today/articles/steam-heat-treatment-fresh-commodities>
- Osteen, C. (n.d.). USDA ERS - Methyl Bromide Phaseout Proceeds. Retrieved January 26, 2024, from <https://www.ers.usda.gov/amber-waves/2003/april/methyl-bromide-phaseout-proceeds/>
- Parent, E., Spears, L., & Davis, R. S. (n.d.). Emerald Ash Borer. Utah State University Fact Sheet. Retrieved January 26, 2024, from <https://extension.usu.edu/pests/research/emerald-ash-borer>
- Ripley, K., & Williams, W. (2023). Forest Facts: Mediterranean Oak Borer *Xyleborus monographus* (Fabr.). Oregon Department of Agriculture, Oregon Department of Forestry.
- Spears, L., & Mull, A. (n.d.). Spotted Lanternfly. Utah State University Fact Sheet. Retrieved January 5, 2024, from <https://extension.usu.edu/pests/research/spotted-lanternfly>
- Spotted Lanternfly Detected in Middle Tennessee. (2023, September 28). Tennessee Department of Agriculture. <https://www.tn.gov/agriculture/news/2023/9/28/spotted-lanternfly-detected-in-middle-tennessee.html>
- SPOTTED LANTERNFLY IDENTIFIED IN ILLINOIS. (2023, September 26). Illinois.Gov. <https://dnr.illinois.gov/press-release.27063.html>
- Spotted Lanternfly Reported Distribution Map | CALS. (n.d.). New York State Integrated Pest Management. Retrieved January 5, 2024, from <https://cals.cornell.edu/new-york-state-integrated-pest-management/outreach-education/whats-bugging-you/spotted-lanternfly/spotted-lanternfly-reported-distribution-map>
- The Montreal Protocol on Substances That Deplete the Ozone Layer. (n.d.). United States Department of State. Retrieved January 26, 2024, from <https://www.state.gov/key-topics-office-of-environmental-quality-and-transboundary-issues/the-montreal-protocol-on-substances-that-deplete-the-ozone-layer/>
- US EPA, O. (2015, July 23). Methyl Bromide [Other Policies and Guidance]. <https://www.epa.gov/ods-phaseout/methyl-bromide>
- USDA APHIS | Spotted Lanternfly. (n.d.). Retrieved January 5, 2024, from <https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/the-threat/spotted-lanternfly/spotted-lanternfly>
- USDA APHIS | Yellow-Legged Hornet. (n.d.). Retrieved January 5, 2024, from <https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/honey-bees/yellow-legged-hornet>
- Wanner, D. (n.d.). Virginia Tech Demonstrates New Method to Treat Ash Firewood | USDA. Retrieved January 26, 2024, from <https://www.usda.gov/media/blog/2014/08/04/virginia-tech-demonstrates-new-method-treat-ash-firewood>
- Wilson, B. (2023, November 4). Spotted Lanternfly now confirmed in Kentucky | Community | somerset-kentucky.com. Commonwealth Journal. https://www.somerset-kentucky.com/community/spotted-lanternfly-now-confirmed-in-kentucky/article_886452cc-7a61-11ee-ab1d-47b01cb1adaa.html

Thank you to our partners.



In its programs and activities, including in admissions and employment, Utah State University does not discriminate or tolerate discrimination, including harassment, based on race, color, religion, sex, national origin, age, genetic information, sexual orientation, gender identity or expression, disability, status as a protected veteran, or any other status protected by University policy, Title IX, or any other federal, state, or local law. Utah State University is an equal opportunity employer and does not discriminate or tolerate discrimination including harassment in employment including in hiring, promotion, transfer, or termination based on race, color, religion, sex, national origin, age, genetic information, sexual orientation, gender identity or expression, disability, status as a protected veteran, or any other status protected by University policy or any other federal, state, or local law. Utah State University does not discriminate in its housing offerings and will treat all persons fairly and equally without regard to race, color, religion, sex, familial status, disability, national origin, source of income, sexual orientation, or gender identity. Additionally, the University endeavors to provide reasonable accommodations when necessary and to ensure equal access to qualified persons with disabilities. The following office has been designated to handle inquiries regarding the application of Title IX and its implementing regulations and/or USU's non-discrimination policies: The Office of Equity in Distance Education, Room 400, Logan, Utah, titelx@usu.edu, 435-797-1266. For further information regarding non-discrimination, please visit equity.usu.edu, or contact: U.S. Department of Education, Office of Assistant Secretary for Civil Rights, 800-421-3481, ocr@ed.gov or U.S. Department of Education, Denver Regional Office, 303-844-5695 ocr.denver@ed.gov. Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Kenneth L. White, Vice President for Extension and Agriculture, Utah State University.

Editor: Marion Murray, IPM Specialist
Email: marion.murray@usu.edu