

Forest Health

2021 highlights

○ PACIFIC ISLANDS
○ MARCH 2022

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2021 Summary

- Detection, monitoring, and management of **Coconut rhinoceros beetles (CRB)** (*Oryctes rhinoceros*) continues on Guam and Rota (CNMI).
- Work to eradicate **little fire ant (LFA)** (*Wasmannia auropunctata*) is occurring on American Samoa, Yap (FSM), and Guam.
- Monitoring, management, and eradication of **invasive plant species** specific to each island continue on Yap and Kosrae (FSM); Saipan, and Rota (CNMI); and Tutuila (American Samoa).
- The University of Guam, Micronesia Conservation Trust and the U.S Forest Service initiated a partnership in 2021 to increase capacity of forestry professionals and programs in the Micronesian Islands.

Forest Resources

The US-affiliated Islands of the western Pacific span an area larger than the continental United States, with a total land mass of 965 square miles. The area includes the Territories of American Samoa and Guam, the states of Chuuk, Kosrae, Pohnpei, and Yap in the Federated States of Micronesia (FSM), the Republic of Palau, the

Republic of the Marshall Islands (RMI), and the Commonwealth of the Northern Mariana Islands (CNMI). Approximately 325,000 acres are forested.

Forests in the Pacific are host to a variety of insects and pathogens and are subject to natural and human-caused disturbances which adversely affect forest health. Forest health issues vary widely among islands, and most pest issues result from introductions via multiple pathways due to the increase in travel and trade throughout the Pacific.

Invasive plants remain one of the greatest forest health issues on the islands, most of which have active invasive plant survey and control programs. Invasive insect introductions are becoming more frequent, increasing the need for early detection and novel integrated pest management tools.

Coconut rhinoceros beetle, *Oryctes rhinoceros* (CRB) CNMI - Rota

An eradication program has been an ongoing in Rota following the initial CRB detection near West Dock in 2017. Additional infestations have been detected at Ga’gani (Figs. 2 and 3, page 2), Gaganen Hulo, Pona, Apanon, Gua’a, Papau, Talakhaya, Tweksberry Beach park and Okgok. Treatments include cutting down and burning dead coconut palm trees, spraying host material with cypermethrin insecticide, and using the cut material to set up CRB traps (Fig. 4, page 2). Over 1,700 CRB specimens in various life stages have been collected to date.

Multiple agencies, including Customs and Quarantine Biosecurity Program, US and local Fish & Wildlife, Department of Agriculture Forestry Division, Mayor’s Offices in Rota and Tinian, Special Assistance to the Military Affairs Office, USDA Forest Service, University of Guam, and the U.S. Department of Interior’s Office of Insular Affairs are collaborating to combat invasive species incursions in the CNMI. Collaboration with local landowners remains critical to detect and eradicate CRB. With continued support from the public, federal partners, and local governments, the Municipality of Rota is optimistic in slowing the spread and preventing CRB from reaching Tinian and Saipan.

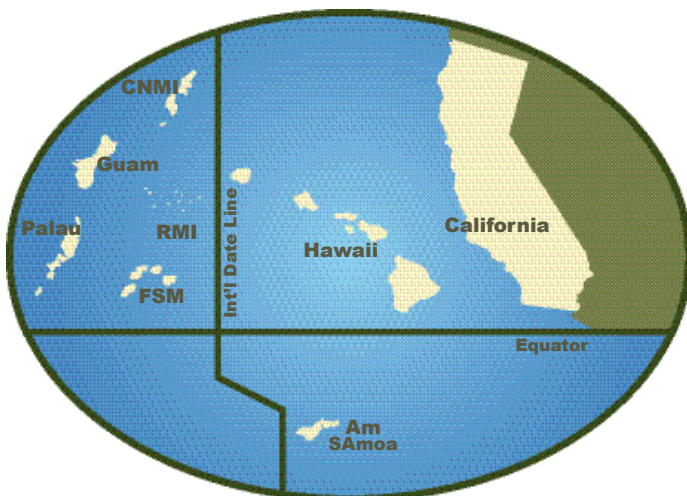


Figure 1. U.S. Forest Service, Region 5



Figure 2. Bruce Castro, CRB team technician, collecting CRB larvae at Ga'gani in September 2021. Photo credit: Mark Manglona, CNMI Department of Lands and Natural Resources, Rota



Figure 3. Vincent Mesngon, Danny Quitugua, Marnecia Barcinas and Colby Ogo (left to right) surveying for CRB life stages at Ga'gani, Rota. Photo Credit: Mark Manglona, CNMI Department of Lands and Natural Resources, Rota



Figure 4. Volunteers and staff from the CRB team setting up CRB traps by placing netting over cut coconut palm material. Photo Credit: Mark Manglona, CNMI Department of Lands and Natural Resources, Rota

Tinian - CNMI

The Center for Environmental Management of Military Lands (CEMML) staff, under the direction of the US Navy, conducted detection surveys for CRB damage in the Military Leased Areas of Tinian, CNMI. Survey results showed no signs of this invasive and destructive pest.

Guam

Under the direction of the US Navy, CEMML staff conducted extensive CRB trapping on Naval Base Guam and Andersen Air Force Base main base areas to detect breeding sites and prevent reproductive beetles from entering the military transportation network. In conjunction, twice-annual surveys for CRB breeding sites were conducted across all Joint Region Marianas military installations on Guam to help the Navy prioritize removal at these sites.



Figure 5. RECCO harmonic radar device suspended from an agricultural drone piloted by Glenn Dulla, Guam Department of Agriculture. Photo Credit: Aubrey Moore, University of Guam

Aubrey Moore, Assistant Professor of Entomology at University of Guam (UoG), is working with partners to evaluate harmonic radar for CRB breeding site detection (Fig. 5). The ability to find breeding sites is critical for successful CRB eradication and control. Dr. Moore and his team are evaluating hand-held harmonic radar equipment and tags manufactured by RECCO in Sweden. This technology was developed to rapidly locate avalanche victims wearing tags sown into their clothing. RECCO technology has been used to track other insects but had not yet been tried with CRB.



Figure 6. Fred Gofigan, Paul Cabana, and Tristan Lizama plant a Kaffo' (*Pandanus sp.*) tree at the Guam Arbor Day tree planting event at Liberty Park in Hagatna. Photo credit: Glenn Dulla, Guam Department of Agriculture

Guam's Department of Agriculture successfully competed for a 2021 USDA Forest Service and National Association of State Foresters, State Urban Forest Resilience (SUFR) grant. Objectives of the grant include maintaining CRB trapping, conducting palm damage surveys around ports of entry, planting native trees in areas where dying and dead palms were removed, conducting surveys for invasive ants, and conducting visual surveys and trapping for tree pests in high-risk areas. In addition, the US Department of the Interior's Office of Insular Affairs provided funding to University of Guam for research and related efforts to combat CRB.

Work conducted under the SUFR grant in 2021 included trapping for CRB at Guam International Airport Authority and Port of Authority of Guam, conducting health assessments of palms, and planting trees. Both the trap catch rate and total CRB adults trapped are progressively increasing. Coconut palm damage assessments were conducted by classifying tree crowns into 5 damage categories with a numerical value; 0=no damage, 1=<20% frond damage, 2=20-50% frond damage, 3=>50% frond damage, 4=>95% frond damage to dead. An assessment conducted in early 2021 showed the mean total damage assessed on trees at all areas around the port of entries more than doubled from the previous survey period. The most recent survey indicated that damage was less than observed in early 2021 and that damage of assessed coconut trees was significantly higher at the airport versus Port of Authority.

Replanting of native trees at the ports of entry where dead coconut palm or coconut rhinoceros beetle breeding sites were removed was also initiated in 2021. On Guam Arbor Day 2021, Department of Agriculture-Forestry and Soil Resources Division spearheaded a partners' tree planting event at Liberty Park in Hagatna (Figs. 6 and 7). Biosecurity personnel, along with other Forestry partners and other high-level government officials, assisted in planting 18 native trees at the park.

Little Fire Ant, *Wasmannia auropunctata* (LFA)

Guam

Little fire ant was detected in November 2011 at a green waste repository in Yigo, a northern village of Guam. Subsequent LFA surveys throughout Guam found it to be established at over 35 widely dispersed sites. The devastating effects of LFA on agriculture and forest ecosystems observed in other Pacific jurisdictions are being repeated on Guam and may potentially occur on other Micronesian islands.



Figure 7. Jessi Hannah Mariano and Guam Forestry aide Paul Cabana prepare a hole for a Binalu (*Pacific rosewood*) tree at the Guam Arbor Day tree planting event at Liberty Park in Hagatna. Photo credit: Glenn Dulla, Guam Department of Agriculture

Human transport of material has facilitated LFA's spread into and throughout Guam, including a Government of Guam-maintained conservation forest. The Forestry and Soil Resources Division of Guam Department of Agriculture manages the 502-acre Cotal Conservation Forest (CCF) in Santa Rita, a southern village of Guam. A 70-acre portion of the conservation area was infested with LFA at this project's inception. The conservation area supports a nursery stand of acacia trees to achieve a long-term reforestation project aimed at returning nutrients to the soil, stopping erosion into the adjacent water reservoir, replacing acacia trees with native flora such as the endangered *Serianthes nelsonii* and ultimately reintroducing native fauna such as the endangered bird, the Guam rail. The forest is directly bordered on the west by residential homes.

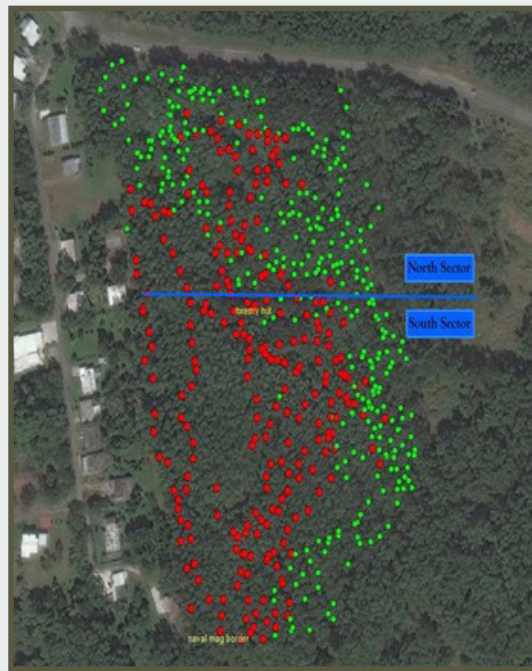


Figure 8. Delineation survey map depicting the presence of LFA (red dots) within the Cotal Conservation Forest in 2018. Negative points are shown in green. The blue line delineates the North Sector from the South Sector. Photo Credit: Glenn Dulla, Guam Department of Agriculture, with data collected by the University of Guam

A project was initiated to eradicate LFA from the CCF and establish and maintain a perimeter/buffer zone to prevent further infestation from surrounding areas. Proven LFA eradication and management techniques developed by the University of Hawaii-Hilo Ant Lab were utilized and adapted for aerial drone use, in addition to manual ground-based applications. Drones allowed for faster and safer treatment of technically challenging areas such as the forest canopy, dense jungle, or other inaccessible terrain. The initial delineation of LFA presence in the CCF was performed in 2018 by the University of Guam, showing 33.12% LFA infestation (or positive survey points) in the northern sector and 58.10% infestation in the southern sector (Fig. 8). The most current survey results indicate the manual and aerial drone treatments have resulted in removal of LFA from approximately 99% of the surveyed areas in the 70-acre portion of the CCF (Fig. 9).

In addition to specific LFA survey and treatment work at Cotal Conservation Forest, Guam's Department of Agriculture conducted surveys for invasive ants at Guam International Airport Authority and Port of Authority of Guam under the SUFR project. Both sugar and protein baits were used in the survey, and 870 individual ant identifications were completed. One or more of the species *Anoplolepis gracillipes* (crazy yellow ant), *Pheidole megacephala*, and LFA were identified at each property, and treatments will be initiated in 2022. These three ant species are on the IUCN list for top 100 Worst Invasive Alien Species in the World.

Under the direction of the US Navy, CEMML conducted little fire ant (LFA) surveys across more than 215 miles of roadsides, forest edges, and training areas across all Joint Region Marianas military installations on Guam. Six locations on Department of Defense property are currently being managed by CEMML staff to eradicate LFA infestations.



Figure 9. Delineation survey map depicting the presence of LFA (a single red dot) within the Cotal Conservation Forest in December 2021. Negative points are shown in green. Map Credit: Glenn Dulla, Guam Department of Agriculture



Figure 10. Trevor Boykin, Jessi Hannah Mariano, Louise Baza and Daryl Elliot stand at the entrance to the Cotal Conservation Forest where they conduct monthly surveys and treatment for little fire ants. Map Credit: Glenn Dulla, Guam Department of Agriculture

American Samoa

The little fire ant was first detected on American Samoa in 2018 in a residential area in the western part of Tutuila Island in the village of Tefata. Since that time, several new detections have been confirmed, and insecticide treatments have been ongoing. Treatments initiated during 2020 at two new detection sites were continued into 2021. After a year of treatments at those two sites, intensive surveys detected no LFA, so treatments have been suspended at those sites. Intensive surveys will be repeated at those sites over the next three years and control resumed if any LFA are detected.

During 2021, insecticidal gel and granular baits were applied to four new sites. No LFAs were detected at those four sites during the most recent assessments, but pending more intensive surveys, treatments will continue. Because LFAs nest in trees as well as on the ground and are known to have relatively short foraging ranges, treatment of trees is essential for eradication to succeed. Local managers are planning to purchase equipment that will enable applications to be conducted via drones to tree crowns, similar to what is occurring on Guam.

Yap - FSM

Since the detection of LFA on Yap in late August 2017, eradication efforts have been ongoing, along with public outreach and education to engage local communities in helping detect additional infested locations. The US Forest Service continues to provide funds to combat the infestations.

Tinian - CNMI

Under the direction of the US Navy, CEMML staff conducted LFA surveys at five locations in the Military Leased Areas of Tinian, CNMI. These surveys did not detect any LFA.

Invasive Plants

American Samoa

American Samoa continued work on invasive plants in 2021 by using USDA Forest Service funds to accomplish goals relating to their Forest Action Plan. The Forestry Program of American Samoa Community College, together with its student and adult interns, have been successfully controlling invasive trees (tamaligi (*Falcataria moluccana*), pulumamoe (*Castilla elastica*), and African tulip (*Spathodea campanulate*)) through the use of herbicides. The Forestry Program continued to control pulumamoe in the Maloata project site, treating a total of 1,516 seedlings, 1,329 saplings, and 463 trees in 2021. The Forestry Program identified more tamaligi growing wild in the northern areas of Maloata, Faga'alu, Malaeloa, and Aua and treated a total of 638 seedlings, 350 saplings, and 116 trees. They also accomplished treatment of African tulip, including 44 seedlings, 800 saplings, and 33 trees.

CNMI - Saipan

Velvet bean (*Mucuna pruriens*) is an invasive annual vine native to Africa and tropical Asia. It poses a high risk to native environments as it easily overgrows shrubs and small trees, and the seed is readily dispersed by birds. CNMI Forestry staff first discovered it in Marpi about 20 years ago. It has since spread throughout the northern portion of Saipan, where the vines are choking out native vegetation and impeding firefighting efforts. Hairs on the seed pods and spicules on the calyxes cause severe itching when touched. During 2021, surveys were conducted for *M. pruriens* on the north and south side of Saipan, with herbicide treatments occurring at over 100 locations.

CNMI - Rota

Monitoring and treatment of invasive plants and trees continued on the island of Rota in 2021. Staff monitored for the reoccurrence of African tulip, scarlet gourd (*Coccinia grandis*) and pink tecoma (*Tabebuia heterophylla*) at several locations. They mechanically removed 43 of the fast-growing invasive African tulip saplings and 258 pink tecoma seedlings/saplings near the Sinapalo-Airport highway. They also initiated



Figure 11. Scarlet gourd vines near total control of *Leucaena* and *Pithecellobium* canopies on an abandoned residential lot on the island of Rota in the latter part of 2021. Photo credit: James Manglona, CNMI Dept. Lands & Natural Resources

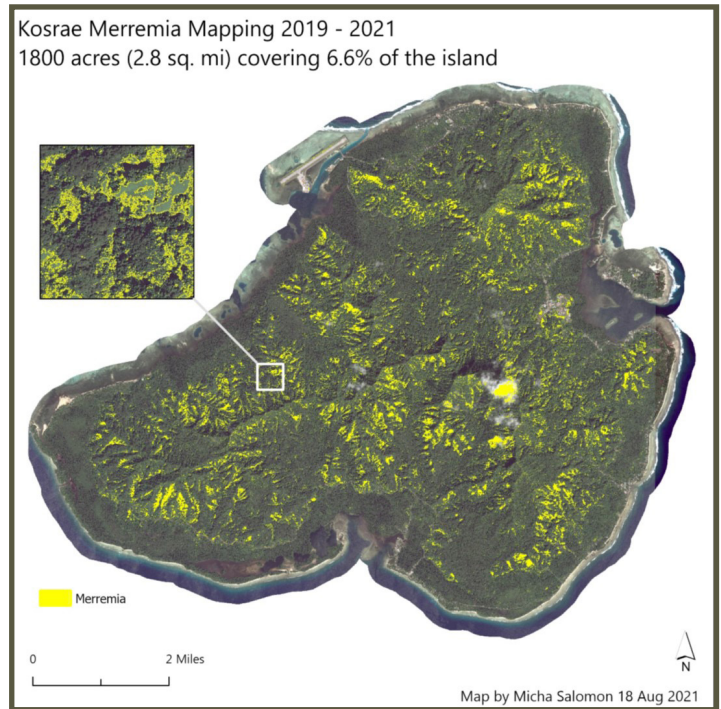
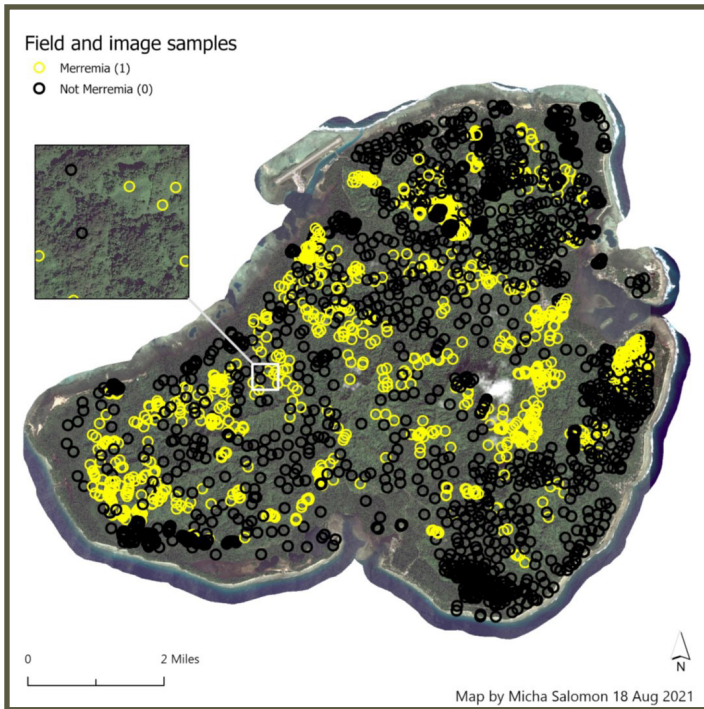


Figure 12. Locations of field samples taken from March to June, 2021. Photo credit: Micha Salomon, USFS

Figure 13. Merremia mapped from 2019 WorldView imagery, with validation samples. Photo credit: Micha Salomon, USFS

clearing of *Leucaena* stands engulfed by scarlet gourd vines at a residential lot in Songsong Village (Fig. 11, page 5). Several areas of Sabana and open grassy landscapes of the Talakhaya watershed were surveyed for invasive plants. The exotic *Buddleja asiatica* (dog tail or Asian butterfly bush) was discovered in sporadic locations in Sabana.

FSM - Kosrae

USFS R5 State & Private Forestry published an online report mapping the distribution of the invasive plant merremia (*Merremia* sp.): “Mapping Merremia in Kosrae Using a Random Forest Classifier (Salomon et al. 2021). The report can be found at: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd973202.pdf.

Merremia was mapped from a single 2019 source image. After sample points were used to train the model, positive model outputs of merremia were verified in the field where possible. Additional field samples were taken after the first iteration of the classification model and used to improve the model output. Field samples for this study were collected from March to June 2021 (Fig. 12). Model results indicate merremia was detected on a total of 1,800 acres (2.8 square miles), or 6.6% of the total area of the island (Fig. 13).

FSM - Yap

The invasive terrestrial program has made great progress in controlling invasive plants. They have eradicated populations of Imperata grass (*Imperata cylindrica*), one of the world’s most persistent, fastest-spreading, and difficult-to-control invasive species, and chain-of-love (*Antigonon leptopus*). In 2021, the island of Yap focused on control of two invasive plant species, African tulip and lantana shrub (*Lantana camara*). A total of 48 juvenile African tulip trees and 12 mature trees were treated, covering half an acre, across 5 sites. In addition, 462 sq ft of lantana were sprayed with herbicide, and 52 sq ft of shrub were pulled up by hand.

Under the 2008 Farm Bill, Congress tasked the states and territories with assessing the condition of trees and forests within their boundaries and developing strategies to: conserve working forest landscapes, protect forests from harm, and enhance public benefits from trees and forests. The resulting state Forest Action Plans (FAP) — completed in 2010, updated in 2015, and comprehensively revised in 2020-2021 — offer practical and comprehensive roadmaps for investing federal, state, local, and private resources where they can be most effective in achieving national conservation goals. You can view the Forest Action Plans here: <https://www.stateforesters.org/forest-action-plans/>.

Some cross-cutting priority issues and gaps related to forest health in the FAPs developed for the Islands included:

- » Biosecurity: Invasive Species, Pests, and Diseases – includes pest prevention, control, eradication, and biosecurity management.
- » Biodiversity: includes protection and propagation of native species and management of areas of important biodiversity.
- » Climate Change: includes impacts associated with increased frequency of extreme weather occurrences, rise in sea level, changes in precipitation patterns, rising air and ocean temperatures, increases in wildfire frequency, size and intensity, etc.
- » Capacity: includes a lack of local availability of people trained in forestry and management of forestry-related programs, the need for more education and training, the desire to have more on-site technical assistance, and the need for increased development and availability of GIS and other map-related needs.

Island partners, NGOs, and local and federal agencies will be working collaboratively over the next several years to address these priority issues and identified gaps, and to support and implement forest health improvement projects in priority areas.

Capacity Building

All 2020-2030 updates of Forest Action Plans for the islands highlighted capacity as a gap in their forestry programs. Turnover can be high, and finding and filling vacant positions with those skilled or qualified to run forestry programs, manage federal funds, successfully compete for funding opportunities, and maintain professional skills is quite difficult. To begin addressing this gap, the University of Guam, Micronesia Conservation Trust and the U.S Forest Service initiated a partnership in 2021 to increase capacity for forestry professionals and programs in the Micronesian Islands.

The initial goal is to develop a forestry-focused curriculum at UoG by bringing resources, people, and knowledge together to provide relevant content for the development of college-level classes that lead to a degree or certificate program in forestry, agroforestry, or forest conservation. The new program(s) will be developed using the Developing a Curriculum (DACUM) approach. People in local and regional government agencies, universities, and colleges, local and regional NGOs, U.S. Forest Service-funded island forestry programs, landscape industries, as well as Peace Corps volunteers and other natural resource stakeholders will be encouraged to enroll in the new programs.

CHECK OUT

University of Guam's **new forest health website**, developed by Dr. Ross Miller, Dr. Robert Bevacqua, and Ms. Jonae Sayama.

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<https://www.uog.edu/wptrc/index.php>

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Salomon, M., Greenberg, D., Betwin, T., and Meredith, A. Mapping Merremia in Kosrae Using a Random Forest Classifier. 2021. Vallejo, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Region. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fse-prd973202.pdf

Data Sources

The data sources used for this report include data gathered by US Forest Service, Pacific Southwest Region, Forest Health Protection staff, the Territorial Foresters of the US-affiliated islands (funded in part by Forest Service's Forest Health Programs), the University of Guam, and American Samoa Community College.

The USDA Forest Service's Forest Health Aerial Survey Program is not currently active on the Islands covered in this report.

For more information visit:

USDA Forest Service, Pacific Southwest Region - www.fs.usda.gov/main/r5/forest-grasslandhealth

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