

Ironwood (Casuarina equisetifolia) is native to Guam and its neighboring islands.

Ironwood Tree Decline on Guam

GUAM



Guam is the largest island in the region at 212 square miles

Guam was formed by the union of two volcanoes about 45 Millions years ago.

61% of the island is raised limestone and 35% volcanic uplands.

On Guam ironwood is considered primarily a strand tree species.



Ironwood is among the most common landscape tree species.



Ironwood is planted on farms for the mulching properties of its branchlets and as a barrier against the trade winds.



Guam's largest stands of ironwood trees are on its beaches.



It is one of Guam's common landscape trees.



In the past was planted for erosion control, ironwood is common among savannah vegetation of Guam's southern volcanic region.



80% are monecious 13% dioecious 7% sterile



10% female



3% male



10% female



3% male



Female cone with male flower attached to peduncle

Flowering types found on Guam



Decline of many of Guam's ironwood trees was first noticed in 2002.



Decline begins as a thinning of upper branches as seen on the tree on the left, this eventually leading to tree death.



Fig.3. Means of decline severity (DS) found at sites during Survey II (July to December 2009). Values in comparison to Survey I (October 2008 to June 2009) remained nearly the same (square), increased (up-triangle) or decreased (down-triangle).

Ironwood tree decline is wide spread and appears to be spreading slowly.



Decline generally radiates slowly from points of origin, which is typical of soilborne pathogens.



Outward symptoms include thinning of branchlets and death of branches.



A five-scale severity rating system was devised to quantify tree decline.



Decline reduces the amount of branchlets but not the size of their supporting branch indicating that dwarfism is not a symptom of decline.



Ganoderma australe is one of the causes of decline, its conks are often found at the base of trees in decline.

Location: N13 25.904 E144 48,197 CBH cm: 129 Decline Severity: 2

1v. Young conk of Ganoderma







The other cause of decline is the bacterium *Ralstonia solanacearum*

The bacterium may form drops of ooze in the sapwood of trucks or large branches.

Agdia specific Rs immunostrips can be used to detect Rs in saw dust.

Rs produces pink to off white clonies on TZC medium.









Declined trees always exhibit a gradient of wood discoloration.



Fungal growth often appear on cut sections of declined trees.



Trees in decline contain wetwood, which appears as a moist, dark stained area that radiates out from the center of the tree. *Ralstonia solanacearum* one of the causes of decline may appear as white drops of bacterial ooze, however, ooze is also formed by wetwood bacteria.







Declined



Declines



Healthy



Healthy

Evidence of decline can be found in cross-sections of large branches.



DS=3





DS = 1

In Conclusion

As of 2017, there is evidence that both *Ralstonia solanacearum* and *Ganoderma australe* species complex are pathogenic contributors to ironwood tree decline (IWTD), whereas the relationship of wetwood and associated endophytic bacteria may be useful in predicting IWTD their role in IWTD remains to be determined.