

POND APPLE (*ANNONA GLABRA*) - A NEW AND AGGRESSIVE WEED
OF WETLANDS IN TROPICAL QUEENSLAND

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Summary. Pond apple is a small semi-deciduous tropical American tree which is spreading aggressively throughout freshwater and brackish coastal wetlands in tropical Queensland. It is also established along an inland creek in rainforest. Coastal wetlands along both sides of the Timor Sea must also be at risk. Long distance transport of seeds is by ocean currents, and local spread primarily by flood waters. High seedling densities cause severe competition with native species, and the rapid replacement of native vegetation by stands of pond apple. Pond apple is very sensitive to fire. Accessible trees can be controlled by stem injection with triclopyr plus picloram or by glyphosate, and by basal bark spraying with triclopyr plus picloram.

DESCRIPTION

Pond apple (*Annona glabra* L.) is a semi-deciduous tree to 10 m tall. It originated in the swamplands of tropical North, Central and South America (2), and was possibly introduced into Queensland as a wetland rootstock for cultivated species of *Annona*.

Plants are usually only 3-6 m tall and single trunked, but multiple stemmed plants are also common since several seedlings may germinate together and new shoots often arise around the bases of established plants. The softwooded stems have a thin greyish bark with prominent lenticels, and when cut exhibit a 1-2 cm diameter pith surrounded by several indistinct growth rings for each year of its age. The wood and roots float readily whether fresh or dry, but when dead they rot away within a few years if they are exposed to damp conditions.

Several growth flushes occur each year, from terminal and axillary buds. Each flush consists of about eight leaves arranged alternately along the new stems, among which one or occasionally two axillary flower buds normally develop on well lit branches. The leaves are ovate, smooth edged, sharply pointed and a distinctive dull green in colour, with a characteristic scent when crushed.

The single flowers have two small sepals and are enclosed within three large green leathery outer petals and three similar creamy inner petals. The petals scarcely open at anthesis. The flowers have numerous stamens and separate carpels, and pollination is probably by small flying insects. After pollination the petals and stamens are shed, and the carpels fuse together to form a smooth oval to spherical compound fruit 5-8 cm long which changes from green to orange or yellow when ripe. Each fruit contains about a hundred large woody seeds.

At maturity the whole fruit falls from the tree, and both the fruits and individual seeds are capable of floating and remaining viable for long periods in fresh, brackish and sea water. The seeds have an innate dormancy of several months, after which they germinate in masses, grow quickly in height, and rapidly form monospecific stands to the exclusion of other species.

ECOLOGY

Pond apple originated in the freshwater and brackish swamplands of tropical North, Central and South America and coastal West Africa (2), where it behaves as a fresh and brackish water mangrove. It survives root immersion in brackish water every high tide, and also prolonged (but not permanent) shallow flooding with freshwater. Its fruits and seeds appear to be spread mainly by water, but local spread also occurs through ingestion and defecation by larger frugivores such as feral pigs and cassowaries.

Seedlings require moist to wet and well-lit conditions for germination and early growth, which they find on riverbanks, floodplains, marshes and areas previously covered by seasonal grasses, sedges, ferns (eg *Acrostichum* spp.) and tea trees (*Melaleuca* spp.), many of which have traditionally been seasonally burnt to retain them as fire disclimaxes.

Pond apple has become established along a permanent creek through rainforest inland from Cairns, where it occurs only on the moist soils very close to the creek and barely survives due to competition from taller trees. Rapid growth and reproduction occur in areas along the creek where the rainforest has been cleared.

DISTRIBUTION

Pond apple occurs sporadically in coastal and subcoastal Queensland between Ingham and Cooktown. Its greatest concentrations occur in the seasonally inundated floodplains of the Murray River, in the swamplands along Nind's Creek near Innisfail, and in the swamplands along the lower Russell River and its estuary. An unconfirmed collection of pond apple from Temple Bay just south of Cape York suggests that it may extend much further north than confirmed collections suggest.

Long distance transport appears to be by ocean currents; it is the only member of the genus to have spread naturally from Tropical America to the west coast of Tropical Africa. Floods carry fruits and seeds out to sea, where they appear to move with the northwards drift along the Queensland coast. Seedlings then appear along shorelines and in creeks and estuaries. High spring tides and floods then redistribute fruits and seeds throughout infested floodplains.

IMPACT

The dense and rapid growth of pond apple seedlings quickly shades out endemic grasses and sedges, removing the ground fuel component so that after a few years burning is no longer possible. The subsequent dense growth of pond apple also prevents germination of the small seeded tea trees, resulting in a tendency towards monospecific stands of the single exotic species.

Areas potentially at risk from pond apple include the extensive floodplains, estuaries and upper edges of the mangrove swamps of the rivers draining into the Coral Sea on the north-eastern side of Cape York Peninsula, and similar areas of both the Fly and other rivers on the southern side of Papua New Guinea and Irian Jaya and the estuaries and floodplains of the Top End of Northern Australia, including Kakadu National Park. Pond apple may also move southwards along the Queensland coast and inland onto the river systems of the Gulf of Carpentaria.

CONTROL

Pond apple is sensitive to fire at all stages of its growth, and where fire can be used this is the preferred method of control. Where sufficient dry fuel has accumulated in the ground layer a hot fire will kill both seedlings and isolated trees, and probably also any seed lying on the soil surface. Many of the areas invaded by pond apple were traditionally burnt during Aboriginal management, but recent changes in land use coupled with fragmentation and much reduced fire frequency have allowed pond apple to proliferate in them. Chemical or physical control of pond apple will usually allow the regeneration of native and grasses, after which the area could be burnt sufficiently often to prevent significant reestablishment of the pond apple.

Biological control appears to be the best long term strategy for the management of pond apple, since it is both widespread and also firmly established in almost inaccessible areas of high conservation value. Possible problems with this approach are that there are several species in the same and a closely related genus (*Rollinia*) which are grown commercially and in gardens for their fruits, and that there are about thirty endemic species of *Annonaceae* in the rainforests of north Queensland.

Pond apples are easily uprooted by mechanical means, but this method is expensive and unsuitable for most of the wetlands and conservation areas which the Plant has invaded.

The plant is readily susceptible to stem injection with glyphosate and with triclopyr plus picloram based herbicides (3); several other herbicides are being tested for its control by stem injection and basal bark (wet stem) application.

DISCUSSION

Pond apple is firmly established in wetlands throughout coastal and subcoastal tropical Queensland, and appears to threaten similar areas (many of high conservation value) around northern Australia and southern Papua New Guinea and Irian Jaya. If left uncontrolled the plant has severely damaging effects on the native vegetation of such areas, most of which are very difficult to access for control.

Pond apple is a potentially severe (category 1 - canopy dominating) (1) environmental weed throughout coastal northern Queensland, and requires coordinated control by a range of legislative, managerial (burning), chemical and possibly biological methods.

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