UF IFAS UNIVERSITY of FLORIDA

Assessment of Non-native Plants in Florida's Natural Areas

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	Piper auritum **(Veracruz pepper) ALL ZONES**	**Answer**	**Score**
1.01	Is the species highly domesticated?	n	0
1.02	Has the species become naturalised where grown?		
1.03	Does the species have weedy races?		
2.01	Species suited to Florida's USDA climate zones (0-low; 1-intermediate; 2-high) North Zone: suited to Zones 8, 9 Central Zone: suited to Zones 9, 10 South Zone: suited to Zone 10	2	
2.02	Quality of climate match data (0-low; 1-intermediate; 2-high)	2	
2.03	Broad climate suitability (environmental versatil+B8:B24ity)	y	1
2.04	Native or naturalized in habitats with periodic inundation North Zone: mean annual precipitation 50-70 inches Central Zone: mean annual precipitation 40-60 inches South Zone: mean annual precipitation 40-60 inches	y	1
2.05	Does the species have a history of repeated introductions outside its natural range?	y	
3.01	Naturalized beyond native range	y	2
3.02	Garden/amenity/disturbance weed	y	2
3.03	Weed of agriculture	unk	
3.04	Environmental weed	y	4
3.05	Congeneric weed	y	2
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	unk	0
4.03	Parasitic	n	0
4.04	Unpalatable to grazing animals	unk	-1
4.05	Toxic to animals	unk	0
4.06	Host for recognised pests and pathogens	unk	0
4.07	Causes allergies or is otherwise toxic to humans	n	0
4.08	Creates a fire hazard in natural ecosystems	unk	0
4.09	Is a shade tolerant plant at some stage of its life cycle	y	1
4.10	Grows on infertile soils (oligotrophic, limerock, or excessively draining soils). North & Central Zones: infertile soils; South Zone: shallow limerock or Histisols.	y	1
4.11	Climbing or smothering growth habit	n	0
4.12	Forms dense thickets	y	1
5.01	Aquatic	n	0

5.02	Grass	n	0
5.03	Nitrogen fixing woody plant	n	0
5.04	Geophyte	n	0
6.01	Evidence of substantial reproductive failure in native habitat	n	0
6.02	Produces viable seed	y	1
6.03	Hybridizes naturally	?	
6.04	Self-compatible or apomictic	y	1
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative propagation	y	1
6.07	Minimum generative time (years)	unk	-1
7.01	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y	1
7.02	Propagules dispersed intentionally by people	y	1
7.03	Propagules likely to disperse as a produce contaminant	unk	-1
7.04	Propagules adapted to wind dispersal	unk	-1
7.05	Propagules water dispersed	unk	-1
7.06	Propagules bird dispersed	y	1
7.07	Propagules dispersed by other animals (externally)	n	-1
7.08	Propagules dispersed by other animals (internally)	y	1
8.01	Prolific seed production	n	-1
8.02	Evidence that a persistent propagule bank is formed (>1 yr)	y	1
8.03	Well controlled by herbicides	y	-1
8.04	Tolerates, or benefits from, mutilation or cultivation	y	1
8.05	Effective natural enemies present in U.S.	?	
	Total Score	**16**	
	Implemented Pacific Second Screening	**NO**	
	Risk Assessment Results	**HIGH**	

section	# questions answered	satisfy minimum?
A	10	yes
B	7	yes
C	18	yes
total	35	yes

	Reference	Source data
1.01	1.PIER http://www.hear.org/pier/species/piper_auritum.htm	1. "No evidence of subspecific or varietal differeiniation" across range from "southern Mexico to northern Southern America (Columbia)"
1.02		Skip to question 2.10
1.03		Skip to question 2.10
2.01	1. Dave's Garden https://davesgarden.com/guides/pf/go/530/ 2. San Marcos Growers https://www.smgrowers.com/products/plants/plantdisplay.asp?plant_id=4113	1. Hardy in zones 8a through zone 11 2. "root hardy to around 10 degrees Farenheit so useful in USDA Zones 8-11"
2.02	1. Global Invasive Species Database http://issg.org/database/species/ecology.asp?si=332&fr=1&sts=&lang=EN	1. Native range of West Indies and tropical America; Known introduced range of Fiji, Papua New Guinea, Solomon Islands, Indonesia, Malaysia, Christmas Island, United States, Mexico, Puerto Rico, Virgin Islands, Panama, and Hawaii
2.03	1. Koppen-Geiger NOAA Dataset 2. GBIF https://www.gbif.org/species/3086352 3. Global Invasive Species Database http://issg.org/database/species/ecology.asp?si=332&fr=1&sts=&lang=EN	1. Grows in Köppen Geiger zones Aw/As, Af, Am, Cfa 2. GBIF map of distrubution for Piper auritum compared to Köppen Geiger map 3. Native range of West Indies and tropical America; Known introduced range of Fiji, Papua New Guinea, Solomon Islands, Indonesia, Malaysia, Christmas Island, United States, Mexico, Puerto Rico, Virgin Islands, Panama, and Hawaii
2.04	1. Climate Charts by World Climate Maps http://www.climate-charts.com/World-Climate-Maps.html#rain 2. GBIF https://www.gbif.org/species/3086352	1 & 2. Piper auritum is naturalized to areas with similar precipitation.
2.05	1. GRIN https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?id=312915 2. Global Invasive Species Database http://issg.org/database/species/ecology.asp?si=332&fr=1&sts=&lang=EN 3. Pest Management in the Pacific Programme http://issg.org/database/species/reference_files/sphtri/Wedelia%20report.pdf 4. Companion Plants http://companionplants.com/catalog/product_info.php?products_id=998 5. Trade Winds Fruit http://www.tradewindsfruit.com/content/root-beer-plant.htm 6. Dave's Garden https://davesgarden.com/guides/pf/go/530/	1. Naturalized in Cuba and Jamaica and cultivated in Cuba 2. Know introduced range: Fiji, Papua New Guinea, Solomon Islands, Indonesia, Malaysia, Christmas Island, United States, Mexico, Puerto Rico, Virgin Islands, Panama, Hawaii 3. There is an eradication project underway to remove it from the Federated State of Micronesia 4. Potted plants sold from Ohio, USA 5. Seeds sold from California, USA 6. Plants said to grow in Alabama, California, Florida, Georgia, Hawaii, Louisiana, Puerto Rico, South Carolina, and Texas
3.01	1. GRIN https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?id=312915 2. Global Invasive Species Database http://issg.org/database/species/ecology.asp?si=332&fr=1&sts=&lang=EN	1. Naturalized in Cuba and Jamaica and cultivated in Cuba 2. Know introduced range: Fiji, Papua New Guinea, Solomon Islands, Indonesia, Malaysia, Christmas Island, United States, Mexico, Puerto Rico, Virgin Islands, Panama, Hawaii
3.02	1. Greig & Mauseth 1991 http://www.jstor.org/stable/pdf/2996859.pdf?refreqid=excelsior%3Abe915c89d24dbe083a58390f986e9a0d 2. LA Times http://latimesblogs.latimes.com/home_blog/2011/11/hoja-santa.html 3. Randy's Tropical Plants http://buyraretropicalplants.com/spice/piper-auritum/	1. This study of dimorphic prop roots in Piper auritum found that wild plants scattered dervied from seeds were found "scattered in recently disurbed, sunny areas- a garden clearing for example." 2. "Even with its constant pruning, the perennial has taken over one section of the garden." 3. Recommended to keep Piper auritum in a container to prevent freezing, keep fertililized, and prevent spread.

3.03	1. Randall 2007 http://www.hear.org/gcw/species/piper_auritum/#AdobeAcrobatInfo	1. No evidence of Piper auritum as weed of agriculture.
3.04	1. HEAR http://www.hear.org/pier/piaurr.htm 2. CABI https://www.cabi.org/isc/datasheet/41359	1. "In natural and secondary forests their dense thickets will prevent the establishment of tree and shrub seedlings, impede the natural regeneration processes of the forest, out-compete native and endemic species, and threaten the natural ecological richness of the islands [Pohnpei]" 2. Piper auritum is "an invasive and noxious weed which competes with other plants and threatens native forests where is is introduced."
3.05	1. Guerrini et al. 2008 https://s3.amazonaws.com/academia.edu.documents/45379391/Bioactivities_of_Piper_aduncum_L._and_Pi20160505-16616-1lo5li8.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1522968698&Signature=6q2nt4AbzB95mpLZ0LNhJoCmVUI%3D&response-content-disposition=inline%3B%20filename%3DBioactivities_of_Piper_aduncum_L._and_Pi.pdf 2. Reddy & Raju 2002 https://www.researchgate.net/profile/Sudhakar_Reddy_C/publication/258876721_Additions_to_the_weed_flora_of_Andhra_Pradesh_India/links/54c4f2f30cf256ed5a970b2a.pdf	1. Piper aduncum often acts "as a weed in disturbed habitats." 2. Piper pellucidum listed as an "exotic weedy species" naturalized to Andhra Pradesh, India.
4.01	1. EFloras http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233500960 2. HEAR http://www.hear.org/pier/piaurr.htm	1. These features are not in the description of this species. 2. Piper auritum is a "soft-wooded, aromatic shrub or tree".
4.02	1. Siddiqui 2007 https://link.springer.com/article/10.1007%2Fs11738-007-0039-0	Allelopathic properties of Piper auritum are undocumented 1. But releated species, Piper nigrum, leaching solutions shown to negatively effect the germination, seedling growth, chlorophyll and chlorophyll supply-orientation.
4.03	1. Parasitic Plant Database http://www.omnisterra.com/bot/pp_home.cgi 2. U.S. National Fungus Collections https://nt.ars-grin.gov/fungaldatabases/	1. No evidence of associated parasites 2. No evidence of fungus host from literature, specimen, or nomenclature database
4.04	1. Slocum & Horvitz (2000) https://link.springer.com/content/pdf/10.1023/A:1009892821864.pdf 2. Joly 1981 http://www.jstor.org/stable/pdf/4254317.pdf?refreqid=excelsior:5cafe75531c33b2399000855c4880c9a	1. No evidence of seeds of any early-successional shrubs (including Piper auritum) in cattle or horse feces 2. Piper auritum clumps are often left on fields and pastures near houses for food and medicinal teas in Panama. It does not mention evidence of livestock eating the plants, but there is potential for it.
4.05	1. Joly 1981 http://www.jstor.org/stable/pdf/4254317.pdf?refreqid=excelsior:5cafe75531c33b2399000855c4880c9a	No evidence of animal grazing 1. Piper auritum clumps are often left on fields and pastures near houses for food and medicinal teas in Panama. It does not mention evidence of livestock or wild animals eating the plants, but there is potential for it.
4.06	1.PIER http://www.hear.org/pier/species/piper_auritum.htm 2. CABI https://www.cabi.org/isc/datasheet/41359	Unknown but potential exists 1. "Potential impacts on the sakau industry include growth reduction from competition and increased exposure to pests and pathogens." 2. "P. auritum may be a carrier of pests and pathrogens, such as cucumber mosaic virus (CMV)."

4.07	1. HEAR http://www.hear.org/pier/piaurr.htm 2. San Marcos Growers https://www.smgrowers.com/products/plants/plantdisplay.asp?plant_id=4113 3. LA Times http://latimesblogs.latimes.com/home_blog/2011/11/hoja-santa.html	1. "Piper auritum produces safroles, which gives the leaves and roots a strong anise aroma. While the effects of these compounds produced by P. auritum are not known, safroles produced by Sassafras album (Lauraceae) are known carcinogens. We find no record of P. auritum containing kava lactones." 2. "safrole [found in P. auritum] was banned in the US after studies in the 1960s found it to be a weak carcinogen" 3. "Piper auritum, is high in safrole, an essential oil that is used in the manufacture of the drug Ecstasy. One encyclopedia of herbs does not recommend using the plant for food, but the plant has been eaten for centuries from Mexico to Venezula."
4.08	1. Galindo-Gonzalez et al. (2000) http://www.jstor.org/stable/pdf/2641520.pdf 2. Furley & Newey 1979 http://www.jstor.org/stable/3038149?casa_token=orRcgLNYUL0AAAAA:XFccJ4MuRrIxnffoGPyeMWtb7msxktXhWAHpeGuWVcVDTjVg0PnxsByoqWc4a69q8w_6eNLRQohjoL6RSmhw8rTr7xko6wyLa9G4QUrYw8iSLNdN7dt0&seq=1#page_scan_tab_contents	1. At a study site in Mexico, where the bat and bird dispersal of Piper auritum was documented, it is noted that "fire is not used as a land-management tool" for this landscape. 2. Piper auritum is commonly found in slopes in Central America in limestone landscapes where fire is a common ecological disturbance.
4.09	1. Schultz & Matthews https://link.springer.com/article/10.1007%2Fs004420050164 2. Popma et al. 1988 http://www.jstor.org/stable/pdf/2559517.pdf?casa_token=-0J2a-PBGw8AAAAA:67WHVzxDid3zLu7OfKes4pCD1SkTiJwVTd3nLfMSEV8-A4PPzI0SY7wAB7vWZc-cY9MbdT1ddQuAtJt0Q96hPPQ32B5o36jks0NrLTLJweCGmc35V61r 3.Global Invasive Species Database http://issg.org/database/species/ecology.asp?si=332&fr=1&sts=&lang=EN 4.HEAR http://www.hear.org/pier/piaurr.htm	1. Grown behneath a shade cloth allowing 2% full sun and found that leaves "wilt rapidly when exposed to high light" and that "the dynamics of water relations in shade-grown P. auritum in response to sunflecks under different VPD and temperature indicate a highly adapted, yet fragile system whose primary constraint seems to be low air humidity" 2. Piper auritum is one of seven large gap pionner species in Neotropical rain forest which "require high light levels for their regeneration" 3."Requires high light levels" and "moderately intolerant of shade, as it requires at laes partial exposure to sunlight for it to reach a large size and flower" 4. open to partial shaded; never found indeep shaded sites, but rather in areas that have an open canopy or are fairly well illuminated
4.10	1. Furley & Newey 1979 http://www.jstor.org/stable/3038149?casa_token=orRcgLNYUL0AAAAA:XFccJ4MuRrIxnffoGPyeMWtb7msxktXhWAHpeGuWVcVDTjVg0PnxsByoqWc4a69q8w_6eNLRQohjoL6RSmhw8rTr7xko6wyLa9G4QUrYw8iSLNdN7dt0&seq=1#page_scan_tab_contents 2. HEAR http://www.hear.org/pier/piaurr.htm	1. P. auritum found along slopes of limestone hills in Belize, Central America. 2. Established in natural and secondary montane rain forests, disturbed areas, such as agricultural clearings, roadsides, and tree gardens
4.11	1. EFloras http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233500960 2. HEAR http://www.hear.org/pier/piaurr.htm	1. This species is not a vine or vining shrub, nor does it show evidence of supressing rosettes. 2. Piper auritum is a "soft-wooded, aromatic shrub or tree".
4.12	1. Global Invasive Species Database http://issg.org/database/species/ecology.asp?si=332&fr=1&sts=&lang=EN 2. CABI https://www.cabi.org/isc/datasheet/41359 3. LA Times http://latimesblogs.latimes.com/home_blog/2011/11/hoja-santa.html	1. This species is "an invader of disturbed areas, where it is able to form dense thickets." 2. "It grows very fast and vigorously, quickly forming large thickets and a dense canopy." 3. "Even with constant pruning, the perennial has taken over one section of the garden."
5.01	1. EFloras http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233500960 2. HEAR http://www.hear.org/pier/piaurr.htm	1. These features are not in the description of this species. 2. "In Costa Rica the species ranges from near sea level to about 1,5000 (rarely 2,000)m elevation in evergreen and partly decidiuous formations or in wet sites in the deciduous formations of Guanacaste."

5.02	1. Atlas of Florida Plants http://florida.plantatlas.usf.edu/Plant.aspx?id=1583 2. EFloras http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233500960	1. Piper auritum is in the family Piperaceae. 2. This species is a shrub or subshrub and rarely herbaceous.
5.03	1. EFloras http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233500960	1. This species is in the family Piperaceae and thus is not a nitrogen fixer.
5.04	1. HEAR http://www.hear.org/pier/piaurr.htm 2. EFloras http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233500960	1. "It sprouts prolifically from subsurface rhizomes" 2. This species is woody and rarely herbaceaous
6.01	1. Flora of Panama http://www.jstor.org/stable/pdf/2394448.pdf?refreqid=excelsior%3A9569a2bc4a5118bef39b7891db5aff75 2.CABI https://www.cabi.org/isc/datasheet/41359	1. No evidence of substantial reproductive failure. 2. "seeds will germinate whenever there are the right climatic conditions"
6.02	1. Quintana-Ascencio et al. 1996 http://www.jstor.org/stable/pdf/2389074.pdf?refreqid=excelsior:02577b259e153f97a8038b7e10003fee 2. Galindo-Gonzalez et al. (2000) http://www.jstor.org/stable/pdf/2641520.pdf 3. CABI https://www.cabi.org/isc/datasheet/41359	1. In seedbank study in Tropical Rain Forest, it was a generally abundant species found in all successional stands 2. Highest germination (96%) of seeds recovered from bat feces 3. "seeds will germinate whenever there are the right climatic conditions"
6.03	1. HEAR http://www.hear.org/pier/piaurr.htm	Possible, but insufficient evidence for a yes answer. 1. "The abundant flower production of P. auritum suggests that the opportunity exists for its hybridized with P. methysticum, potentially diluting its gene pool and masking its desirable qualities."
6.04	1. de Figueiedo & Sazima 2000 https://watermark.silverchair.com/850455.pdf?token=AQECAHi208BE49Ooan9kkhW_Ercy7Dm3ZL_9Cf3qfKAc485ysgAAAaIwggGeBgkqhkiG9w0BBwagggGPMIIBiwIBADCCAYQGCSqGSIb3DQEHATAeBglghkgBZQMEAS4wEQQMI8GIRvUXTnq_G_1PAgEQgIIBVTZFsDofnpcOnRSngnsehdJ4N8T0RoccJ2O4f_XLizoYonzF4Rn6nirJp0Ggxyxr690_nTkhNmtX9TkFbFwf-5Y6UckiVKhBp8TgIDmy2mHUzYDkBMCbuN1YHLJq7jS0_C8PretRGOYVSYJgVfD1WWpP3rjzpgmbGZH0MVViEG0i72T7q_aJkvc5gMPOL3pt3Td3NQfksguxx-pKkZb_32OLryHmYrq7ljzxtyNC5ui249NUPbgYZzCdLLvDkSvc_8-3MQenCkf6U6uTS_WoRuOkv7S5j4sCspp4TBKi8qKs4TD6hpQ1RzA4rtzTezpOmJaxNn33sO9DRZkyy6zT6Ue6hO5IhAFTB_CuJ-g41m-cZ45RP6Pj1tPW88fAMWi1h7gY7JT7x5dz6SBLGjmonjR2qLEbzk0dL4ph9cItPBPSxE5JJtVS71fRfTCQNScyvAa9FRv3 2. Chen et al. 2014 https://link.springer.com/chapter/10.1007/978-981-287-077-3_49 3. Semple 1974 http://www.jstor.org/stable/pdf/2395033.pdf?refreqid=excelsior%3A78316f38951f5b36c174f04bd2873398	1. Piper aduncum, P. mollicomum, P. regnelli, P. gaudichaudianum, and P. macedoi, and P. xylosteoides show "substantial degree of self-compatibility." On a whole the reproduction of species in Piperaceae are relevelatively understudied. 2. Piper nigrum prone to self-pollination. 3. Self-pollination in Piperaceae is very understudied, but likely to occur in many species becuase it has been documented in some species such as Piper nigrum.
6.05	1. Semple 1974 http://www.jstor.org/stable/pdf/2395033.pdf?refreqid=excelsior%3A195f4b669c51c8498cf3f0640bdeed92 2. HEAR http://www.hear.org/pier/piaurr.htm	1. Found that multiple insects visit many Piper species (including P. auritum) and are likely involved in pollination in Costa Rica. 2. Pendant infructescences observed in Pohnpei where P. auritum already invaded, which indicates that pollination is occuring outside of native range.

6.06	1. HEAR http://www.hear.org/pier/piaurr.htm 2. CABI https://www.cabi.org/isc/datasheet/41359	1. "Since it readily sprouts from rhizomes and forms dense thickets, hand pulling or grubbing would result in new sprouts unless care is taken to assure that even the smallest piece of rhizome is removed from the soil." 2. "It regrows from exposed roots and prolifically from subsurface rhizomes. P. auritum also roots easily from nodes."
6.07	1. CABI https://www.cabi.org/isc/datasheet/41359 2. Global Invasive Species Database http://issg.org/database/species/ecology.asp?si=332&fr=1&sts=&lang=EN 3. HEAR http://www.hear.org/pier/piaurr.htm	Unclear what the exact time requirment is 1. "P. auritum is a fast-growing, relatively short-lived plant." 2. "Sprouts and suckers are able to grow more than a metre in their first year. Individual stems can live from 2 to several years, but through sprouting they can live for much longer." 3. Recommended to monitor sites were removals have taken place every two years to check for new plants.
7.01	1. Global Invasive Species Database http://issg.org/database/species/ecology.asp?si=332&fr=1&sts=&lang=EN 2. Report on the Eradication of the Invasive Weed Pest Wedelia triolbata from Niue http://issg.org/database/species/reference_files/sphtri/Wedelia%20report.pdf	1. Introduced by translocation of machinery/equiptment and by seafreights (thought to have been introduced in Fiji in packing materials at Suva port) 2. Piper auritum was acidentatlly introduced to the Federated States of Micronesia because it was confused with kava (Piper methysticum).
7.02	1. Global Invasive Species Database http://issg.org/database/species/ecology.asp?si=332&fr=1&sts=&lang=EN 2.US GRIN https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?id=312915	1. Introduced for agriculture, ornamental purposes, forestry 2. Economic importance as a food and medicine
7.03	1. Report on the Eradication of the Invasive Weed Pest Wedelia triolbata from Niue http://issg.org/database/species/reference_files/sphtri/Wedelia%20report.pdf	No evidence as a produce contaminant, but can be confused for other horticultural plants. 1. Piper auritum was acidentatlly introduced to the Federated States of Micronesia because it was confused with kava (Piper methysticum).
7.04	1.Martin & Gregory 1962 https://dl.sciencesocieties.org/publications/cs/abstracts/2/4/CS0020040295 2. Semple 1974 http://www.jstor.org/stable/pdf/2395033.pdf?refreqid=excelsior%3A195f4b669c51c8498cf3f0640bdeed92	1.Piper amalago, P. scabrum, P. cirtifolium pollen is "eaily released by agitation of the spike. These species are proabaly wind pollinated." However, P. blattavum and P.nigrum are more "gluinous" and "pollen is likely distrbuted by gravity, but wind and rain may increase the efficiency of distribution." 2."Due to the globular nature of the pollen [in Piperaceae] it is not likely that wind or rain are significant pollination agents."
7.05	1. HEAR http://www.hear.org/pier/piaurr.htm	No evidence of water dispersal 1. "The ripe fruits are fleshy and green where birds, bats, and rodents assist in dispersal."
7.06	1.Loiselle, B.A (1990) https://link.springer.com/content/pdf/10.1007/BF00319792.pdf 2. Galindo-Gonzalez et al. (2000) http://www.jstor.org/stable/pdf/2641520.pdf	1. Piper auritum seeds found in bird droppings, found evidence for 1 whole swallowed fruit and 14 mandibulates fruit (more opportunities for dispersal). 2. Fifty-one Piper auritum seeds were found in seed traps after being dispersed by birds.
7.07	1. HEAR http://www.hear.org/pier/piaurr.htm 2. Galindo-Gonzalez et al. (2000) http://www.jstor.org/stable/pdf/2641520.pdf	No evidence of external dispersal 1. "The ripe fruits are fleshy and green where birds, bats, and rodents assist in dispersal." 2. Piper auritum seeds found in bat and bird feces.
7.08	1. Galindo-Gonzalez et al. (2000) http://www.jstor.org/stable/pdf/2641520.pdf 2. HEAR http://www.hear.org/pier/piaurr.htm	1. Piper auritum seeds one of five most abundant species found in bat feces and germinated with 96% success. 2. "The ripe fruits are fleshy and green where birds, bats, and rodents assist in dispersal."

8.01	1. EFloras http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233500960 2. PIER http://www.hear.org/pier/species/piper_auritum.htm 3. Riffle, R. L. 1998. The Tropical Look. An Encyclopedia of Dramatic Landscape Plants. Timber Press, Portland, OR.	Specific seed sets could not be found, often reproduces vegetatively 1. "Spikes 12-25cm. Fruits not seen. Flowering all year." 2. "The fruits are very small (less than 1mm) and tightly packed on the spike. The fruits of this species and many other pipers are known to be eaten by bats, which play the major role in seed dispersal." 3. As far as I know it never sets seed in the United States
8.02	1. CABI https://www.cabi.org/isc/datasheet/41359 2. Vazquez-Yanes & Orozco-Segovia https://www.annualreviews.org/doi/pdf/10.1146/annurev.es.24.110193.000441 3. Perez-Nasser & Yazquez-Yanes http://www.hear.org/Pier/wra/pacific/piper_auritum_htmlwra.htm	1. Eradication programs may take three to five years as seeds will germinate whenever the climatic conditions are right. 2. Seeds with a hard coat may survive burial for a considerable period. Some of the species found dormant,sometimes for more than a year, belong to the genera Acacia, Cecropia, Piper, and Trema, among others. 3. 1-20% of seeds of P. auritum were alive after 2 years
8.03	1. HEAR http://www.hear.org/pier/piaurr.htm 2. Global Invasive Species Database http://issg.org/database/species/ecology.asp?si=332&fr=1&sts=&lang=EN 3. CABI https://www.cabi.org/isc/datasheet/41359	1. "Systemic herbicides such as triclopyr, 2,4-D, or imazapyr likely would be translocated to growing points in the stems and roots and thereby kill the entire plant and greatly reduce re-sprouting." But since this will be in an area with high rainfall and high surface water, "application method should minimize the chance of herbicide wash-off and drift to non-target plants on surface water." 2. "Basal bark application of 20% Garlon 4, or cut stems at ground level and apply 50% Garlon 3A to the stump." 3. "Piper auritum should be cut about 15cm above ground level and sprayed immediately."
8.04	1. HEAR http://www.hear.org/pier/piaurr.htm 2. CABI https://www.cabi.org/isc/datasheet/41359 3. LA Times http://latimesblogs.latimes.com/home_blog/2011/11/hoja-santa.html	1. "Cutting or slashing would encourage basal sprouting. Unless cut tops are removed from the site and destroyed (incineration or drying), new plants could develop from layering of the cut shoots. If mechanical or hand control methods are used, caution should be used to assure that the infestation is not worsened by inadvertently promoting establishment of new plants." 2. Piper auritum is "hard to kill as new shoots grow from rhizomes, cut stems and cuttings left on the soil surface." 3. "Even with constant pruning, the perennial has taken over one section of the garden."
8.05	1. Peck 1998 http://www.jstor.org/stable/pdf/2388833.pdf 2. Encyclopedia of Life http://eol.org/pages/811/maps 3. The Dirt Doctor https://www.dirtdoctor.com/garden/Hoja-Santa_vq1807.htm 4. Randy's Tropical Plants	1. Adult froghoppers (Homoptera: Cercopidae) feed on the plant's main stem 2. Cercopidae found in Florida and throughout US 3. Minor chewing from insect pests seen in Dallas/Fort Worth, Texas 4. No pests in Florida noted for this species