

A CHECK-LIST ON THE INVASIVE SPECIES OF FORESTRY PLANTATIONS IN LOWER AMAZON, NW (1).

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RESUMO

Foi feito um levantamento das plantas invasoras ocorrentes durante os primeiros seis meses de plantações florestais em segunda e terceira rotação, na região do Jari, NW Pará. A lista resultante mostrou dois tipos de plantas invasoras: (1) **plantas daninhas propriamente ditas** - aquelas espécies cosmopolitas típicas de ambientes perturbados; e (2) **espécies pioneiras** - aquelas prováveis remanescentes da vegetação original da área estudada.

INTRODUCTION

In the present paper we equate the term "invasive plants" with "weeds" *lato sensu*, loosely defined as any plant growing where it is not wanted. In the scope of this paper we divide the invasive plants into two categories: i) the true "weeds" (ervas daninhas) - those cosmopolitan species of large distribution which tend to occur in man-made or ecologically disturbed environments such as plantations, pastures, gardens, abandoned fields and roadsides; ii) **pioneers or colonizing species** - those species that are natural to a region and tend to grow on forest gaps or in the early stages of the natural forest succession.

Plantation forests are defined here as forest crops or stands raised artificially either by seed sowing or by seedling planting. The plantation forestry in the region of the Jari river basin started in 1969 by the Jari Project, in areas previously covered by natural Amazon rain forest. Its aim was to produce bleached pulp to supply a worldly demand that had been forecasted to occur in 1985. The Jari Project has been considered the first large scale silviculture enterprise in the Amazon. Today it has some 120 thousand hectares of planted forests of the fast growing exotics **Gmelina arborea** Roxby, **Pinus caribaea** Morelet var. **hondurensis** Barr. & Golf. and **Eucalyptus** spp. For information on the fitogeography and vegetation of Jari a book is being released (Coutinho, unpublished), while the soil survey of the plantation areas was published by Companhia Florestal Monte Dourado (Corrêa et al. 1989).

A check-list on the invasive species of silvicultural areas is important for the following reasons: (1) - **Weed control**. In forestry plantations weeds compete with tree seedlings for light and nutrients and diminishes the rate of inicial growth of seedlings. There are reports of allelopathic effect of certain weeds such as a grass referred by the foresters as "pangola" (not collected or identified) which has as negative effect on the development of **Pinus** seedlings. Knowledge of the invasive species of an area under cultivation is very important when deciding the best method of weed control; (2) - **Disease control**. Many weeds are natural hosts of disease carrying viruses, bacteria and fungi as well as of insect pests (Sewell, 1981; Smith

¹ Financiada pela JARI - Companhia Florestal Monte Dourado.

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et al. 1989). - A good example is given by the bacteria *Pseudomonas sonanacearum* (Smith) Smith which is responsible for causing the wilt disease in many crops including the eucalypt (*Eucalyptus* spp.) (Smith et al. 1989). This bacteria is hosted by solanaceous plants as well as by several weeds of euphorbs and composites, as well as by the Amazon genus *Heliconia*; (3) - **Ecological information.** The importance of the fast reproducing "true weeds" for microadaptation and evolutionary studies have been pointed out by authors such as Baker (1974). The greatest ecological significance of the present paper has to do with the invasive pioneer species listed at Table 1. This information may be important for studies in natural forest regeneration and secondary succession.

MATERIALS AND METHODS

The work consisted of collecting and recording the invasive plant species found in sampling plots of 100 x 100 m placed in 16 different areas recently planted with tree seedlings. After collecting on the first three areas the check-list of the weeds was almost complete and allowed the checking for the presence or absence of the species in each of the remaining plots. Voucher materials were deposited in the JARI herbarium, Monte Dourado and duplicates were sent to the MG and INPA herbaria. The species of Asteraceae (Compositae) were also sent to the RB herbarium.

Although the major objective was to make a check-list of the invasives that occur in the areas of plantation forestry, an estimation of their relative frequency was made based on their presence or absence in the sixteen areas surveyed. The species that occurred in less than three areas were considered being of low density (L), those which occurred between four and seven were placed in the class of medium density (M), and those which occurred in eight or more areas were placed in the high density category (H). A further classification separated the invasives into two categories: W = true weeds, P = pioneer species.

RESULTS

Table 1 gives the check list of the invasive plants found in the plantation forestry studied in the Jarim river basin. About 180 species were found, of which 70 were considered "true weeds", while the remaining were pioneer species from a secondary succession of the natural vegetation.

As far as relative density is concerned it was found that the great majority of the species in the medium and high frequency classes were "true weeds" while the pioneer belonged mostly to the low frequency class.

Fifty plant families (the ferns were counted here as one family, for practical reason) and about 180 species were found in the sixteen areas surveyed. The Poaceae (grasses) has the greatest number of different species (28), followed by Cyperaceae (sedges), Asteraceae and Leguminosae (each with 13 species) and Euphorbiaceae and Solanaceae (with 10). The families **Rubiaceae**, **Lamiaceae** e **Molluginaceae** had few species but some of the most noxious of the "true weeds" belonged to them: **Borreria verticillata**, **Hyptis mutabilis** and **Mollugo verticillata**.

CONCLUSION

The check-list of Table 1 seems to have a much larger number of species than other lists found in the literature, such as in Dantas & Rodrigues (1980) and Gonçalves et al. (1974). This can be explained by the

Table I.
**Check list of the invasive plants of plantation forestry in
the region of Jari, lower Amazon.**

Family Species (Synonyms)	Type(a)	Frequency(b)	Voucher (M.J.Pires, Col. n°)
ACANTHACEAE			
<i>Ruellia inflata</i> Rich.	W	-	M (1305,1324)
<i>Ruellia pipericalis</i> Rizzini	P	-	L (1148)
AMARANTHACEAE			
<i>Alternanthera brasiliana</i> Kuntze	W	-	L (1289)
<i>Cyathula prostrata</i> Blume (<i>C. geniculata</i> Lour.)	W	-	L (1017)
APOCYNACEAE			
<i>Anartia flavicans</i> Miers (<i>Tabernaemontana flavicans</i> Willd. ex. Roem. & Schult.)	P	-	L (752,938,1218)
<i>Bonafousia undulata</i> A.DC. (<i>Tabernaemontana undulata</i> Vahl)	P	-	L (1019)
<i>Condylocarpon pubiflorum</i> Muell. - Arg <i>Tabernaemontana angulata</i> Mart. ex Muell. - Arg	P	-	L (1125)
	P	-	L (1088,1226)
ARACEAE			
<i>Dieffenbachia humilis</i> Poepp. & Endl.	P	-	L (983)
ARECACEAE/PALMAE			
<i>Bactris cf. sphaerocarpa</i> Trail	P	-	L (985,1207)
<i>Desmoncus polyacanthos</i> Mart.	P	-	L (998)
<i>Maximiliana maritima</i> Karst (<i>M. regia</i> Mart.)	P	-	L (924)
<i>Orbignya sagotii</i> Trail ex Im Thum	P	-	M (1626)
ARISTOLOCHIACEAE			
<i>Aristolochia</i> sp.	P	-	L (1206)
ASCLEPIADACEAE			
<i>Blepharodon</i> sp.	P	-	L (1087)
ASTERACEAE (COMPOSITAE)			
<i>Acanthospemum australe</i> Kuntze (<i>A. brasilum</i> Schrank).	W	-	H (958,1110,1164)
<i>Ageratum conyzoides</i> L.	W	-	L (1035,1210)

Family Species (Synonyms)	Type(a)	Frequency(b)		Voucher (M.J.Pires, Col. n°)
<i>Bidens pilosa</i> L.	W	-	H	(1066,1300)
<i>Emilia sagittata</i> DC. (<i>E. flammeae</i> Cass.)	W	-	H	(793,1073)
<i>Emilia sonchifolia</i> Benth. (<i>E. flammea</i> Cass.)	W	-	H	(1149,1151)
<i>Erechtites hieracifolia</i> Rafin, ex DC. (<i>E. praealta</i> Rafin.)	W	-	H	(908,1085,1165)
<i>Eupatorium macrophyllum</i> L.	W	-	L	(967,1213)
<i>Eupatorium odoratum</i> L. (<i>E. conyzoides</i> Vahl)	W	-	L	(1304)
<i>Eupatorium</i> spp.	W	-	M	(1074,1101,1312)
<i>Porophyllum ellipticum</i> Cass. (<i>P. nuderale</i> Cass.)	W	-	M	(950,1050,1238)
<i>Rolandra fruticosa</i> Rottb. (<i>R. argentea</i> Rottb.)	W	-	M	(929,1129)
<i>Unxia camphorata</i> L. <i>Melampodium camphoratum</i> Benth. & Hook. (f.)	W	-	L	(1225)
<i>Veronia cinerea</i> (L.) Less.	W	-	B	(1038,1119)
<i>Veronia</i> spp.	W	-	B	(1042)
BIGNONIACEAE				
<i>Arabideae</i> spp.	P	-	B	(1167,991,1161)
<i>Memora racemosa</i> A. Gentry	P	-	L	(1314)
Unknown	P	-	L	(1162)
BORAGINACEAE				
<i>Cordia scabrada</i> Mart.	P	-	L	(1122)
BROMELIACEAE				
<i>Ananas ananosoides</i> (Baker) L.B. Smith	P	-	L	(914,1625)
CAMPANULACEAE				
<i>Centropogon comutus</i> Druce	P	-	L	(973)

Family Species (Synonyms)	Type(a)	Frequency(b)	Voucher (M.J.Pires, Col. n°)
CLUSIACEAE (GUTTIFERAE)			
<i>Vismia baccifera</i> Tr. & Pl. (<i>V. panamensis</i> Duchass & Walp.; <i>Ferrugineae</i> H.B. & K.)	P	-	L (1157,1203)
COMMELINACEAE			
<i>Dichorisandra hexandra</i> (Aubl.) Stand.	P	-	L (1010)
CONVOLVULACEAE			
<i>Ipomoeae phillomega</i> House	P	-	L (923)
<i>Ipomea</i> sp.	P	-	L (992)
<i>Jacquemontia tamnifolia</i> Griseb.	P	-	L (1281)
<i>Merremia glabra</i> Hallier (<i>Ipomoeae glabra</i> Choisy)	P	-	L (1298,1340)
<i>Merremia macrocalyx</i> (Ruiz & Pavon O'Donnell)	P	-	L (1014)
COSTACEAE			
<i>Costus arabicus</i> Aublet (<i>Costus spicatus</i> Sw.)	P	-	L (982)
CUCURBITACEAE			
<i>Cayaponia jenmanii</i> C. Jeffrey	P	-	L (997)
<i>Gurania cissoides</i> Cogn.	P	-	L (976)
<i>Gurania spinulosa</i> Cogn.	P	-	L (994,1299)
<i>Melothria pendula</i> L.	P	-	L (1216)
CYCLANTHACEAE			
<i>Carduvica latifrons</i> Drude	P	-	L (993)
CYPERACEAE			
<i>Bacquerelia cymosa</i> Brongn.	P	-	L (1174)
<i>Cyperus diffusus</i> Vahl.	W	-	M (978,1011,1034)
<i>Cyperus ligularis</i> Hort.(<i>C. congestus</i> Vahl)	P	-	M (1031,1060)
<i>Cyperus sphacelatus</i> Rottb.	P	-	L (1241)
<i>Cyperus</i> spp.	W/P	-	M (1098,1253)

Family Species (Synonyms)	Type(a)	Frequency(b)	Voucher (M.J.Pires, Col. nº)
<i>Dichromena ciliata</i> Vahl	P	-	L (930,1202)
<i>Dichromena pubera</i> Vahl	P	-	L (1332)
<i>Fimbristylis dichotoma</i> (L.) Vahl	P	-	L (1194,1260)
<i>Fiurena umbellata</i> Rottb.	P	-	L (942)
<i>Rhynchospora graminea</i> Uitt.	P	-	L (1188)
<i>Rhynchospora</i> sp.	P	-	L (1195)
<i>Scleria bracteata</i> Cav.	P	-	L (514)
<i>Scleria malaleuca</i> Reichb. ex Schlecht. & Cham.	W	-	B (1193)
<i>Scleria pterota</i> Presl.	P	-	L (1252,1255)
DILLENIACEAE			
<i>Davilla kunthii</i> St. Hil.	P	-	L (1072,1310)
EUPHORBIACEAE			
<i>Acalypha arvensis</i> Poepp. & Endl.	P	-	L (1006,1302)
<i>Aparisthium cordatum</i> Baill. (<i>Alchomea cordata</i> Muell. Arg.)	P	-	L (1000)
<i>Croton lobatus</i> L.	P	-	L (961,1013)
<i>Croton miquelensis</i> Ferg.	W	-	H (1021,1145)
<i>Croton tomentosus</i> Link. (<i>C. flavens</i> L.)	W	-	L (518)
<i>Mabea angustifolia</i> Spruce ex Benth.	P	-	L (1178)
<i>Manihot brachyloba</i> Muell. Arg.	P	-	L (1090)
<i>Manihot</i> sp.	P	-	L (1083)
<i>Phyllanthus carolinensis</i> Walt.	W	-	M (939,969,1239)
<i>Phyllanthus orbiculatus</i> Rich.	W	-	M (1092,1103)
<i>Sebastiania comiculata</i> Muell. Arg.	P	-	L (1240)
GENTIANACEAE			
<i>Chelonanthus chelonoides</i> Gilg. (<i>Lisianthus chelonoides</i> L.)	W	-	B (911,1186)

Family Species (Synonyms)	Type(a)	Frequency(b)	Voucher (M.J.Pires, Col. nº)
HELICONIACEAE			
<i>Heliconia acuminata</i> A. Rich. (<i>H. ballia</i> Rich.)	P	-	L (824,1201)
<i>Heliconia bihai</i> L. (<i>Stralitzia augusta</i> Salisb.)	P	-	L (980)
LAMIACEAE (LABIATAE)			
<i>Hyptis gaudichaudii</i> Benth.	W	-	M (966,1146,1328)
<i>Hyptis suaveolens</i> Poit	W	-	M (944,1269)
<i>Hyptis atrorubens</i> Poit	W	-	L (1179,1284)
LEGUMINOSAE - CAESALPINIOIDEAE			
<i>Bauhinia bicuspidata</i> Benth.	P	-	L (984b)
<i>Bauhinia</i> sp.	P	-	L (1271)
<i>Cassia chrysocarpa</i> Desv.	P	-	L (1327)
<i>Cassia latifolia</i> G.F.W. Mey	P	-	L (1272)
<i>Cassia nictitans</i> L.	P	-	L (960)
<i>Cassia tora</i> L.	W	-	L (965)
LEGUMINOSAE - PAPILIONOIDAE			
<i>Aeschynomene americana</i> L.	P	-	L (1250)
<i>Centrosema grazielae</i> V.B. Barbosa	W	-	L (1209)
<i>Desmodium barbatum</i> Wall. (<i>D. confertum</i> DC.)	W	-	L (1141)
<i>Machaerium aureiflorum</i> Ducke	P	-	M (1089)
<i>Machaerium ferox</i> Ducke	P	-	L (999,1222)
<i>Vigna luteola</i> Mart. (<i>V. glabra</i> Savi)	P	-	W (1084,1295)
<i>Zornia diphylla</i> Pers	W	-	M (957,1022)
LEGUMINOSAE - MIMOSOIDEAE			
<i>Mimosa camporum</i> Benth.	P	-	L (1200)
<i>Mimosa racemosum</i> (Ducke) Killip (<i>Pithecellobium racemosum</i> Ducke)	P	-	L (1070)

Family Species (Synonyms)	Type(a)	Frequency(b)	Voucher (M.J.Pires, Col. nº)
MALPIHIACEAE			
<u>Banisteriosopsis schwannioides</u> (Grisebach) B. Gates	P	-	L (1152,1370)
<u>Banisteriosopsis</u> sp. (1267)			
<u>Mascagnia multiglandulosa</u> Niedenzu	P	-	L (907)
<u>Mascagnia sepium</u> Griseb. (<u>Hiraea sepium</u> A. Juss.)	P	-	L (956,1264)
<u>Stigmaphyllon</u> sp.	P	-	L (1266)
MALVACEAE			
<u>Cienefuegosia</u> sp.	W	-	L (963)
<u>Sida cordifolia</u> L. Medic.	W	-	L (1321)
<u>Sidastrum micranthum</u> (A.St.Hil.) Fryxell	W	-	L (1317)
<u>Sida rhobifolia</u> L.	W	-	M (1144,1228)
<u>Urena lobata</u> L.	W	-	H (1254,1279)
MARANTHACEAE			
<u>Ischnosiphon gracilis</u> Koem.	P	-	L (1217)
<u>Monotagma plurispicatus</u> K. Schum. (<u>Ischnosiphon plurispicatus</u> Koem.)	P	-	L (931)
MENISPERMACEAE			
<u>Cissampelos</u> sp.	P	-	L (990)
MOLLUGINACEAE			
<u>Mollugo verticillata</u> L.	W	-	H (1166,1326)
MORACEAE			
<u>Cecropia obtusa</u> Tréc.	P	-	H (910,1004,1331)
<u>Ficus hebetifolia</u> Dugand	P	-	L (1077)
MYRTACEAE			
<u>Eugenia</u> sp.	P	-	L (1127)
ONAGRACEAE			
<u>Jussiaea</u> sp.	P	-	L (1008)
<u>Ludwigia torulosa</u> (Am.) Hara	P	-	L (922,1143,1242))

Family Species (Synonyms)	Type(a)	Frequency(b)	Voucher (M.J.Pires, Col. n°)
PASSIFLORACEAE			
<i>Passiflora glandulosa</i> Cav.	P	-	L (523,1160)
PIPERACEAE			
<i>Piper hispidum</i> Mart. & Gal. (<i>P. mexicanum</i> C.DC.)	W	-	L (1019b)
<i>Piper marginatum</i> Jacq.	W	-	L (1012,1205,1293)
<i>Piper</i> spp.	P	-	L (921,1219,1493,1494)
<i>Pothomorphe peltata</i> Miq. (<i>Piper peltatum</i> Ruiz & Pavon)	P	-	L (1016)
POACEAE (GRAMINEAE)			
<i>Andropogon bicomis</i> L.	W	-	H (933,1069)
<i>Axonopus</i> sp.	W	-	L (1080,1309)
<i>Digitaria insularis</i> (L.) Fedde	W	-	M (1059,1259)
<i>Eleusine indica</i> (L.) Gaertn.	W	-	L (1176)
<i>Eragrostis ciliaris</i> (Kunth)	W	-	M (1132,1155,1306)
<i>Eragrostis maypurensis</i> (H. & B.) Steud.	W	-	L (1134)
<i>Homolepis aturensis</i> (H. & B.) Chase	W	-	M (1296,1319)
<i>Ichnanthus breviscrobis</i> Doell	W	-	L (728,915)
<i>Leptochloa filiformis</i> Beauv. (<i>L. cyanosuroides</i> Roem. & Schult.)	W	-	L (1111,1248)
<i>Leptochloa virgata</i> (L.) Beauv.	W	-	L (955,1026)
<i>Leptochloa</i> spp.	W	-	L (1099,1135)
<i>Melinis minutiflora</i> Beauv.	W	-	L (1051,1093)
<i>Olyra micrantha</i> H.B. & K.	P	-	L (1168)
<i>Panicum bolivense</i> Hackel	W	-	L (916,1047,1078)
<i>Panicum laxum</i> Sw.	W	-	L (1247)
<i>Panicum maximum</i> Jacq.	W	-	L (1138,1211,1318)
<i>Panicum milleflorum</i> Hitchc. & Chase	W	-	L (1212)
<i>Panicum rivulare</i> Trin.	W	-	L (1124)
<i>Panicum</i> sp.	W	-	L (1213)

Family Species (Synonyms)	Type(a)	Frequency(b)	Voucher (M.J.Pires, Col. n°)
<i>Pariaria nervata</i> Sw.	P	-	L (1181)
<i>Paspalum conjugatum</i> Berg.	W	-	L (1045,1177)
<i>Paspalum conspersum</i> Schrad. ex. Schult. (<i>P. virgatum</i> L.)	W	-	L (947)
<i>Paspalum decumbens</i> S.W.	W	-	L (1208)
<i>Paspalum multicaule</i> Poir	W	-	L (906,1133,1189)
<i>Paspalum paniculatum</i> L.	W	-	L (1025)
<i>Paspalum plicatum</i> Pers.	W	-	L (1199)
<i>Paspalum virgatum</i> L.	W	-	L (1030,1235)
<i>Paspalum</i> sp	W	-	M (1325,1338)
POLYGALACEAE			
<i>Trichachne insularis</i>			
<i>Polygala</i> sp.	P	-	L (1224)
<i>Securidaca</i> sp.	P	-	L (1126)
RUBIACEAE			
<i>Borreria latifolia</i> K. Schum. (<i>Spermacoce latifolia</i> Aubl.)	W	-	H (1262,1330)
<i>Borreria verticillata</i> G.F. Mey (<i>Spermacoce verticillata</i> Spreng.)	W	-	H (1079,1320)
RUTACEAE			
<i>Zanthoxylum rhoifolia</i> Lam.	P	-	L (1175)
<i>Moniera</i> sp.	P	-	L (1261)
SCHROPHULARIACEAE			
<i>Lindemia crustacea</i> F. Muell. (<i>Vandellia crustacea</i> Bentham; <i>V. irosinensis</i> Elmer ex Merrill)	W	-	L (1007)
<i>Antirrhinum hexandrum</i> Forsk.; <i>Capraria</i> <i>crustacea</i> L.)			

Family Species (Synonyms)	Type(a)	Frequency(b)	Voucher (M.J.Pires, Col. n°)
<u>Lindernia diffusa</u> Wettst. (<u>Vandellia diffusa</u> L.)	W	-	LA 1987 IV (926,1192)
<u>Scoparia dulcis</u> L.	W	-	L (1215)
SMILACACEAE			
<u>Smilax</u> sp.	P	-	L (1123)
SOLANACEAE			
<u>Physalis viscosa</u> L.	W	-	M (996,1244)
<u>Solanum coarense</u> Sendt.	P	-	L (1220)
<u>Solanum grandiflorum</u> Ruiz & Pavon	P	-	M (1076,1128)
<u>Solanum granuloso-leprosum</u> Dun.	P	-	L (1283,1323)
<u>Solanum leucocarpon</u> Dun.	P	-	L (1291)
<u>Solanum rugosum</u> Dun.	P	-	L (1102,1140)
<u>Solanum salvifolium</u> Lam. (<u>S. Radula</u> Vahl)	P	-	M (1118,1159,1180)
<u>Solanum schlechtendalianum</u> Walp.	P	-	L (977)
<u>Solanum subinerme</u> Jacq.	P	-	L (1075)
<u>Solanum surinamense</u> Steud.	P	-	L (1020,1170)
STERCULIACEAE			
<u>Melochia melissifolia</u> Benth	W	-	H (1150,1236,1333)
THEOPHRASTACEAE			
<u>Claytonia lancifolia</u> Desf.	P	-	L (945)
TILIACEAE			
<u>Corchorus hirtus</u> L.	W	-	L (1251)
TURNERACEAE			
<u>Piriqueta cistoides</u> C.F.W. Mey ex Steud. (<u>P. villosa</u> Aubl.)	W	-	M (1223,1243)
ULMACEAE			
<u>Trema micrantha</u> Blume	P	-	M (920,1290)

Family Species (Synonyms)	Type(a)	Frequency(b)	Voucher (M.J.Pires, Col. n°)
VERBENACEAE			
<i>Aegiphila amazonica</i> Moldenke	P	-	L (1169)
<i>Lantana camara</i> L.	W	-	L (1172)
<i>Stachylarpheta cayennensis</i> (L.C. Rich) Vahl	W	-	H (1094,1280)
PTERIDOPHYTA (FERNS)			
<i>Lycopodium cernuum</i> L. (<i>Lycopodiella cernua</i> (L.) Pichi-Serm.)	W	-	L (943)
<i>Nephrolepis biserrata</i> L.	W	-	L (1015)
<i>Pteridium aquilinum</i> (L.) Kuhn	W	-	L (936,1091)
<i>Ptyrogramma calomelanos</i> (L.) Link.	W	-	L (925,1214)
<i>Selaginella stellata</i> Spring	P	-	L (1009)

fact that the forestry plantations of Jari are relatively new when compared with other agricultural lands and pastures, and therefore have more resources in their soil seed bank. It would be interesting to compare the pioneer species listed in Table 1 with a list of the species found in areas of known stages of forest secondary succession. This would inform whether or not the periodical cutting of the planted forest maintained the invasive community of pioneers at an early stage of secondary succession.

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SUMMARY

The work consists of a survey of the invasive plants which appeared during the first six months of seedling stage in forest plantations of second and third rotation, in the Jari area,

Brazil. The resulting list showed two types of invasives: (1) **true weeds** - those cosmopolitan species that are typical of disturbed habitats; and (2) **pioneer species** - those which were probably remnants from the original natural vegetation of the studied area.

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