

Australia/New Zealand Weed Risk Assessment adapted for United States.

Data used for analysis published in: Gordon, D.R. and C.A. Gantz. 2008. Potential impacts on the horticultural industry of screening new plants for invasiveness. Conservation Letters 1: 227-235. Available at: <http://www3.interscience.wiley.com/cgi-bin/fulltext/121448369/PDFSTART>

| <i>Tupistra nutans</i> |  |        |       |
|------------------------|--|--------|-------|
| Question number        | Question   | 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 U.S. climates (USDA hardiness zones; 0-low, 1-intermediate, 2-high)    | 2      |       |
| 2.02                   | Quality of climate match data (0-low; 1-intermediate; 2-high)                            | 1      |       |
| 2.03                   | Broad climate suitability (environmental versatility)                                    | n      | 0     |
| 2.04                   | Native or naturalized in regions with an average of 11-60 inches of annual precipitation | y      | 1     |
| 2.05                   | Does the species have a history of repeated introductions outside its natural range?     | y      |       |
| 3.01                   | Naturalized beyond native range  | n      | -2    |
| 3.02                   | Garden/amenity/disturbance weed  | n      | 0     |
| 3.03                   | Weed of agriculture  | n      | 0     |
| 3.04                   | Environmental weed   | n      | 0     |
| 3.05                   | Congeneric weed  | n      | 0     |
| 4.01                   | Produces spines, thorns or burrs   | n      | 0     |
| 4.02                   | Allelopathic   |        |       |
| 4.03                   | Parasitic  | n      | 0     |
| 4.04                   | Unpalatable to grazing animals   |        |       |
| 4.05                   | Toxic to animals   | n      | 0     |
| 4.06                   | Host for recognised pests and pathogens  |        |       |
| 4.07                   | Causes allergies or is otherwise toxic to humans   | n      | 0     |
| 4.08                   | Creates a fire hazard in natural ecosystems  |        |       |
| 4.09                   | Is a shade tolerant plant at some stage of its life cycle                                | ?      |       |
| 4.1                    | Grows on one or more of the following soil types: alfisols, entisols, or mollisols       | y      | 1     |
| 4.11                   | Climbing or smothering growth habit  | n      | 0     |
| 4.12                   | Forms dense thickets   | ?      |       |

|                    |  |   |           |
|--------------------|--|---|-----------|
| 5.01               | Aquatic  | n | 0         |
| 5.02               | Grass  | n | 0         |
| 5.03               | Nitrogen fixing woody plant  | n | 0         |
| 5.04               | Geophyte   | ? |           |
| 6.01               | Evidence of substantial reproductive failure in native habitat                                 | n | 0         |
| 6.02               | Produces viable seed   |   |           |
| 6.03               | Hybridizes naturally   |   |           |
| 6.04               | Self-compatible or apomictic   |   |           |
| 6.05               | Requires specialist pollinators  |   |           |
| 6.06               | Reproduction by vegetative fragmentation   | y | 1         |
| 6.07               | Minimum generative time (years)  |   |           |
| 7.01               | Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas) |   |           |
| 7.02               | Propagules dispersed intentionally by people   | y | 1         |
| 7.03               | Propagules likely to disperse as a produce contaminant   | n | -1        |
| 7.04               | Propagules adapted to wind dispersal   | n | -1        |
| 7.05               | Propagules water dispersed   |   |           |
| 7.06               | Propagules bird dispersed  | ? |           |
| 7.07               | Propagules dispersed by other animals (externally)   | n | -1        |
| 7.08               | Propagules dispersed by other animals (internally)   | ? |           |
| 8.01               | Prolific seed production   |   |           |
| 8.02               | Evidence that a persistent propagule bank is formed (>1 yr)                                    |   |           |
| 8.03               | Well controlled by herbicides  |   |           |
| 8.04               | Tolerates, or benefits from, mutilation or cultivation   |   |           |
| 8.05               | Effective natural enemies present in U.S.  |   |           |
| <b>Total Score</b> |  |   | <b>-1</b> |

|                |               |
|----------------|---------------|
| <b>Outcome</b> | <b>Accept</b> |
|----------------|---------------|

| section | # questions answered | satisfy minimum? |
|---------|----------------------|------------------|
| A       | 11                   | Yes              |
| B       | 6                    | Yes              |
| C       | 9                    | Yes              |
| total   | 26                   | yes              |

Data collected 2008

| Question number | Reference   | Source data   |
|-----------------|---|---|
| 1.01            |   | used horticulturally, but no evidence of significant modification   |
| 1.02            |   |   |
| 1.03            |   |   |
| 2.01            | <p>1. PERAL NAPPFAST Global Plant Hardiness (<a href="http://www.nappfast.org/Plant_hardiness/NAPPFAST%20Global%20zones/10-year%20climate/PLANT_HARDINESS_10YR%20gnd.tif">http://www.nappfast.org/Plant_hardiness/NAPPFAST%20Global%20zones/10-year%20climate/PLANT_HARDINESS_10YR%20gnd.tif</a>). 2. Plant Delights Nursery (<a href="http://www.plantdelights.com/About/intros.html">http://www.plantdelights.com/About/intros.html</a>). 3. Press, JR, Shrestha, KK, and Sutton, DA (2000) Annotated checklist of the flowering plants of Nepal. The Natural History Museum, London and Tribhuvan University, Kathmandu. 4. Hara, H, Stearn, WT, and Williams, LHJ (1978) An enumeration of the flowering plants of Nepal. Volume 1. Trustees of British Museum (Natural History), London. 5. Kubitzki, K (1998) The Families and Genera of Vascular Plants. Volume III: Flowering Plants. Monocotyledons. Liliaceae (except Orchidaceae). Springer-Verlag, Berlin and New York. 6. van Steenis, CGGJ (1979) Flora Malesiana. Series I, Spermatophyta. Volume 9, Part 1. P. 221. P. Noordhoff, Haarlem, The Netherlands.</p> | <p>1. Global hardiness zones 9-13. 2. collected from India 3. Himalaya (Nepal, Sikkim), NE India (Meghalaya). 4. E. Himalaya (Nepal, Sikkim), Assam (Khasia). 5. "E Himalayas to S China and Malesia" [genus description]. 6. "Distr. Eastern Himalayas to southern China; in Malesia: Malay Peninsula and Sumatra" [genus description].</p>  |
| 2.02            |   |   |
| 2.03            | <p>1. Köppen-Geiger climate map (<a href="http://www.hydro-earth-syst-sci.net/11/1633/2007/hess-11-1633-2007.pdf">http://www.hydro-earth-syst-sci.net/11/1633/2007/hess-11-1633-2007.pdf</a>). 2. Plant Delights Nursery (<a href="http://www.plantdelights.com/About/intros.html">http://www.plantdelights.com/About/intros.html</a>). 3. Press, JR, Shrestha, KK, and Sutton, DA (2000) Annotated checklist of the flowering plants of Nepal. The Natural History Museum, London and Tribhuvan University, Kathmandu. 4. Hara, H, Stearn, WT, and Williams, LHJ (1978) An enumeration of the flowering plants of Nepal. Volume 1. Trustees of British Museum (Natural History), London. 5. Kubitzki, K (1998) The Families and Genera of Vascular Plants. Volume III: Flowering Plants. Monocotyledons. Liliaceae (except Orchidaceae). Springer-Verlag, Berlin and</p>   | <p>1. 2-3 climatic regions (distribution is unknown, but India has 3 climatic regions). 2. collected from India 3. Himalaya (Nepal, Sikkim), NE India (Meghalaya). 4. E. Himalaya (Nepal, Sikkim), Assam (Khasia). 5. "E Himalayas to S China and Malesia" [genus description]. 6. "Distr. Eastern Himalayas to southern China; in Malesia: Malay Peninsula and Sumatra" [genus description].</p> |

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|      | New York. 6. van Steenis, CGGJ (1979) Flora Malesiana. Series I, Spermatophyta. Volume 9, Part 1. P. 221. P. Noordhoff, Haarlem, The Netherlands.   |  |
| 2.04 | 1. Atlapedia Online ( <a href="http://www.atlapedia.com/online/countries/nepal.htm">http://www.atlapedia.com/online/countries/nepal.htm</a> ). 2. Microsoft Encarta World Precipitation and Average Rainfall ( <a href="http://uk.encarta.msn.com/encnet/RefPages/RefMedia.aspx?refid=461530746&amp;artrefid=761554737&amp;pn=3&amp;sec=-1">http://uk.encarta.msn.com/encnet/RefPages/RefMedia.aspx?refid=461530746&amp;artrefid=761554737&amp;pn=3&amp;sec=-1</a> ). | 1. For Nepal: "Average annual precipitation decreases from 1,778 mm (70 inches) in the east to 899 mm (35 inches) in the west" 2. Average annual precipitation for the northeastern part of India appears to be between 20 inches/year to 80+ inches/year. |
| 2.05 | 1. WorldPlants.com ( <a href="http://www.worldplants.com/index.html">http://www.worldplants.com/index.html</a> ). 2. Plant Delights Nursery ( <a href="http://www.plantdelights.com/About/intros.html">http://www.plantdelights.com/About/intros.html</a> ).  | 1. Sold internationally. 2. Sold in the United States.   |
| 3.01 |   | no evidence  |
| 3.02 |   | no evidence  |
| 3.03 |   | no evidence  |
| 3.04 |   | no evidence  |
| 3.05 |   | no evidence  |
| 4.01 | Liang, SY and Tamura, MN (2000) <i>Tupistra</i> . Pp. 239-240 in Wu, ZY and Raven, PH (editors), Flora of China, Vol. X. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis.  | no description of these traits [genus description]   |
| 4.02 |   |  |
| 4.03 | Liang, SY and Tamura, MN (2000) <i>Tupistra</i> . Pp. 239-240 in Wu, ZY and Raven, PH (editors), Flora of China, Vol. X. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis.  | no description of parasitism [genus description]   |
| 4.04 |   |  |
| 4.05 | Liang, SY and Tamura, MN (2000) <i>Tupistra</i> . Pp. 239-240 in Wu, ZY and Raven, PH (editors), Flora of China, Vol. X. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis.  | no evidence  |
| 4.06 |   |  |
| 4.07 | 1. Rai, AK, Sharma, RM, and Tamang, JP (2005) Food Value of Common Edible Wild Plants of Sikkim. Journal of Hill Research 18(2): 99-103. 2. Chettri, N, Sharma, E, and Lama, SD (2005). Non-  | 1. "The inflorescence is eaten as vegetable and pickle." 2. "Flowers are eaten as vegetables or made pickles"... "Flower[s] are taken as a   |

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|      | timber forest produces utilization, distribution and status in a trekking corridor of Sikkim, India. <i>Lyonia</i> 8(1). Accessed online 12/13/2007: <a href="http://www.lyonia.org/viewArticle.php?articleID=388">http://www.lyonia.org/viewArticle.php?articleID=388</a>   | curry". [no evidence of toxicity]  |
| 4.08 |  |  |
| 4.09 | van Steenis, CGGJ (1979) <i>Flora Malesiana</i> . Series I, Spermatophyta. Volume 9, Part 1. P. 221. P. Noordhoff, Haarlem, The Netherlands.   | "Most frequently recorded from dry evergreen forest, often in deep shade and often from near streams." [genus description].  |
| 4.1  | USDA, National Resources Conservation Services (NRCS), Soil Survey Division, World Soil Resources ( <a href="http://soils.usda.gov/use/worldsoils/mapindex/order.html">http://soils.usda.gov/use/worldsoils/mapindex/order.html</a> ).   | Nepal: mostly entisols with some inceptisols and a small amount of ultisols and gelisols (and also some rocky land); mostly entisols with some inceptisols, ultisols and a small amount of aridisols (also with some rocky land); India (NE – Assam): mostly inceptisols with some ultisols and entisols; India (NE – Meghalaya): mostly inceptisols with some ultisols and entisols |
| 4.11 | 1. Liang, SY and Tamura, MN (2000) <i>Tupistra</i> . Pp. 239-240 in Wu, ZY and Raven, PH (editors), <i>Flora of China</i> , Vol. X. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis. 2. Kubitzki, K (1998) <i>The Families and Genera of Vascular Plants</i> . Volume III: Flowering Plants. Monocotyledons. <i>Liliana</i> (except <i>Orchidaceae</i> ). Springer-Verlag, Berlin and New York. 3. van Steenis, CGGJ (1979) <i>Flora Malesiana</i> . Series I, Spermatophyta. Volume 9, Part 1. P. 221. P. Noordhoff, Haarlem, The Netherlands. | 1. "Herbs perennial, rhizomatous"; terrestrial [genus description]. 2. "Acaulescent monopodial herbs" [genus description]. 3. "Stemless herbs" [genus description].  |
| 4.12 | 1. Liang, SY and Tamura, MN (2000) <i>Tupistra</i> . Pp. 239-240 in Wu, ZY and Raven, PH (editors), <i>Flora of China</i> , Vol. X. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis. 2. Kubitzki, K (1998) <i>The Families and Genera of Vascular Plants</i> . Volume III: Flowering Plants. Monocotyledons. <i>Liliana</i> (except <i>Orchidaceae</i> ). Springer-Verlag, Berlin and New York. 3. van Steenis, CGGJ (1979) <i>Flora Malesiana</i> . Series I, Spermatophyta. Volume 9, Part 1. P. 221. P. Noordhoff, Haarlem, The Netherlands. | 1. "Herbs perennial, rhizomatous"; terrestrial [genus description]. 2. "Acaulescent monopodial herbs" [genus description]. 3. "Stemless herbs" [genus description].  |
| 5.01 | Liang, SY and Tamura, MN (2000) <i>Tupistra</i> . Pp.  | "Herbs perennial, rhizomatous";  |

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|      | 239-240 in Wu, ZY and Raven, PH (editors), Flora of China, Vol. X. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis.   | terrestrial [genus description]   |
| 5.02 | Liang, SY and Tamura, MN (2000) <i>Tupistra</i> . Pp. 239-240 in Wu, ZY and Raven, PH (editors), Flora of China, Vol. X. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis.   | Liliaceae   |
| 5.03 | Liang, SY and Tamura, MN (2000) <i>Tupistra</i> . Pp. 239-240 in Wu, ZY and Raven, PH (editors), Flora of China, Vol. X. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis.   | Liliaceae   |
| 5.04 | 1. Liang, SY and Tamura, MN (2000) <i>Tupistra</i> . Pp. 239-240 in Wu, ZY and Raven, PH (editors), Flora of China, Vol. X. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis. 2. Kubitzki, K (1998) The Families and Genera of Vascular Plants. Volume III: Flowering Plants. Monocotyledons. <i>Liliana</i> (except <i>Orchidaceae</i> ). Springer-Verlag, Berlin and New York. 3. van Steenis, CGGJ (1979) Flora Malesiana. Series I, Spermatophyta. Volume 9, Part 1. P. 221. P. Noordhoff, Haarlem, The Netherlands. | 1. "Herbs perennial, rhizomatous" [genus description]. 2. "Rhizomes thick, sometimes tuberous, spreading" [genus description]. 3. "Rhizomes tuberous or horizontal, thick and woody; roots thick and fleshy" [genus description]. |
| 6.01 |  | no evidence   |
| 6.02 |  |   |
| 6.03 |  |   |
| 6.04 |  |   |
| 6.05 |  |   |
| 6.06 | 1. Liang, SY and Tamura, MN (2000) <i>Tupistra</i> . Pp. 239-240 in Wu, ZY and Raven, PH (editors), Flora of China, Vol. X. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis. 2. Kubitzki, K (1998) The Families and Genera of Vascular Plants. Volume III: Flowering Plants. Monocotyledons. <i>Liliana</i> (except <i>Orchidaceae</i> ). Springer-Verlag, Berlin and New York. 3. van Steenis, CGGJ (1979) Flora Malesiana. Series I, Spermatophyta. Volume 9, Part 1. P. 221. P. Noordhoff, Haarlem, The Netherlands. | 1. "Herbs perennial, rhizomatous" [genus description]. 2. "Rhizomes thick, sometimes tuberous, spreading" [genus description]. 3. "Rhizomes tuberous or horizontal, thick and woody; roots thick and fleshy" [genus description]. |
| 6.07 |  |   |
| 7.01 |  |   |
| 7.02 | 1. WorldPlants.com ( <a href="http://www.worldplants.com/index.html">http://www.worldplants.com/index.html</a> ). 2. Plant   | 1. Sold internationally. 2. Sold in the United States.  |

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|      | Delights Nursery<br>( <a href="http://www.plantdelights.com/About/intros.html">http://www.plantdelights.com/About/intros.html</a> ).   |   |
| 7.03 |  | no evidence   |
| 7.04 | 1. Kubitzki, K (1998) The Families and Genera of Vascular Plants. Volume III: Flowering Plants. Monocotyledons. Liliae (except Orchidaceae). Springer-Verlag, Berlin and New York. 2. van Steenis, CGGJ (1979) Flora Malesiana. Series I, Spermatophyta. Volume 9, Part 1. P. 221. P. Noordhoff, Haarlem, The Netherlands. | 1. "Fruit a berry, single-seeded" [genus description]. 2. "Fruit a globose berry, usually 1-seeded; seeds turgid" [genus description]. [no evidence of adaptations to wind dispersal]     |
| 7.05 |  |   |
| 7.06 | 1. Kubitzki, K (1998) The Families and Genera of Vascular Plants. Volume III: Flowering Plants. Monocotyledons. Liliae (except Orchidaceae). Springer-Verlag, Berlin and New York. 2. van Steenis, CGGJ (1979) Flora Malesiana. Series I, Spermatophyta. Volume 9, Part 1. P. 221. P. Noordhoff, Haarlem, The Netherlands. | 1. "Fruit a berry, single-seeded" [genus description]. 2. "Fruit a globose berry, usually 1-seeded; seeds turgid" [genus description].  |
| 7.07 | 1. Kubitzki, K (1998) The Families and Genera of Vascular Plants. Volume III: Flowering Plants. Monocotyledons. Liliae (except Orchidaceae). Springer-Verlag, Berlin and New York. 2. van Steenis, CGGJ (1979) Flora Malesiana. Series I, Spermatophyta. Volume 9, Part 1. P. 221. P. Noordhoff, Haarlem, The Netherlands. | 1. "Fruit a berry, single-seeded" [genus description]. 2. "Fruit a globose berry, usually 1-seeded; seeds turgid" [genus description]. [no evidence of adaptations to external dispersal] |
| 7.08 | 1. Kubitzki, K (1998) The Families and Genera of Vascular Plants. Volume III: Flowering Plants. Monocotyledons. Liliae (except Orchidaceae). Springer-Verlag, Berlin and New York. 2. van Steenis, CGGJ (1979) Flora Malesiana. Series I, Spermatophyta. Volume 9, Part 1. P. 221. P. Noordhoff, Haarlem, The Netherlands. | 1. "Fruit a berry, single-seeded" [genus description]. 2. "Fruit a globose berry, usually 1-seeded; seeds turgid" [genus description].  |
| 8.01 |  |   |
| 8.02 |  |   |
| 8.03 |  |   |
| 8.04 |  |   |
| 8.05 |  |   |