WEED RISK ASSESSMENT FORM

Botanical name: *Lythrum salicaria* L. & *Lythrum virgatum* L.

Common name: purple loosestrife

Assessors:

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Outcome score:

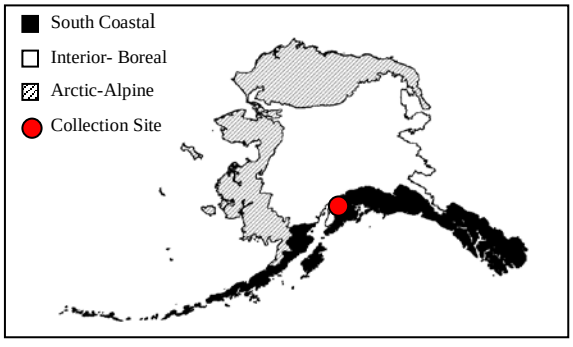
A.	**Climatic Comparison**		
	This species is present or may potentially establish in the following eco-geographic regions:		
1	South Coastal		No
2	Interior-Boreal	Yes	
3	Arctic-Alpine		No
	This species is unlikely to establish in any region in Alaska		

B.	**Invasiveness Ranking**	Total (Total Answered*) Possible	Total
1	Ecological impact	40 (40)	34
2	Biological characteristic and dispersal ability	25 (25)	20
3	Ecological amplitude and distribution	25 (25)	22
4	Feasibility of control	10 (10)	8
	Outcome score	100 (100)[b]	84
	Relative maximum score†		0.84

* For questions answered "unknown" do not include point value for the question in parentheses for "Total Answered Points Possible."
† Calculated as [a]/[b].

A. CLIMATIC COMPARISON:

	1.1 Has this species ever been collected or documented in Alaska?
Yes	Yes – continue to 1.2
	No – continue to 2.1
	1.2. Which eco-geographic region has it been collected or documented (see inset map)? *Proceed to Section B. Invasiveness Ranking.*
	South Coastal
Yes	Interior-Boreal
	Arctic-Alpine



Documentation: *Lythrum salicaria* has been planted in gardens in Anchorage (M.L. Carlson – pers. obs., J. Riley – pers. obs.).
Sources of information:
Carlson, M.L. Assistant research professor, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2790 – Pers. obs.
Riley, J., Horticulture Agent, UAF Cooperative Extension Service, 2221 E. Northern Lights Blvd. #118, Anchorage, AK 99508-4143, tel: (907) 786-6306 – pers. com.

2.1. Is there a 40% or higher similarity (based on CLIMEX climate matching) between climates any where the species currently occurs and

a. Juneau (South Coastal Region)?
Yes – *record locations and similarity; proceed to Section B. Invasiveness Ranking*
No

No

b. Fairbanks (Interior-Boreal)?
Yes – *record locations and similarity; proceed to Section B. Invasiveness Ranking*
No

c. Nome (Arctic-Alpine)?

Yes

Yes – *record locations and similarity; proceed to Section B. Invasiveness Ranking*
No
– If "No" is answered for all regions, reject species from consideration

Documentation: Using CLIMEX matching program, climatic similarity is low between South-Coastal ecoregion and where this species is known. Climatic similarity between Nome (Arctic-Alpine ecoregion) and areas where the species is documented is high. Range of the species includes Bogolovsk, and Kirov, Russia (Gubanov et al. 1995), and Anchorage, Alaska, which has a 67%, 66%, and 61% climatic match with Nome, respectively. However, germination requires "high temperatures" (WDNR 2004) and it is not found in arctic or alpine regions in its native range (Blossey 2002). Therefore it is unlikely to establish in the Arctic-Alpine ecoregion.
Sources of information:
CLIMEX for Windows, Version 1.1a. 1999. CISRO Publishing, Australia.
Blossey, B. 2002. Purple Loosestrife. In: Driesche, R.V. et. al. 2002. Biological Control of Invasive Plants in the Eastern United States. USDA Forest Service Publication FHTET-2002-04, 413 pp.
Gubanov, I.A., K.V. Kiseleva, V.S. Novicov, V.N. Tihomirov. 1995. Flora of vascular plants of central European Russia. Moscow Argus. 558 pp.
USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
Wisconsin Department of Natural Resources: abstract. Non-native plants. Purple Loosestrife (*Lythrum salicaria*). 2003. http://www.dnr.state.wi.us [May 7, 2004].

B. INVASIVENESS RANKING

1. ECOLOGICAL IMPACT

1.1. Impact on Natural Ecosystem Processes

A.	No perceivable impact on ecosystem processes	0
B.	Influences ecosystem processes to a minor degree (e.g., has a perceivable but mild influence on soil nutrient availability)	3
C.	Significant alteration of ecosystem processes (e.g., increases sedimentation rates along streams or coastlines, reduces open water that are important to waterfowl)	7
D.	Major, possibly irreversible, alteration or disruption of ecosystem processes (e.g., the species alters geomorphology; hydrology; or affects fire frequency, altering community composition; species fixes substantial levels of nitrogen in the soil making soil unlikely to support certain native plants or more likely to favor non-native species)	10
U.	Unknown	

Score 8

Documentation:
Identify ecosystem processes impacted:
Purple loosestrife alters biogeochemical and hydrological processes in wetlands (lowers phosphates in the summer). Leaves of the plant decompose quickly in the fall resulting in a nutrient flush, whereas leaves of native species decompose in the spring. Thise results in significant alterations of wetland communities adapted to decomposition of plant tissues in spring. Wetland bird communities and ecology is altered by its presence (Blossey 2002).
Rational:

Sources of information:
Blossey, B. 2002. Purple Loosestrife. In: Driesche, R.V. et. al. 2002. Biological Control of Invasive Plants in the Eastern United States. USDA Forest Service Publication FHTET-2002-04, 413 pp.

1.2. Impact on Natural Community Structure

A.	No perceived impact; establishes in an existing layer without influencing its structure	0
B.	Influences structure in one layer (e.g., changes the density of one layer)	3
C.	Significant impact in at least one layer (e.g., creation of a new layer or elimination of an existing layer)	7
D.	Major alteration of structure (e.g., covers canopy, eradicating most or all layers below)	10
U.	Unknown	

Score 8

Documentation:
Identify type of impact or alteration:
This species forms very dense monospecific stands that displacing other emergent and submerged layers (Bender and Rendall 1987, Mann 1991).
Rational:

Sources of information:
Bender, J. and J. Rendall. 1987. Element Stewardship Abstract for *Lythrum salicaria* Purple Loosestrife. The Nature Conservancy. Arlington, VA.
Mann, H. 1991. Purple loosestrife: a botanical dilemma. Osprey 22:67-77.

1.3. Impact on Natural Community Composition

A.	No perceived impact; causes no apparent change in native populations	0
B.	Influences community composition (e.g., reduces the number of individuals in one or more native species in the community)	3
C.	Significantly alters community composition (e.g., produces a significant reduction in the population size of one or more native species in the community)	7
D.	Causes major alteration in community composition (e.g., results in the extirpation of one or several native species, reducing biodiversity or change the community composition towards species exotic to the natural community)	10
U.	Unknown	

Score 8

Documentation:
Identify type of impact or alteration:
Purple loosestrife infestation causes reductions in native plant species diversity, eliminating cattails and pondweeds, for example. Native animals avoid nesting and foraging in these stands (Blossey 2002).
Rational:

Sources of information:
Blossey, B. 2002. Purple Loosestrife. In: Driesche, R.V. et. al. 2002. Biological Control of Invasive Plants in the Eastern United States. USDA Forest Service Publication FHTET-2002-04, 413 pp.

1.4. Impact on higher trophic levels (cumulative impact of this species on the animals, fungi, microbes, and other organisms in the community it invades)

A.	Negligible perceived impact	0

B.	Minor alteration	3
C.	Moderate alteration (minor reduction in nesting/foraging sites, reduction in habitat connectivity, interference with native pollinators, injurious components such as spines, toxins)	7
D.	Severe alteration of higher trophic populations (extirpation or endangerment of an existing native species/population, or significant reduction in nesting or foraging sites)	10
U.	Unknown	

Score 10

Documentation:

Identify type of impact or alteration:

Purple loosestrife is likely degrading salmon and waterfowl habitats (M. Carlson – pers. com.). Native animals avoid nesting and foraging in stands of purple loosestrife (Bender 1987). But moose has been observed browsing on this plant (J. Riley - pers. obs.). It has been reported as an alternate host for cucumber mosaic virus (Royer and Dickinson 1999).

Rational:

Sources of information:

Bender, J. and J. Rendall. 1987. Element Stewardship Abstract for *Lythrum salicaria* Purple Loosestrife. The Nature Conservancy. Arlington, VA.

Carlson M.L., Ph.D., Assistant Research Professor – Botany, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2790 – Pers. obs.

Riley, J., Horticulture Agent, UAF Cooperative Extension Service, 2221 E. Northern Lights Blvd. #118, Anchorage, AK 99508-4143, tel: (907) 786-6306 – pers. com.

Royer, F. and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.

Total Possible 40

Total 34

2. BIOLOGICAL CHARACTERISTICS AND DISPERSAL ABILITY

2.1. Mode of reproduction

A.	Not aggressive reproduction (few [0-10] seeds per plant and no vegetative reproduction)	0
B.	Somewhat aggressive (reproduces only by seeds (11-1,000/m^2)	1
C.	Moderately aggressive (reproduces vegetatively and/or by a moderate amount of seed, <1,000/m^2)	2
D.	Highly aggressive reproduction (extensive vegetative spread and/or many seeded, >1,000/m^2)	3
U.	Unknown	

Score 3

Documentation:

Describe key reproductive characteristics (including seeds per plant):

Plants are capable of producing over 100,000 seeds (Shamsi and Whitehead 1974). It can spread vegetatively by resprouting from cut stems and regenerating from root fragments and pieces of the stem (Bender and Rendall 1987, Royer and Dickinson 1999).

Rational:

Sources of information:

Bender, J. and J. Rendall. 1987. Element Stewardship Abstract for *Lythrum salicaria* Purple Loosestrife. The Nature Conservancy. Arlington, VA.

Royer, F. and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.

Shamsi, S.R.A. and F.H. Whitehead. 1974. Comparative eco-physiology of *Epilobium hirsutum* L. and *Lythrum salicaria* L. I. General biology, distribution, and germination. J. Ecol. 62:279-290.

2.2. Innate potential for long-distance dispersal (bird dispersal, sticks to animal hair, buoyant fruits, wind-dispersal)

A.	Does not occur (no long-distance dispersal mechanisms)	0
B.	Infrequent or inefficient long-distance dispersal (occurs occasionally despite lack of adaptations)	2
C.	Numerous opportunities for long-distance dispersal (species has adaptations such as pappus, hooked fruit-coats, etc.)	3
U.	Unknown	

Score 3

Documentation:

Identify dispersal mechanisms:

The seeds are small, weighing 0.06 mg each (Shamsi and Whitehead 1974). Thus, dispersal is mainly by wind, but seeds can also be transported by waterfowl or other wetland animals. Further, seeds and seedlings are buoyant and can be dispersed by water (Bender and Rendall 1987, Blossey 2002).

Rational:

Sources of information:

Bender, J. and J. Rendall. 1987. Element Stewardship Abstract for *Lythrum salicaria* Purple Loosestrife. The Nature Conservancy. Arlington, VA.

Blossey, B. 2002. Purple Loosestrife. In: Driesche, R.V. et. al. 2002. Biological Control of Invasive Plants in the Eastern United States. USDA Forest Service Publication FHTET-2002-04, 413 pp.

Shamsi, S.R.A. and F.H. Whitehead. 1974. Comparative eco-physiology of Epilobium *hirsutum* L. and *Lythrum salicaria* L. I. General biology, distribution, and germination. J. Ecol. 62:279-290.

2.3. Potential to be spread by human activities (both directly and indirectly – possible mechanisms include: commercial sales, use as forage/revegetation, spread along highways, transport on boats, contamination, etc.)

A.	Does not occur	0
B.	Low (human dispersal is infrequent or inefficient)	1
C.	Moderate (human dispersal occurs)	2
D.	High (there are numerous opportunities for dispersal to new areas)	3
U.	Unknown	

Score 3

Documentation:

Identify dispersal mechanisms:

Introductions into North America have occurred through ship ballast, wool, and most likely as ornamental plantings. Humans carry seeds inadvertently on clothing and shoes and bee-keepers have purposely sown seeds to provide a source of nectar. It was and continues to be widely planted in gardens (Bender and Rendall 1987, Royer and Dickinson 1999).

Rational:

Sources of information:

Bender, J. and J. Rendall. 1987. Element Stewardship Abstract for *Lythrum salicaria* Purple Loosestrife. The Nature Conservancy. Arlington, VA.

Royer, F. and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.

2.4. Allelopathic

A.	No	0
B.	Yes	2
U.	Unknown	

Score 0

Documentation:

Describe effect on adjacent plants:

There is no known allelopathic potential.
Rational:

Sources of information:

2.5. Competitive ability

A.	Poor competitor for limiting factors	0
B.	Moderately competitive for limiting factors	1
C.	Highly competitive for limiting factors and/or nitrogen fixing ability	3
U.	Unknown	

Score 3

Documentation:
Evidence of competitive ability:
Purple loosestrife is competitively superior over native wetland plant species (Blossey 2002).
Rational:

Sources of information:
Blossey, B. 2002. Purple Loosestrife. In: Driesche, R.V. et. al. 2002. Biological Control of Invasive Plants in the Eastern United States. USDA Forest Service Publication FHTET-2002-04, 413 pp.

2.6. Forms dense thickets, climbing or smothering growth habit, or otherwise taller than the surrounding vegetation

A.	No	0
B.	Forms dense thickets	1
C.	Has climbing or smothering growth habit, or otherwise taller than the surrounding vegetation	2
U.	Unknown	

Score 2

Documentation:
Describe grow form:
Purple loosestrife forms dense stands that shade out other plans (Bender and Rendall 1987). Densities as high as 80,000 stalks/acre have been recorded (Heidorn 1991).
Rational:

Sources of information:
Bender, J. and J. Rendall. 1987. Element Stewardship Abstract for *Lythrum salicaria* Purple Loosestrife. The Nature Conservancy. Arlington, VA.
Heidorn, R. 1991. Vegetation management guideline: purple loosestrife (*Lythrum salocaria* L.). Natural Areas Journal. 11(3): 172-173.

2.7. Germination requirements

A.	Requires open soil and disturbance to germinate	0
B.	Can germinate in vegetated areas but in a narrow range or in special conditions	2
C.	Can germinate in existing vegetation in a wide range of conditions	3
U.	Unknown	

Score 0

Documentation:
Describe germination requirements:
Germination of purple loosestrife is restricted to open soils and requires high temperature (WDNR 2004). Seedlings are not able to survive in the dense shade of the grass cover (Thompson 1991).
Rational:

Sources of information:
Thompson, D.Q. 1991. History of purple loosestrife (*Lythrum salicaria* L.) Biological control efforts. Natural Areas Journal. 11(3): 148-150.

Wisconsin Department of Natural Resources: abstract. Non-native plants. Purple Loosestrife (*Lythrum salicaria*). 2003. http://www.dnr.state.wi.us [May 7, 2004].

2.8. Other species in the genus invasive in Alaska or elsewhere

A. No 0
B. Yes 3
U. Unknown

Score 3

Documentation:
Species:
Lythrum hyssopifolia L., *L. maritimum* Kunth, *L. portula* (L.) D.A. Webber, *L. thymifolia* L., *L. tribracteatum* Salzm. ex Spreng, *L. virgatum* L.
Sources of information:
USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

2.9. Aquatic, wetland, or riparian species

A. Not invasive in wetland communities 0
B. Invasive in riparian communities 1
C. Invasive in wetland communities 3
U. Unknown

Score 3

Documentation:
Describe type of habitat:
Purple loosestrife is found in cattail marshes, sedge meadows, and open bogs, and it along stream and river banks and lake shores (Bender and Rendall 1987, WDNR 2003).
Rational:

Sources of information:
Bender, J. and J. Rendall. 1987. Element Stewardship Abstract for *Lythrum salicaria* Purple Loosestrife. The Nature Conservancy. Arlington, VA.
Wisconsin Department of Natural Resources: abstract. Non-native plants. Purple Loosestrife (*Lythrum salicaria*). 2003. http://www.dnr.state.wi.us [May 7, 2004.

Total Possible 25
Total 20

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3. DISTRIBUTION

3.1. Is the species highly domesticated or a weed of agriculture

A. No 0
B. Is occasionally an agricultural pest 2
C. Has been grown deliberately, bred, or is known as a significant agricultural pest 4
U. Unknown

Score 4

Documentation:
Identify reason for selection, or evidence of weedy history:
In North America, it was first reported in 1814. Further introductions have occurred most likely as ornamental plantings. It continues to be widely planted in gardens (Royer and Dickinson 1999).
Rational:

Sources of information:
Royer, F. and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.

3.2. Known level of impact in natural areas

A.	Not known to cause impact in any other natural area	0
B.	Known to cause impacts in natural areas, but in dissimilar habitats and climate zones than exist in regions of Alaska	1
C.	Known to cause low impact in natural areas in similar habitats and climate zones to those present in Alaska	3
D.	Known to cause moderate impact in natural areas in similar habitat and climate zones	4
E.	Known to cause high impact in natural areas in similar habitat and climate zones	6
U.	Unknown	

Score 4

Documentation:

Identify type of habitat and states or provinces where it occurs:

Purple loosestrife displaced grass cover in aquatic communities in New York state (Thompson 1991). In wetlands in Wisconsin it forms monospecific stands that reduce biotic diversity (WDNR 2003).

Sources of information:

Thompson, D.Q. 1991. History of purple loosestrife (Lythrum salicaria L.) Biological control efforts. Natural Areas Journal. 11(3): 148-150.

Wisconsin Department of Natural Resources: abstract. Non-native plants. Purple Loosestrife (Lythrum salicaria). 2003. http://www.dnr.state.wi.us [May 7, 2004.

3.3. Role of anthropogenic and natural disturbance in establishment

A.	Requires anthropogenic disturbances to establish	0
B.	May occasionally establish in undisturbed areas but can readily establish in areas with natural disturbances	3
C.	Can establish independent of any known natural or anthropogenic disturbances	5
U.	Unknown	

Score 3

Documentation:

Identify type of disturbance:

Purple loosestrife flourishes in disturbed and degraded habitats, for example, wetlands that suffered from draining, natural drawdown, bulldozing, siltation, shore manipulation, cattle trampling, or dredging (Bender and Rendall 1987, WDNR 2003), but it also can colonize undisturbed wetland (Bossard et al. 2000). J. Snyder (pers. com.) observed this plant establishing in a pond and stream system in Michigan with no perceived disturbances.

Rational:

Sources of information:

Bender, J. and J. Rendall. 1987. Element Stewardship Abstract for *Lythrum salicaria* Purple Loosestrife. The Nature Conservancy. Arlington, VA.

Bossard, C.C., J.M. Randall and M.C. Hoshovsky. 2000. Invasive plants of California's wildlands. Pp. 218-221.

Snyder, J.M. UAF Cooperative Extension Service 2221 E. Northern Lights Blvd. #118 Anchorage, AK 99508-4143 tel: (907) 786-6310 alt.tel: (907) 743-9448 – Pers. obs.

Wisconsin Department of Natural Resources: abstract. Non-native plants. Purple Loosestrife (*Lythrum salicaria*). 2003. http://www.dnr.state.wi.us [May 7, 2004.

3.4. Current global distribution

A.	Occurs in one or two continents or regions (e.g., Mediterranean region)	0
B.	Extends over three or more continents	3
C.	Extends over three or more continents, including successful introductions in arctic or subarctic regions	5
U.	Unknown	

Score 5

Documentation:

Describe distribution:
This species distributed all over the world except in extremely cold and arctic regions. Purple loosestrife is native to Eurasia, extending from Great Britain across western Europe into central and southern Europe along the Mediterranean Basin. Japan is the core of the species native range in Asia; populations extend to Southeast Asia and India (Blossey 2002). It is present in North Africa and North America. It is also found in southeast temperate Australia (Bender and Rendall 1987).
Rational:

Sources of information:
Bender, J. and J. Rendall. 1987. Element Stewardship Abstract for *Lythrum salicaria* Purple Loosestrife. The Nature Conservancy. Arlington, VA.
Blossey, B. 2002. Purple Loosestrife. In: Driesche, R.V. et. al. 2002. Biological Control of Invasive Plants in the Eastern United States. USDA Forest Service Publication FHTET-2002-04, 413 pp.

3.5. Extent of the species U.S. range and/or occurrence of formal state or provincial listing

A.	0-5% of the states	0
B.	6-20% of the states	2
C.	21-50%, and/or state listed as a problem weed (e.g., "Noxious," or "Invasive") in 1 state or Canadian province	4
D.	Greater than 50%, and/or identified as "Noxious" in 2 or more states or Canadian provinces	5
U.	Unknown	

Score 5

Documentation:
Identify states invaded:
Purple loosestrife occurs in nearly all states of the United States (USDA 2002). It is a noxious weed in 25 states and 2 Canadian provinces (Invaders Database System 2003).
Rational:

Sources of information:
Invaders Database System. The University of Montana. 2003. Montana Noxious Weed Trust Fund. Department of Agriculture. http://invader.dbs.umt.edu/
USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Total Possible 25
Total 22

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4. FEASIBILITY OF CONTROL

4.1. Seed banks

A.	Seeds remain viable in the soil for less than 3 years	0
B.	Seeds remain viable in the soil for between 3 and 5 years	2
C.	Seeds remain viable in the soil for 5 years and more	3
U.	Unknown	

Score 2

Documentation:
Identify longevity of seed bank:
Viability of seeds decreased from 99% to 80% after two years of storage in a natural body of water (Bender and Rendall 1987). Seeds under cold dry storage remain highly viable for at least 3 years, but longevity under field conditions is unknown (DiTomaso and Healy 2003).
Rational:

Sources of information:

Bender, J. and J. Rendall. 1987. Element Stewardship Abstract for *Lythrum salicaria* Purple Loosestrife. The Nature Conservancy. Arlington, VA.
DiTomaso, J.M., and E.A. Healy. 2003. Aquatic and Riparian Weeds of the West. University of California Agricultural and Natural Resources. Publication 3421, pg. 245.

4.2. Vegetative regeneration

A.	No resprouting following removal of aboveground growth	0
B.	Resprouting from ground-level meristems	1
C.	Resprouting from extensive underground system	2
D.	Any plant part is a viable propagule	3
U.	Unknown	

Score: 2

Documentation:

Describe vegetative response:
Purple loosestrife can resprout from cut stems and regenerate from root fragments and pieces of the stem (Bender and Rendall 1987, Heidorn 1991, Royer and Dickinson 1999).
Rational:

Sources of information:
Bender, J. and J. Rendall. 1987. Element Stewardship Abstract for *Lythrum salicaria* Purple Loosestrife. The Nature Conservancy. Arlington, VA.
Heidorn, R. 1991. Vegetation management guideline: purple loosestrife (*Lythrum salicaria* L.). Natural Areas Journal. 11(3): 172-173.
Royer, F. and R. Dickinson. 1999. Weeds of the Northern U.S. and Canada. The University of Alberta press. 434 pp.

4.3. Level of effort required

A.	Management is not required (e.g., species does not persist without repeated anthropogenic disturbance)	0
B.	Management is relatively easy and inexpensive; requires a minor investment in human and financial resources	2
C.	Management requires a major short-term investment of human and financial resources, or a moderate long-term investment	3
D.	Management requires a major, long-term investment of human and financial resources	4
U.	Unknown	

Score: 4

Documentation:

Identify types of control methods and time-term required:
Current methods for eradication of large, dense populations of loosestrife are not totally effective. Mechanical control methods are ineffective, and most herbicides are non-selective. Follow-up treatments are recommended for three years after plants are removed (Bender and Rendall 1987). Biological controls have been developed in North America (Swearing 2002).
Rational:

Sources of information:
Bender, J. and J. Rendall. 1987. Element Stewardship Abstract for *Lythrum salicaria* Purple Loosestrife. The Nature Conservancy. Arlington, VA.
Swearing, J. M. 2002. Purple loosestrife, *Lythrum salicaria*. U.S. National Park Service. On Line Report. www.nps.gov/plants/alien/fact/lysa1.htm

Total Possible: 10
Total: 8

Total for 4 sections Possible: 100
Total for 4 sections: 84

References:

Bender, J. and J. Rendall. 1987. Element Stewardship Abstract for *Lythrum salicaria* Purple Loosestrife. The Nature Conservancy. Arlington, VA.

Blossey, B. 2002. Purple Loosestrife. In: Driesche, R.V. et. al. 2002. Biological Control of Invasive Plants in the Eastern United States. USDA Forest Service Publication FHTET-2002-04, 413 pp.

Bossard, C.C., J.M. Randall and M.C. Hoshovsky. 2000. Invasive plants of California's wildlands. Pp. 218-221.

Carlson M.L., Ph.D., Assistant Research Professor – Botany, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2790 – Pers. obs.

DiTomaso, J.M., and E.A. Healy. 2003. Aquatic and Riparian Weeds of the West. University of California Agricultural and Natural Resources. Publication 3421, pg. 245.

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Invaders Database System. The University of Montana. 2003. Montana Noxious Weed Trust Fund. Department of Agriculture. http://invader.dbs.umt.edu/

Mann, H. 1991. Purple Loosestrife: a botanical dilemma. Osprey 22:67-77.

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