

## Ohio Invasive Plant Assessment Protocol

Botanical Name: *Rhamnus cathartica*  
 Common Name: Common buckthorn, European buckthorn  
 Family Name: Rhamnaceae  
 Assessment conducted by: OIPC Team

Step I Outcome: **Invasive**  
 Step II Score: **58**  
 Step II Outcome: **Invasive**

**Score**

**Notes**

**References**

### Step I

*Directions: Place an "X" in the Score column next to the selected answer to each of the four questions.*

**1. Is this plant known to occur in the state and listed as "noxious" on any federal or Ohio Department of Agriculture plant list?**  
 Yes. Place on invasive plant list, no further investigation needed. **STOP**  
 No. Continue on to question 2.

X

**2. Has this plant demonstrated widespread dispersion and establishment (i.e. high numbers of individuals forming dense stands) in natural areas across two or more regions in Ohio?<sup>a</sup>**  
 Yes. Place on invasive plant list, no further investigation needed. **STOP**  
 No. Continue on to question 3.

x

Species occurs in 4 regions of Ohio, but population sizes have not been documented

1,2

**3. Does this plant form self-replicating populations outside of cultivation in Ohio and is it documented to alter the composition, structure, or normal processes or functions of a natural ecosystem?**  
 Yes  
 No  
 Unknown

X

Species occurs in 4 regions of Ohio, but impacts on ecological processes and functions have not been documented.

**4. Is the plant listed as invasive in an adjoining state or a nearby state east of the Mississippi within the USDA Plant Hardiness zones 5-6?<sup>b,c</sup>**  
 Yes  
 No  
 Unknown

x

CT, IL, MA, NH, VT, MI, PA

3,4,5,6,7

*If the answer was yes for both questions 3 and 4, the plant is placed on the invasive plant list and no further research is needed. Stop here. If the answer is no for both questions 3 and 4, the plant is not considered invasive and no further investigation is warranted. Otherwise, proceed to Step II.*

### Step II: Invasion Status

*Directions: Place the appropriate numerical score (or "U") in the Score column next to the selected answer to each of these 18 questions.*

#### 1. Current Invasion in Ohio

- plant is not found in natural areas (**0 pts.**)
- plant is found in natural areas but only because it persist from previous planting in that location (e.g. old home sites) (**0 pts.**)
- plant is only expanding from sites of previous planting (**1 pt.**)
- plant occurs in natural areas away from site of planting (**3 pts.**)
- Information unknown (**U**)

3

1,2

#### 2. State Distribution<sup>a</sup>

- plant is not naturalized in any region of Ohio (**0 pts.**)
- plant is naturalized in only one region in Ohio (**1 pt.**)
- plant is naturalized in two regions in Ohio (**2 pts.**)
- plant is naturalized in three regions in Ohio (**3 pts.**)
- plant is naturalized in four regions in Ohio (**4 pts.**)

4

Regions 1,2,3,5

1,2,20

- plant is naturalized in five regions in Ohio (5 pts.)
- Information unknown (U)

### 3. Regional/US Distribution

- plant is not considered to be a problem in any other state (0 pts.)
- plant has been reported as a widespread problem in another non-neighboring state within the USDA Plant Hardiness Zones 5-6 (1 pt.)
- plant has been reported to be a widespread problem in 1-2 adjoining states (3 pts.)
- plant has been reported to be a widespread problem in 3 or more adjoining states (5 pts.)
- plant has been reported to be a widespread problem in similar habitat outside the US (1 pt.)
- Information unknown (U)

3

MI,PA

5,6,20

## Step II: Biological Characters

### 4. Vegetative Reproduction

- no vegetative reproduction (0 pts.)
- reproduces readily within the original site (1 pt.)
- has runners or spreading rhizomes that root easily (3 pts.)
- fragments easily and fragments can be easily dispersed (4 pts.)
- has runners or spreading rhizomes that root easily AND fragments easily and fragments can be easily dispersed (5 pts.)
- Information unknown (U)

0

10

### 5. Sexual Reproduction

- no sexual reproduction (0 pts.)
- infrequent sexual reproduction (1 pt.)
- frequent sexual reproduction, but high variation among years in seed production (3 pts.)
- frequent sexual reproduction (one or more events per year) (5 pts.)

5

10=>Site conditions impact fruit set. 12=>species is dioecious species with a sex ratio of 6-7 female individuals per male individual (Godwin 1943). 18=>buckthorn in North America reportedly reproduces only when 9-20 yrs old, but once maturity is achieved, plant produces seed every year (prolifically).

10,12,29

- Information unknown (U)

### 6. Number of Viable Seeds or Propagules per Plant

- few (0-10) (1 pt.)
- moderate (11-1,000) (3 pts.)

- prolific (>1,000) (5 pts.)

- Information unknown (U)

3

10=>Fruit set is variable - but plants that do produce seed produce more than 11 viable seeds, with very few accounts describing more than 1000 seeds per plant (and those were in Europe). 12=> prolific fruit set in Canada. 29=>in Canada, female flowers appear in clusters of about 30 and male flowers in clusters of about 40, fruits are drupes containing 1-5 seeds (commonly 4 seeds).

10,12,29,33

### 7. Flowering Period

- one month or less per year (0 pts.)
- two months (1 pt.)
- three to five months (2 pts.)

1

May to June

10,29

- longer than five months (3 pts.)
- Information unknown (U)

**8. Dispersal Ability**

- low potential for long-distance seed/propagule dispersal (>1km) (0 pts.)
- medium potential for long-distance seed/propagule dispersal (3 pts.)
- high potential for long-distance seed/propagule dispersal (5 pts.)
- Information unknown (U)

**9. Generation Time**

- long juvenile period (>5 or more years for trees, 3 or more years for other growth forms) (0 pts.)
- short juvenile period (<5 years for trees, <3 years for other forms) (3 pts.)
- Information unknown (U)

**10. Establishment**

- unable to invade natural areas (0 pts.)
- can only colonize certain habitat stages (e.g. early successional habitats) (1 pt.)
- aggressively colonizes and establishes in edge habitats (3 pts.)
- aggressively colonizes and establishes in intact and healthy natural areas (6 pts.)
- Information unknown (U)

**Step II: Ecological Importance**

**11. Impact on Ecosystem Processes**

- no known effect on ecosystem-level processes (0 pts.)

5

Dispersed by birds, water, deer, small mammals. The seeds produce a "severe laxative effect" that help distribute the seed.

8,10,18,24,25,29,32

0

13=>"age of first reproduction, based on observations of the youngest flowering individuals in this study site, is between 4 and 6 years of age (personal observation)." 18,19=>European studies report that buckthorn reproduces as young as 4 yrs old but North American investigations state between 9-20 years old.

10,13,18,19

6

12=>species is plastic in that it has two growth forms (a tree in the shade, and a large, reproductive shrub in the full sun). 13=> observed mean rate of linear expansion was 6.7 m per year in New Hampshire. 22=> in WI, buckthorn is aggressive and reaches 81% mean density. 26=>populations are sparse in beech-maple forests but are dense in open fields. 30=>buckthorn increased in frequency over 40+ years in WI forests, but was not linked to declines in native plant species.

10,12,13,22,26,30

Influx of nutrients create favorable soil conditions for exotic earthworms (positive feedback loop), 9 => "affects soil chemistry by acidifying soil, increasing nitrogen content, and lowering soil C:N", also 9=> "The results...support observations that R. cathartica affects the soil environment in ways that affect...

## Step II

- moderate effects on ecosystem-level processes (e.g., changes in nutrient cycling)(3 pts.)

- causes long-term, substantial alterations in the ecosystem (e.g., changing fire regime of an area, changing hydrology of wetlands) (6 pts.)

### 12. Impact on Rare Organisms

- no known negative impact on Ohio State-listed or federal-listed plants or animals (0 pts.)
- negatively impacts listed species, such as through displacement or interbreeding (3 pts.)

### 13. Impact on Native Animals

- no known negative impact on animals (0 pts.)

- documented direct or indirect negative effects on animal taxa (3 pts.)

6

changes the soil environment in ways that often depress the germination, growth, and flowering of forest herbs". Authors of 9 also believe that the sp. is allelopathic but more studies are necessary. 11=> R. cathartica is the host of the soybean aphid. 14=>buckthorn leaves can break down rapidly in local streams, suggesting that "buckthorn has the potential to alter stream food webs by changing the timing of leaf fall and the duration of available allochthonous energy sources." 15=>buckthorn increases in cover after ash tree removal due to EAB. 16=>"soil in areas of the woodland where buckthorn dominates have higher percentage of nitrogen (N) and carbon (C), modified nitrogen mineralization rates, elevated pH, and higher soil moisture than those areas where buckthorn was not present." 18=>buckthorn produces chemicals that protect it from herbivory and pathogen attack, and is allelopathic. 18=>alteration of ecosystem processes, including decomposition and N and C cycling. 23=>forests dominated by buckthorn only have half the above-ground biomass as forests dominated by native species.

8,9,10,11,14,15,16,18,23

0

no evidence

3

Common buckthorn is the host for the Asian soybean aphid (*Aphis glycines*) and also is known to possibly promote invasion of nonnative earthworms. 18=>"*Turdus migratorius* (American robin) and *Hylocichla mustelina* (wood thrush) nest in *R. cathartica* and *L. maackii* shrubs (Schmidt and Whelan 1999). When birds nest in the exotic shrubs, they experience a higher rate of predation compared to birds nesting in native shrubs (Schmidt and Whelan 1999)." 21=>"Removal of invasive shrubs significantly reduced the abundance and biomass of invasive earthworms."

8,18,21

#### 14. Impact on Native Plants

- no known negative effects on native plants (0 pts.)
- negatively impacts some native plants (increasing their mortality and/or recruitment of certain taxa) (3 pts.)
- impacts native plants to such an extent that community structure is greatly altered (6 pts.)

#### 15. Hybridization

- no known instances of hybridization with other plant species (0 pts.)
- can hybridize with native Ohio plants or commercially-available species, but seeds are inviable (1 pt.)
- can hybridize with native Ohio plants or commercially-available species, producing viable seed (3 pts.)

#### 16. Population Density

- occurs only as small, sporadic populations or individuals (1 pt.)
- typically forms small, monospecific patches (3 pts.)
- is a dominant plant in area where population occurs (absolute cover 15-50%) (4 pts.)

8=>Species can cause a reduction in spp. richness, inhibition of seedling germination, growth, and flowering. 17=>species is potentially allelopathic and is detrimental to forbs. 18=>"Although the surveys and removal experiments do not definitively implicate *R. cathartica* in the decline of native species, and the controlled experiments under individual *R. cathartica* trees did not show detrimental effects on understory plants, it is quite likely that *R. cathartica* thickets have negative effects on native species in North America." 28=>modification of inorganic nitrogen availability impacts oaks. 30=>although buckthorn increased in frequency over several decades in WI, it was not associated with the documented decline in native plants. 31=>negative association between buckthorn presence and white/red oaks.

8,17,18, 28,30,31

3

Species can hybridize with other *Rhamnus* spp. - in MI, species was observed hybridizing with Chinese buckthorn (*R. utilis*).

10,20

3

8=>"present in 0.43 % (945 ha) of the land cover in the Oak Openings Region in 2007–2011 in Ohio", often forming large thickets. 18=>"The average number of seedlings beneath a dense *R. cathartica* stand in Saskatchewan, Canada was > 100/m<sup>2</sup>...(Archibold et al. 1997)." 18=>"*R. cathartica* forms dense monospecific thickets over large areas. In forests, it sometimes becomes the dominant understory species (Archibold et al. 1997), comprising 50% of all understory plant stems (Mackoff 2005) with

8,10,18,22

5

- forms an extensive, monospecific stand (absolute cover >50%) (5 pts.)

**17. Role in Succession in Natural Areas**

- successional information is unknown (0 pts.)

- is an early successional species that temporarily invades a disturbed site but does not persist as the site matures (0 pts.)

- readily invades disturbed sites and persists, but does not interfere with succession (1 pt.)

- readily invades disturbed sites, persists and interferes with succession of native plants (4 pts.)

**18. Number of Habitats Invaded**

Forestlands: Floodplain forest, hemlock-hardwood forest, mixed mesophytic forest, beech-maple forest, oak-maple forest, oak-hickory forest.

Grasslands: Alvar\*, beach-dune community\*, bur oak savanna\*, slough-grass-bluejoint prairie\*, sand barren\*, big bluestem prairie, little bluestem

Wetlands: Bog\*, fen\*, twigrush-wiregrass wet prairie\*, marsh, buttonbush swamp, mixed shrub swamp, hemlock-hardwood swamp\*, maple-ash-oak

\* Considered a rare plant community in Ohio by ODW's Biodiversity Database Program.

† = xeric limestone prairies or cedar glades and post oak openings are unique to the Interior Low Plateau Region of Adams, Highland and Pike counties and are not included in Schneider and Cochrane (1997)

- not found in any natural habitats in Ohio (0 pts.)

- only found in 1 broad category (1 pt.)

- found in 2 broad categories or 2 rare habitat types (3 pts.)

- found in 3 broad categories or 3 rare habitat types (4 pts.)

- found in 4 or more rare habitat types (5 pts.)

understory plant stems (wyckoff 2005) with densities reaching 34,600 sapling stems per hectare (J. J. Moriarty, personal communication)." 22=> in WI, buckthorn forms monotypic populations with a density of 81%.

4

9 => indicates that the persistence of this sp. in an area will likely change the successional trajectory of Wisconsin forests, but more time and data are needed. 14=>buckthorn increased in coverage in forests in which ash trees were killed by EAB in OH. 16=> soil under buckthorn has higher percentage of nitrogen (N) and carbon (C), modified nitrogen mineralization rates, elevated pH, and higher soil moisture than areas without buckthorn. 17=>buckthorn is potentially allelopathic. 34=>buckthorn persists and spreads when sown into "recently constructed native plant communities", depending on the light conditions and propagule pressure. 35=> in MN, buckthorn thrives in the forest understory and was not found in the open areas of the study site [different from studies in the eastern US]

9,10,15,16,17,34,35

4

forests, grasslands, fens, wetlands. 20=>see list in Table 2. 27=>also along bike paths.

8,9,10,18,20,27,29

**Total Score:**

58

**Number of Unknowns:**

0

**Outcome:**

Invasive

Total Points	Assessment Decision
4 or more U	Insufficient Data

0-34	Not Known to be Invasive
35-44	Pending Further Review
45-80	Invasive