

APPLICATION OF A SIMPLIFIED RISK ASSESSMENT METHOD FOR CONTROLLING INVASIVE ALIEN PLANT SPECIES IN PROTECTED AREAS: A CASE STUDY IN ŠUMAVA NATIONAL PARK, CR

Ing. Maria-Magdalini Mertzimeki

Supervisor: doc. Ing. Kateřina Berchová Bimová

Department of Applied Ecology

Faculty of Environmental Sciences, Czech University of Life Sciences Prague



Main invader of Sumava NP

- Ability to propagate vegetatively from creeping rhizomes
- Ability to tolerate harsh conditions
- Introduced accidentally or for ornamental reasons
- Inhabits a range of habitat types from open ruderal habitats, such as **road verges, wastelands, meadows to river banks**



Lupinus polyphyllus (Bigleaf Lupine)

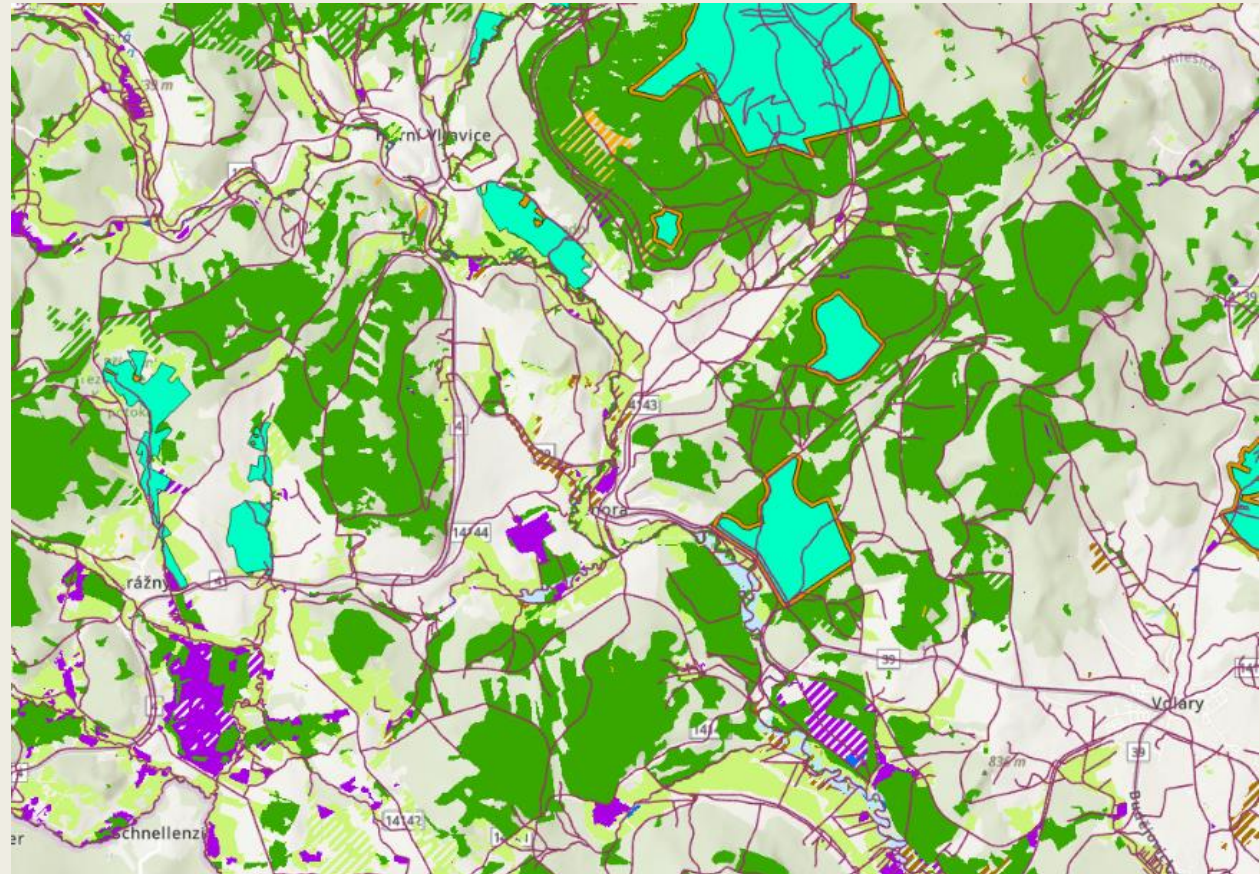
Manual Assessment

Data used:

- roads
- streams
- protected area zone
- buffer zone

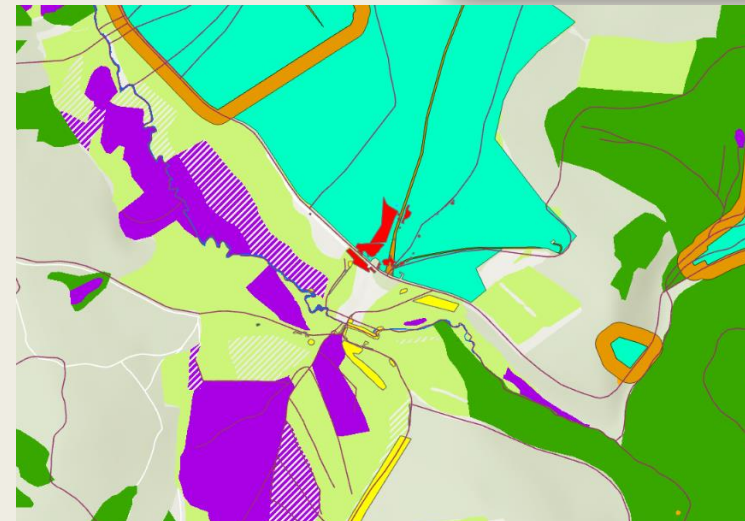
New data added:

- **Habitats/biotops**



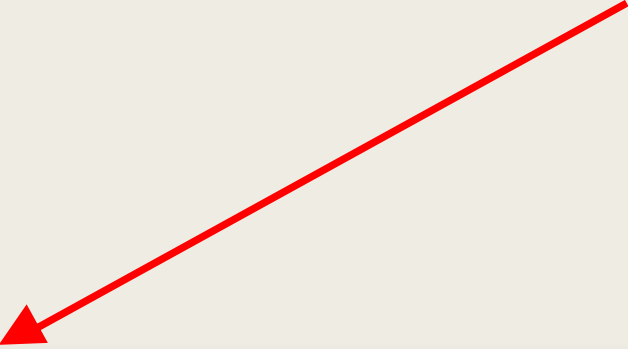
Prioritization

- Category I (1): Immediate control, High Priority
- Category II (2): Risk of expansion, Medium Priority
- Category III (3): Low-risk, Low priority



Excel data analysis

- Category I (1): Immediate control, High Priority
- Category II (2): Risk of expansion, Medium Priority
- Category III (3): Low-risk, Low priority



GlobalID	Species	GIS Application	Manual	Rate of Disagreement	Justify
{E3AD4BCF-EF6E-40E4-9854-0F37358A187D}	<i>Lupinus polyphyllus</i>	2	2	0	inside grassland/heathland habitat, near stream and road
{4713AD77-C7F9-4B3D-BA29-24E3300F9942}	<i>Lupinus polyphyllus</i>	2	2	0	near road
{FF7C6186-64F5-4EFE-AFA1-F5F0CA50A9B5}	<i>Lupinus polyphyllus</i>	2	2	0	inside grassland/heathland habitat, near road
{4ACF362A-616A-4794-9D3D-4AFFC201EAB2}	<i>Lupinus polyphyllus</i>	2	2	0	inside grassland/heathland habitat, near road
{C5C2A3AF-8053-4CD4-A827-D572AA7E3696}	<i>Lupinus polyphyllus</i>	2	2	0	above road, inside grassland/heathland habitat
{F6321BC0-91C0-4C42-9350-962ABC384A1B}	<i>Lupinus polyphyllus</i>	2	2	0	inside grassland/heathland, near peatbogs + roads
{C02A5B3A-2BF0-4508-A7C3-523C1600ECE2}	<i>Lupinus polyphyllus</i>	2	2	0	near peatbogs
{60A3138B-F5D1-4D79-B9E8-0613B3CEF7BC}	<i>Lupinus polyphyllus</i>	2	2	0	near peatbogs
{2B0F46C6-F730-4ABB-AED5-8DF154DFAC7F}	<i>Lupinus polyphyllus</i>	2	2	0	inside peatbogs, near forest habitat
{310948C5-F179-4567-BEAD-AEFC8714FECC}	<i>Lupinus polyphyllus</i>	2	2	0	inside heathlands and stream habitats, nearby roads
{A0F2DB25-5513-4366-975F-2F9D85E62A79}	<i>Lupinus polyphyllus</i>	2	2	0	inside heathlands, nearby roads
{054190D0-2A12-4699-948D-FD4B4BCC1332}	<i>Lupinus polyphyllus</i>	2	2	0	inside heathlands, nearby streams
{5078E3DE-DA5A-4748-B817-83E13789D314}	<i>Lupinus polyphyllus</i>	2	2	0	inside heathlands and peatbogs habitats
{77113AD7-F29E-466C-8489-5DE4810B741A}	<i>Lupinus polyphyllus</i>	2	2	0	inside heathlands and peatbogs habitats
{2D822143-F843-479E-80C2-70FD59D4DD96}	<i>Lupinus polyphyllus</i>	2	2	0	inside heathlands and peatbogs habitats
{134ED0F6-FE73-4491-A521-EEE4541F1E01}	<i>Lupinus polyphyllus</i>	2	3	1	nearby heathlands and peatbogs habitats and roads
{A4EFA07C-DA9B-4A2B-88F9-EFCD761A96}	<i>Lupinus polyphyllus</i>	2	2	0	inside forest
{4B2352BC-81C7-4BDB-91DF-4C46708749AB}	<i>Lupinus polyphyllus</i>	2	2	0	inside heathland habitat, close to stream
{054F9A60-D598-49BB-8AD9-CC4462B78520}	<i>Lupinus polyphyllus</i>	2	2	0	inside heathland
{0625060A-1833-4351-9E37-2C1172D849BF}	<i>Lupinus polyphyllus</i>	2	2	0	inside heathland
{B7281F4A-BE79-4FF8-A052-B9DE032947A8}	<i>Lupinus polyphyllus</i>	2	2	0	inside heathland
{D9BD0F12-DE6E-476A-BFB4-1A855CE576A3}	<i>Lupinus polyphyllus</i>	2	2	0	inside heathland, expansion in streams
{5F896588-6BB3-4519-9A3D-4636CEB3B19A}	<i>Lupinus polyphyllus</i>	2	2	0	inside heathland
{B97A7383-702F-4611-9A0B-99A190E6EC8A}	<i>Lupinus polyphyllus</i>	2	2	0	inside heathland
{33F65227-267E-475F-9426-7021EE6E495E}	<i>Lupinus polyphyllus</i>	3	3	0	
{0875EDD0-4224-4467-9BDE-CC1C4E0379B4}	<i>Lupinus polyphyllus</i>	3	3	0	
{3C327759-1BC3-44EF-A72B-624489A6A667}	<i>Lupinus polyphyllus</i>	3	3	0	
{AE410BB1-E5E0-4631-9E21-D62A2A287EEB}	<i>Lupinus polyphyllus</i>	3	3	0	nearby peatbogs, but not inside any habitat or near road

Data analysis

GIS vs Manual Assessment Evaluation:

■ Binomial GLM

Results:

- 1st Category, 49 cases, rate of dis. 0,14
- 2nd Category, 127 cases, rate of dis. 0.10
- **3rd Category, 73 cases, rate of dis. 0.2**

The screenshot displays the RStudio interface with the following components:

- Source Editor:** Contains R code for a binomial GLM analysis:

```
1 library(glm2)
2 install.packages("glm2")
3 glm_model <- glm(Disagreement-GIS+Manual, data = Sumava_Manual_MM_2024, family="binomial")
4 summary(glm_model)
5
6 ##Count the samples with disagreement rate 1
7 dis_1 <- sum(Sumava_Manual_MM_2024$Disagreement==1)
8 ##Count the samples with disagreement rate 2
9 dis_2 <- sum(Sumava_Manual_MM_2024$Disagreement==2)
10 dis_0 <- sum(Sumava_Manual_MM_2024$Disagreement==0)
11
12
13 ##Calculate disagreement rate by category
14 dis_rate <- aggregate(Disagreement-GIS+Manual, data=Sumava_Manual_MM_2024, function(x)sum(x)/
15 print(dis_rate)
16
17 coefficients <-coef(glm_model)
18 print(coefficients)
19
20
```
- Console:** Shows the execution output:

```
R 4.3.3 ~ C:/Users/mm/Desktop/
Error in install.packages : Updating loaded packages
> glm_model <- glm(Disagreement-GIS+Manual, data = Sumava_Manual_MM_2024, family="binomial")
> summary(glm_model)

Call:
glm(formula = Disagreement ~ GIS + Manual, family = "binomial",
    data = Sumava_Manual_MM_2024)

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -3.2561    0.8224  -3.959 7.52e-05 ***
            GIS      -0.1852    0.5088  -0.364  0.716
            Manual    0.8167    0.5234   1.560  0.119
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Dispersion parameter for binomial family taken to be 1

> print(dis_rate)
[1] 0.14
[1] 0.10
[1] 0.20
```
- Environment:** Shows the loaded objects:

Object	Description
dis_rate	6 obs. of 3 variables
glm_model	List of 30
Sumava_Manual_MM_2024	227 obs. of 7 variables
- Files:** Shows a file explorer view of the desktop directory.