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Forest Bioenergy in the Protected Mediterranean Areas

Impact assessment of increase biomass use in the short, medium and long term in the protected areas

Annex 2 : Study area report - SLOVENIA

Workpackage 3 - Testing

Activity A.3.5. - Threats and benefits of increase the biomass use in the protected areas

Deliverable D.3.5.1. – Impact assessment of increase biomass use in the short, medium and long term in the protected areas

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1 PRELIMINARY ASSESSMENT IN THE STUDY AREA

Slovenia belongs to the most forested countries in Europe. 1,186,104 ha of forests cover more than a half of its territory (forestation amounts to 58.5%). Most Slovenian forests are located within the area of beech, fir-beech and beech-oak sites (70 %), which have a relatively high production capacity (Zavod za gozdove, 2018). Main forest habitat type in Park Škocjanske Caves area of influence are coppice beech and oak forests, main forest category included in the "Habitats Directive" is *Fagus sylvatica (Aremonio - Fagion).*

Characteristic habitat types are black pine plantations (planted in last century) that are temporary forest category as a consequence of forest restoration on opened rocky karst areas. Plantations are left to natural regeneration, rarely used practice is shelterwood cutting that has bigger impact on tree species composition. In addition to damage caused by weather (wind, sleet, snow), Slovenian forests have lately been endangered mostly by insects (mainly by bark beetles) that are the most common reason for sanitary cut (37% of sanitary cut). On average sanitary cut amounts to a third of the entire cut and in different years it ranges between 19% and 45% of the total cut. Such a situation reduces the share of necessary tending cut, thus making planned forest management difficult and at the same time it weakens the bioecological stability of forests. (Zavod za gozdove, 2018)

1.1 Škocjan Caves Regional Park and Pivka Lakes Nature Park

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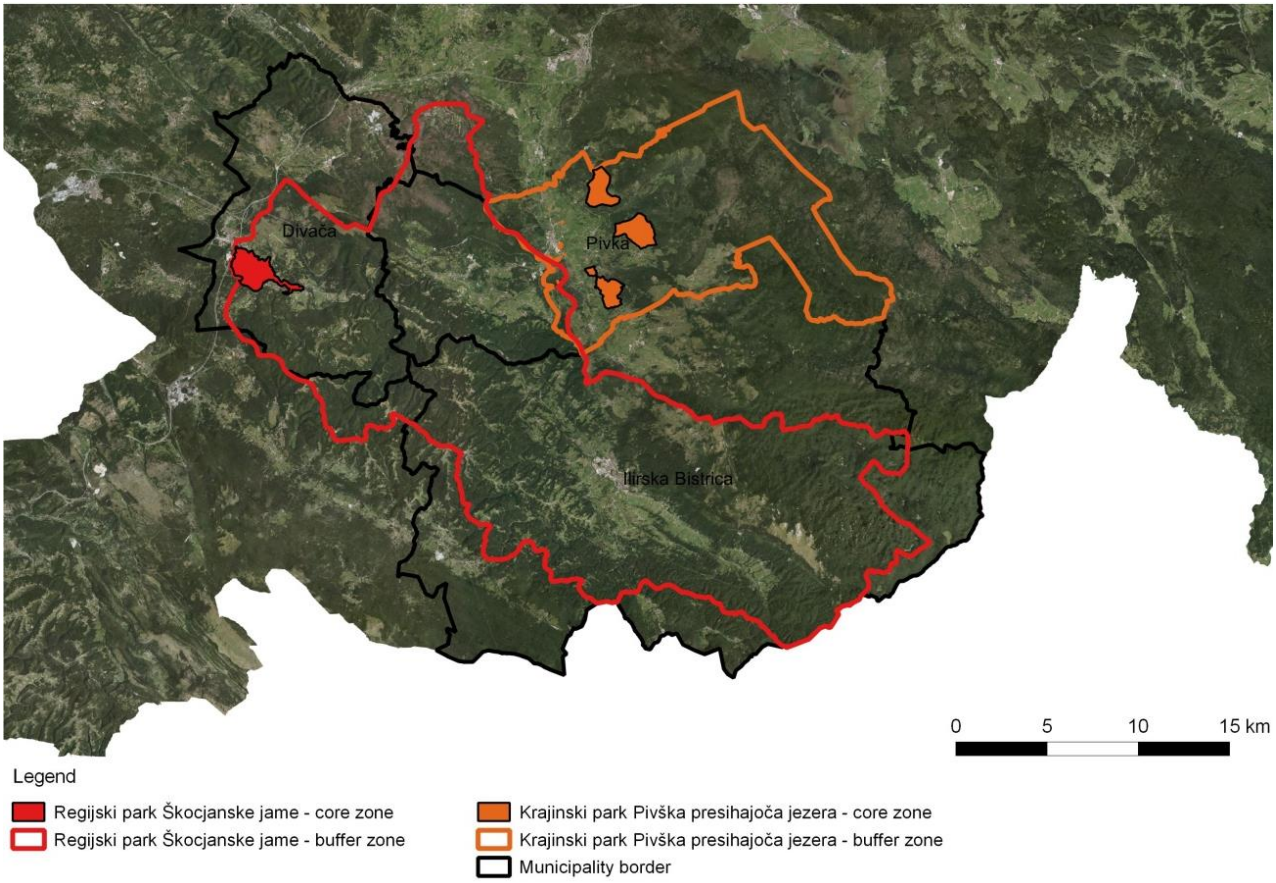
1.1.1 Biotic components

The whole area is presented in the figure 1, where core zones and buffer zones of two protected areas are displayed separately. Study area consists of two protected areas buffer zones – Škocjan Caves Regional Park and Pivka Lakes Nature Park (hereinafter: study area). Matrices of the possible impacts of silvicultural and harvesting practices on biotic and abiotic components are assesed for the whole study area.

Figure 1: Study area – buffer and core zones of Škocjan Caves Regional Park and Pivka Lakes Nature Park



Škocjan Caves Regional Park

Škocjan Caves Regional Park with the famous UNESCO protected Škocjanske caves. The area of influence of the Škocjan Caves Regional Park ecompasses the entire Reka River watershed and covers 45.000 ha.

Škocjanske Caves Regional Park is situated at the extensive junction of the karst and non-karst worlds at the southwestern foot of a high barrier of Dinaric plateaus. Its favourable location is influenced by the Mediterranean climate, and its surface is heavily broken. Reigning above it is the 1,796-metre high Mount Snežnik, the area's easternmost border and the highest non-alpine mountain in Slovenia.

The regional park comprises a unique landscape that brings together a large number of natural valuable features or natural heritage in the form of Karst or other phenomena and interesting features.

The regional park constitutes a typical "Karst architecture" with its system of caves, collapse dolines and individual natural monuments. The unique distribution of flora and fauna co-existing in an extremely small area proves that this is a highly diverse region in terms of both biotic and abiotic parameters and simultaneously a vulnerable one. (Park Škocjanske jame, 2018)

The area of influence of the Škocjan Caves Regional Park ecompasses the entire Reka River watershed and covers 450 square kilometres. It is situated at the extensive junction of the karst and non-karst worlds at the southwestern foot of a high barrier of Dinaric plateaus. Its favourable location is influenced by the Mediterranean climate, and its surface is heavily broken. Reigning above it is the 1,796-metre high Mount Snežnik, the area's easternmost border and the highest non-alpine mountain in Slovenia.

Areas that Škocjan Caves Regional Park consists of:

- Snežnik mountain chain
- Reka River valley
- Brkini
- Vremščica, Košana valley, Prestranško-slavinski ravnik and Sajevško polje
- Škocjan Caves Park area

Mount Snežnik is known for its interesting flora that is extremely diverse from both phytogeographic and ecological points of view. It is known for its many plants, rare and common, as well as ecologically and floristically highly diverse plant associations. Not long ago the area above Ilirska Bistrica was covered with many meadows that were created following the deforestation of flowering ash, European hop hornbeam and downy oak habitats. Nowadays, these are overgrown due to the progressive cessation of pastoral stockfarming and mowing. Above them, vast fir-beech forests extend, while pine trees prevail in numerous depressions where temperature inversions occur. The Snežnik mountain chain is also known for its diverse fauna. Hardly accessible and still rather intact forests offer shelter to many animal species, among others to three greatest predators, the bear, wolf and lynx.

Reka River Valley is an ornithologically important area where, on the humid and flooding meadows, smaller swamps, reeds and the Reka River banks, many animals found their habitat, including the corncrake (Crex crex), a globally endangered species, little bittern (*Ixobrychus minutus*), common quail (*Coturnix coturnix*), kingfisher (*Alcedo atthis*), bee-eater (*Merops apiaster*) and other rare bird species. Flooding and marshy meadows are of significant importance especially in the sub-Mediterranean part of Slovenia since they represent a valuable and rare habitat of endangered plant and animal species, among them the scarce large blue (*Maculinea teleius*), a globally endangered butterfly species. Thermophilic slopes and occasional steep walls created as a result of the thrust of Snežnik's calcareous mass on the flysch Reka River valley are interesting from both the floral and faunal points of view.

In Brkini moderately acidophilic beech forests prevail, and the intermittent grassy areas are mainly overgrown with upright brome grasses and Chrysopogon gryllus.

All the present habitat types within Škocjan Caves Regional Park buffer zone, included in Natura 2000:

91E0*	Alnus glutinosa in Fraxinus excelsior (Alno- Padion, Alnion incanae, Salicion albae)
9110	Luzulo-Fagetum
91K0	Fagus sylvatica (Aremonio - Fagion)
9410	Vaccinio-Piceetea
4060	Alpine and Boreal heaths
4070*	Mugo-Rhododendretum hirsuti
5130	*Juniperus communis* formations on heaths or calcareous grasslands
6170	Alpine and subalpine calcareous grasslands
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
8120	Thlaspietea rotundifolii
8210	Calcareous rocky slopes with chasmophytic vegetation
8310	Caves not open to the public
9180*	*Tilio-Acerion* forests of slopes, screes and ravines

All the present plant species within study area, included in Natura 2000:

SP 4089	Arabis scopoliana
SP 4104	Himantoglossum adriaticum
SP 4087	Serratula lycopifolia

Besides these many endemic, rare and endangered plant species that are present: Orobanche hederae, Lamium westtsteinii, Campanula justiniana, Primula auricula, Saxifraga crustata, Viola biflora, Kernera saxatilis, Adiantum capillus-veneris, Asparagus acutifolius, Juniperus oxycedrus...

Within protected area of Škocjan Caves Regional Park buffer zone there are 90 species of butterflies that represent 50% of all species, present in Slovenia. Some of them are also defining Natura 2000 site – Kras: *Euplagia quadripunctaria, Zerynthia polyxena, Euphydryas aurinia* and *Parnassius mnemosyne. Perisomena caecigena* is endemit species within Kras Natura 2000 site.

Last bird species inventory pointed out that 81 bird species are present. From that 49 species are nesting there too.

Within Škocjan Caves Regional Park buffer zone there are 9 Natura 2000 site that include 6 different Special Areas of Conservation (SAC) and 3 Special Protection Area (SPA):

- SI3000130 Kozja luknja (SAC)
- SI3000222 Zabiče (SAC)

- SI3000223 Reka (SAC)
- SI3000197 Slavinski Ravnik (SAC)
- SI3000231 Javorniki – Snežnik (SAC)
- SI3000276 Kras (SAC)
- SI5000003 Dolina Reke (SPA)
- SI5000002 Snežnik – Pivka (SPA)
- SI5000023 Kras (SPA)

Pivka Lakes Nature Park

The Pivka lakes nature park lies is rougly divided into two parts. The lowladns part, the open, cultivated ara of mosaic landscape of seasonally flooded meadows, river bed and lake depressions and dry carboniferous pastures. This area lies between 620 and 520 m ASL. The second part is the hill area surrounding the forests, covering more than half of the park area.

The Pivka lakes nature park is divided into two distinctive morphological units: levelled bottom of the basin and higher rocky terrace along the Javorniki mountains. Depressions of the Pivka lakes are deepened into the terrace. Most of the depressions of the Pivka lakes are doline-like. In rainy season, water table in the karst bedrock rises and water appears on the surface and fills the lakes.

As many as 17 regularly occurring lakes (jzero) are as follows:

Šembijsko jezero, Kalsko jezero, Laneno jezero, Bačko jezero, Kljunov ribnik, Veliki dol (za Kalcem), Malo Zagorsko jezero, Veliko Zagorsko jezero, Veliko Drskovško jezero, Malo Drskovško jezero, Parsko jezero, Radohovsko jezero, Klenski dol, Palško jezero, Petelinjsko jezero, Krajnikov dol and Jeredovce. Furthermore, several other flooded karst depressions of different extent were observed, such as Nariče, which is a part of Šembijsko jezero, and the extensive flooding area around Knežak and Bač (Mulec et al, 2005).

The nature in the Pivka lakes nature park faces two contradictions: lack of water and heavy droughts during dry summers on one hand, and vast volumes of water and floods during high precipitations, which prevent maintaining of adequate dry fields and meadows, on the other.

The Pivka valley belongs to two phytogeographical areas, Submediterranean and Dinaric. The seasonal flooding of the Pivka lakes creates special growing conditions for some very interesting plant species as the floods last from some days to, in extreme circumstances, even to half a year.

The inventory of flora and vegetation of the Pivka lakes includes 182 species of higher plants. The area is floristically still poorly examined but the following species are to be highlighted: small bunches of siberian iris (Iris sibirica) found only on the eastern part of Petelinjsko lake, vast associations of mouse garlic (Allium

angulosum), an association of wild gladiolus and purple moor grass (Gladiolo-Molinietum), association of tufted hairgrass and tall plantain (Deschampsio-Plantaginetum altissimae) (Polak, 2005).

Dry, half-dry and seasonally flooded meadows represent living space to many animal and plant species creating many ecological niches. Due to overgrowth of open cultural land on one hand and due to intensive agricultural exploitation and other anthropogenic impacts, some of them are becoming heavily endangered. The most threatened species are those connected with marshy grass-lands and wet meadows. Also, many of the species adapted to opened grassland and exensive pastures are endangered sice the habitat is either overgrown by different forest stages or exposed to intensive mowing and pastural stockfarming.

For the flora and fauna of the Pivka lakes both open, meadow-like flooded areas and higher dry meadows at the lakes margins and elevated areas inbetween are important. Dry and flooded meadows, classified into a group of wetland habitats are exceptional due to a large number of plant and animal species, typical of this particular biotope. Especially Petelinjsko lake and Palško jezero stand out from the floristic and faunistic point of view. In the lakes or puddles 18 species of water animals were found, above all insects and tiny shrimps. Abundant numbers of the endemic fairy shrimp Chirocephalus croaticus from Petelinjsko lake indicate that the population is in good condition. Many specimens of Proteus anguinus are found not just in Matijeva jama, but also in in Pivšce and in the upper part of the Pivka riverbed when high karst waters eject them (Polak, 2005).

The area of the Pivka intermittent lakes has also many other animals, occasionally game and wild beasts. Petelinjsko jezero and Palško jezero are very important nesting areas. The nesting density of certain birds is among the highest in Slovenia: corncrake (Crex crex), barred warbler (Sylvia nisoria), quail (Coturnix coturnix), common whitethroat (Sylvia communis), red-backed shrike (Lanius collurio) and corn bunting (Miliaria calandra). Migrating birds use the Pivka basin as a migration corridor between the highlands of Snežnik and the Javorniki on one side and Hrušica and Nanos on the other.

From the big mammals, the brown bear (Ursus arctos), wildcat (Felis silvestris), fox (Vulpes vulpes), badger (Meles meles) and beech marten (Martes foina) can be met. Also, wolves (Canis lupus) are not strangers to the area (Polak, 2005).

Regarding the butterflies, different habitats host different species, varying from those on marsh butterflies and typical mesophilic butterfly species to butterflies from dry, barren karst bedrock. The most important and endangered species are also the Natura 2000 species, marsh fritillary (Euphydryas aurinia) and scarce large blue (Maculiea teleius) (Polak, 2005).

More than half of the surface of the Pivka lakes nature park is coverd by vast forests. The most important forest types in terms of conservation are the remains of old oak forests, especially the Turkey oak (Quercus cerris) forests at the edges of the Pivka poljes. Both the wet meadows and the dry karst grasslands in the

Pivka region are to a great extent the result of the work of man and do not display the natural potential vegetation. The following major forest types are present in the park area: Illyrian beech forests with common beech (Fagus sylvatica) cover large part of the protected area and represent main habitat type. The gorges and gravel slopes are coverd by Large-leaved Lime (Tilia platyphyllos), maple trees (Acer sp.), common ash (Fraxinus excelsior), and elm (Ulmus sp.). On the warm sunny hill slopes thermofilic oak forests (Quercus sp.) can be found where also mixed deciduous forests are present (Cernatič Gregorič A., 2013).
There are two Natura 2000 sites, a Special Areas of Conservation (SAC) named Javorniki – Snežnik (SI3000231) and a Special Protection Area (SPA) named Snežnik – Pivka (SI5000002).

The following habitats are included into the SAC Javorniki – Snežnik location:

3180*	Intermittent lakes
4060	Alpine and boreal Ericaceae
4070	*Pinus mugo* in *Rhododendron hirsutum* pine communities
5130	*Juniperus communis* formations on heaths or calcareous grasslands
6170	Alpine and subalpine calcareous grasslands
62A0	Eastern Submediterranean dry grasslands (*Scorzoneretalia villosae*)
6410	Meadows with prevailing *Molinia caerulea on carbonate, peat and clay-muddy soil*
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
6510	Lowland, extensively cultivated meadows (*Alopecurus pratensis, Sanguisorba officinalis*)
8120	Carbonate scree from montane to alpine belt *(Thlaspietea rotundifolii)*
8210	Calcareous rocky slopes with chasmophytic vegetation
8310	Caves not open to public
9180*	*Tilio-Acerion* forests of slopes, screes and ravines
91K0	Illyrian beech forests (*Fagus sylvatica, Aremonio-Fagion)*
9410	Acid-like spruce forests from montane to alpine belt (*Vaccinio-Piceetea)*

Plant and animal species from the SAC Javorniki – Snežnik area:

4089	Arabis scopoliana
1308	western barbastelle (*Barbastella barbastellus)*
1078*	Jersey tiger *(Callimorpha quadripunctaria*)
1352*	Wolf (*Canis lupus*)

1088	great capricorn beetle (*Cerambyx cerdo*)
4072	*Cerastium dinaricum*
1065	marsh fritillary (*Euphydryas aurinia*)
4019	*Leptodirus hochenwartii*
1060	large copper (*Lycaena dispar*)
1361	Eurasian lynx *(Lynx lynx*)
1059	scarce large blue (*Maculinea teleius*)
1089	*Morimus funereus*
1186*	olm (*Proteus anguinus*)
1303	lesser horseshoe bat (*Rhinolophus hipposideros*)
1087*	Alpine longhorn beetle (*Rosalia alpine*)
1167	Italian crested newt (*Triturus carnifex*)
1354*	brown bear (*Ursus arctos*)

Plant and animal species from the SPA Snežnik – Pivka:

A109	rock partridge (*Alectoris graeca)*
A247	Eurasian skylark (*Alauda arvensis)*
A255	tawny pipit (*Anthus campestris)*
A091	golden eagle (*Aquila chrysaetos)*
A104	hazel grouse (*Bonasa bonasia)*
A215	Eurasian eagle-owl (*Bubo bubo)*
A224	European nightjar (*Caprimulgus europaeus)*
A030	black stork (*Ciconia nigra)*
A080	short-toed snake eagle (*Circaetus gallicus)*
A081	western marsh harrier (*Circus aeruginosus)*
A084	Montagu's harrier (*Circus pygargus)*
A113	common quail (*Coturnix coturnix)*
A122	corn crake (*Crex crex)*
A239	white-backed woodpecker (*Dendrocopos leucotos)*
A236	black woodpecker (*Dryocopus martius)*
A103	peregrine falcon (*Falco peregrinus)*

A217	Eurasian pygmy owl (*Glaucidium passerinum)*
A078	griffon vulture (*Gyps fulvus)*
A338	red-backed shrike (*Lanius collurio)*
A246	woodlark (*Lullula arborea)*
A383	corn bunting (*Miliaria calandra)*
A280	common rock thrush (*Monticola saxatilis)*
A214	Eurasian scops owl (*Otus scops)*
A072	European honey buzzard (*Pernis apivorus)*
A241	three-toed woodpecker (*Picoides tridactylus)*
A234	grey-headed woodpecker (*Picus canus)*
A120	little crake (*Porzana parva)*
A275	whinchat (*Saxicola rubetra)*
A220	Ural owl (*Strix uralensis)*
A307	barred warbler (*Sylvia nisoria)*
A108	western capercaillie (*Tetrao urogallus)*
A232	Hoopoes (*Upupa epops)*
A223	boreal owl (*Aegolius funereus)*
A412	rock partridge (*Alectoris graeca saxatilis)*

Qualifying Natura 2000 habitat types and species

Figure 1: Natura 2000 sites (SAC) within the study area

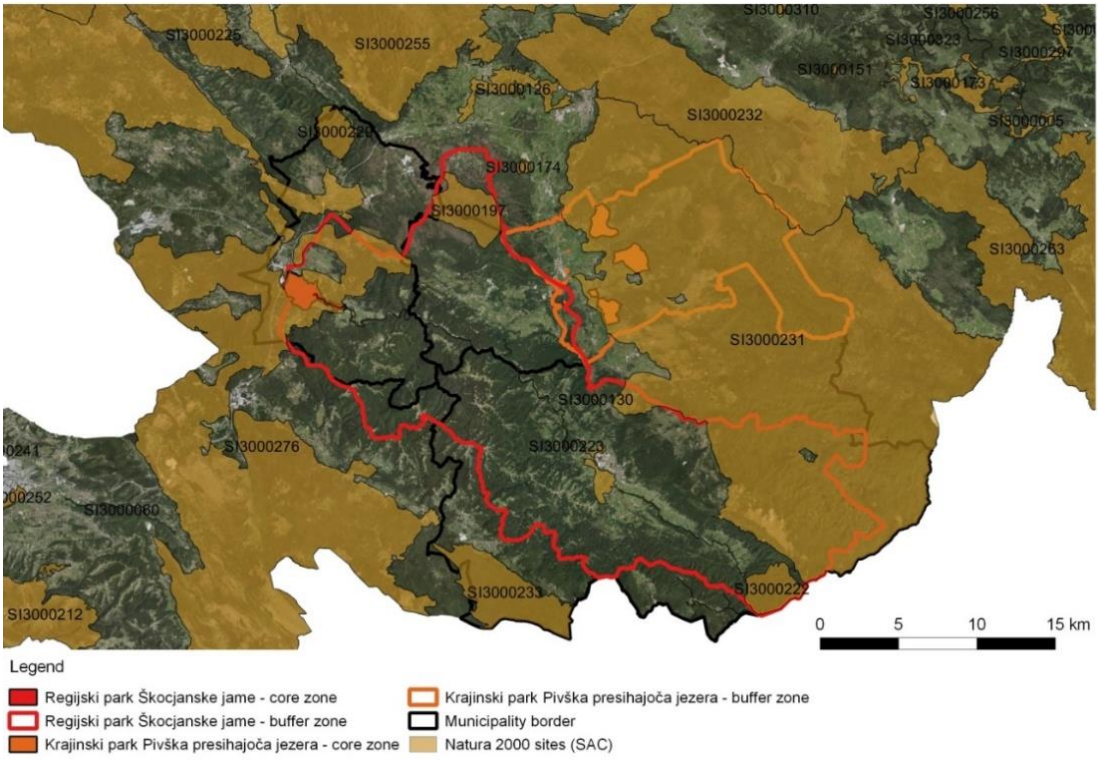
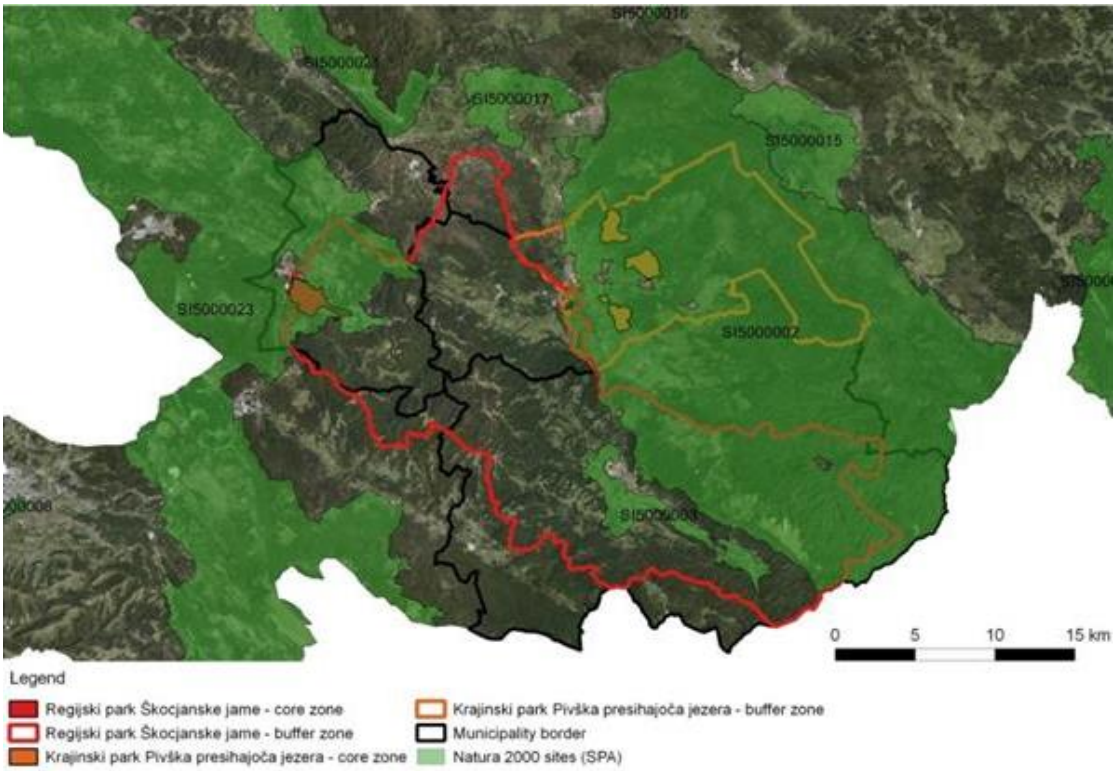


Figure 2: Natura 2000 sites (SPA) within the study area



Qualifying Natura 2000 habitat types and species were identified according to the SDF form. In the table below, there is a list of all species and HT with the indications if forest management could influence the status of species and HT.

The table differs from the SDF form because the Natura 2000 sites areas were intersected with area of influence of Škocjan Caves Regional Park and Pivka Lakes Nature Park. In this case all of the species and HT listed in SDF form are not present in the study area. Data for every HT, plant and animal specie is available in .shp file and this is how more detailed list of present species and HT within each Natura 2000 site was possible to define. Those that are present within the Škocjan Caves Regional Park and Pivka Lakes Nature Park buffer zones are listed in the tables.

Table 1: List of all species and HT with the indications if forest management could influence the status of species and HT within Škocjan Caves Regional Park buffer zone

Natura 2000 site code	Natura 2000 site name	Type	Natura 2000 site area (ha)	Natura 2000 site area influence area of Park Škocjanske Caves (ha)	Specie /HT code	Qualifying Natura 2000 habitat types and species	HT area within Škocjan Caves Regional Park buffer zone (ha)	Forest management could influence the species/HT
SI3000130	Kozja luknja	SAC	12	12	1186*	Proteus anguinus		x
					8310	Caves not open to the public	12	x
SI3000222	Zabiče	SAC	804	802	1078*	Callimorpha quadripunctaria		x
					1092	Austropotamobius pallipes		x
					9110	Luzulo-Fagetum	553	✓
					91E0*	Alnus glutinosa in Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	11[1]	✓
SI3000223	Reka	SAC	441	441	1059	Maculinea teleius		x
					1092	Austropotamobius pallipes		x
					1137	Barbus plebejus		x
					1193	Bombina variegata		x
					1304	Rhinolophus ferrumequinum		✓
					1310	Miniopterus schreibersi		✓
					1316	Myotis capaccinii		✓
SI3000197	Slavinski Ravnik	SAC	1186	1174	1078*	Callimorpha quadripunctaria		x
					4019	Leptodirus hochenwarti		x
					8310	Caves not open to the public	1174	x
					91K0	Fagus sylvatica (Aremonio - Fagion)	455	✓
SI3000231	Javorniki-Snežnik	SAC	44039	7375	1065	Euphydryas aurinia		x
					1078*	Callimorpha quadripunctaria		x
					1087*	Rosalia alpina		✓
					1088	Cerambyx cerdo		✓
					1089	Morimus funereus		✓
					1167	Triturus carnifex		x
					1303	Rhinolophus hipposideros		✓
					1308	Barbastella barbastellus		✓
					1352*	Canis lupus		✓

[1] The area of habitat type is so small that it was not recognized as a relevant habitat type for further discussion.

Natura 2000 site code	Natura 2000 site name	Type	Natura 2000 site area (ha)	Natura 2000 site area influence area of Park Škocjanske Caves (ha)	Specie /HT code	Qualifying Natura 2000 habitat types and species	HT area within Škocjan Caves Regional Park buffer zone (ha)	Forest management could influence the species/HT
					1354*	Ursus arctos		✓
					1361	Lynx lynx		✓
					4019	Leptodirus hochenwarti		x
					4089	Arabis scopoliana		x
					4060	Alpine and Boreal heaths	5	x
					4070*	Mugo-Rhododendretum hirsuti	81	x
					5130	*Juniperus communis* formations on heaths or calcareous grasslands	94	x
					6170	Alpine and subalpine calcareous grasslands	5	x
					6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	65	x
					8120	Thlaspietea rotundifolii	70	x
					8210	Calcareous rocky slopes with chasmophytic vegetation	70	x
					8310	Caves not open to the public	7375	x
					9180*	*Tilio-Acerion* forests of slopes, screes and ravines	12[2]	✓
					9410	Vaccinio-Piceetea	301	✓
					62A0	(Scorzoneretalia villosae)	382	x
					91K0	Fagus sylvatica (Aremonio - Fagion)	4936	✓
SI3000276	Kras	SAC	48041	2247	1074	Eriogaster catax		x
					1083	Lucanus cervus		✓
					1088	Cerambyx cerdo		✓
					1089	Morimus funereus		✓
					1092	Austropotamobius pallipes		x
					1167	Triturus carnifex		x
					1186*	Proteus anguinus		x
					1193	Bombina variegata		x
					1303	Rhinolophus hipposideros		✓

[2] The area of habitat type is so small that it was not recognized as a relevant habitat type for further discussion.

Natura 2000 site code	Natura 2000 site name	Type	Natura 2000 site area (ha)	Natura 2000 site area influence area of Park Škocjanske Caves (ha)	Specie /HT code	Qualifying Natura 2000 habitat types and species	HT area within Škocjan Caves Regional Park buffer zone (ha)	Forest management could influence the species/HT
					1304	Rhinolophus ferrumequinum		✓
					1307	Myotis blythii		✓
					1310	Miniopterus schreibersi		✓
					4087*	Serratula lycopifolia		x
					4104	Himantoglossum adriaticum		x
					5130	Juniperus communis	72	x
					62A0	Scorzoneretalia villosae	568	x
					91K0	Fagus sylvatica (Aremonio - Fagion)	10	✓
SI5000003	Dolina Reke	SPA	1866	1865	A119	Porzana porzana		x
					A122	Crex crex		x
					A338	Lanius collurio		x
SI5000002	Snežnik - Pivka	SPA	54927	10949	A078	Gyps fulvus		x
					A239	Dendrocopos leucotos		✓
					A030	Ciconia nigra		✓
					A236	Dryocopus martius		✓
					A108	Tetrao urogallus		✓
					A104	Bonasa bonasia		✓
					A246	Lullula arborea		x
					A080	Circaetus gallicus		x
					A223	Aegolius funereus		✓
					A122	Crex crex		x
					A109	Alectoris graeca		x
					A220	Strix uralensis		✓
					A217	Glaucidium passerinum		✓
					A084	Circus pygargus		x
					A307	Sylvia nisoria		x
					A234	Picus canus		x
					A091	Aquila chrysaetos		x
					A224	Caprimulgus europaeus		x

Natura 2000 site code	Natura 2000 site name	Type	Natura 2000 site area (ha)	Natura 2000 site area influence area of Park Škocjanske Caves (ha)	Specie /HT code	Qualifying Natura 2000 habitat types and species	HT area within Škocjan Caves Regional Park buffer zone (ha)	Forest management could influence the species/HT
					A247	Alauda arvensis		x
					A113	Coturnix coturnix		x
					A275	Saxicola rubetra		x
					A255	Anthus campestris		x
					A081	Circus aeruginosus		x
					A338	Lanius collurio		x
					A280	Monticola saxatilis		x
					A232	Upupa epops		x
					A103	Falco peregrinus		x
					A072	Pernis apivorus		✓
					A241	Picoides tridactylus		✓
					A215	Bubo bubo		✓
					A214	Otus scops		✓
					A383	Miliaria calandra		x
SI5000023	Kras	SPA	58752	3117	A078	Gyps fulvus		x
					A246	Lullula arborea		x
					A080	Circaetus gallicus		x
					A224	Caprimulgus europaeus		x
					A247	Alauda arvensis		x
					A255	Anthus campestris		x
					A338	Lanius collurio		x
					A232	Upupa epops		x
					A103	Falco peregrinus		x
					A072	Pernis apivorus		✓
					A215	Bubo bubo		✓
					A214	Otus scops		✓
					A383	Miliaria calandra		x
					A379	Emberiza hortulana		x

Note: Habitat types, on which forest management could influence and are as well recognized as a relevant habitat type for further discussion, are coloured green. Species, on which forest management could influence and are as well recognized as relevant specie for further discussion, are coloured pink. Some of the species on which forest management could influence are not discussed in following matrices as none of the indicators or threats included their discussion.

Table 2: List of all species and HT with the indications if forest management could influence the status of species and HT within Pivka Lakes Nature Park buffer zone

Natura 2000 site code	Natura 2000 site name	Type	Natura 2000 site area (ha)	Natura 2000 site area within Pivka Lakes Nature Park buffer zone (ha)	Specie /HT code	Qualifying Natura 2000 habitat types and species	HT area within Pivka Lakes Nature Park buffer zone (ha)	Forest management could influence the species/HT
SI3000231	Javorniki - Snežnik	SAC	44.032	11.934	HT-3180	Intermittent lakes	181,60	x
					HT-5130	Juniperus communis	628,91	x
					HT-62A0	Scorzoneretalia villosae	1.352,46	x
					HT-8310	Caves not open to the public	11.933,59	x
					HT-9180	Tilio-Acerion	661,76	✓
					HT-91K0	Fagus sylvatica (Aremonio-Fagion)	5.821,78	✓
					SP-1059	Maculinea teleius		x
					SP-1060	Lycaena dispar		x
					SP-1065	Euphydryas aurinia		x
					SP-1078	Callimorpha quadripunctaria		x
					SP-1087	Rosalia alpina		✓
					SP-1088	Cerambyx cerdo		✓
					SP-1089	Morimus funereus		✓
					SP-1167	Triturus carnifex		x
					SP-1186	Proteus anguinus		x
					SP-1303	Rhinolophus hipposideros		✓
					SP-1308	Barbastella barbastellus		✓
					SP-1352	Canis lupus		✓
					SP-1354	Ursus arctos		✓
					SP-1361	Lynx lynx		✓

Natura 2000 site code	Natura 2000 site name	Type	Natura 2000 site area (ha)	Natura 2000 site area within Pivka Lakes Nature Park buffer zone (ha)	Specie /HT code	Qualifying Natura 2000 habitat types and species	HT area within Pivka Lakes Nature Park buffer zone (ha)	Forest management could influence the species/HT
					SP-4019	Leptodirus hochenwarti		x
SI3000232	Notranjski trikotnik	SAC	15.228	56	HT-8310	Caves not open to the public	55,54	x
					HT-91K0	Fagus sylvatica (Aremonio-Fagion)	57,10	✓
					SP-1078	Callimorpha quadripunctaria		x
					SP-1089	Morimus funereus		✓
					SP-1167	Triturus carnifex		x
					SP-1186	Proteus anguinus		x
					SP-1193	Bombina variegata		x
					SP-1308	Barbastella barbastellus		✓
					SP-1310	Miniopterus schreibersi		✓
					SP-1323	Myotis bechsteini		✓
					SP-1352	Canis lupus		✓
					SP-1354	Ursus arctos		✓
					SP-1361	Lynx lynx		✓
					SP-4019	Leptodirus hochenwarti		x
SI5000002	Snežnik - Pivka	SPA	54.917	13.746	A030	Ciconia nigra		✓
					A072	Pernis apivorus		✓
					A078	Gyps fulvus		x
					A080	Circaetus gallicus		x
					A081	Circus aeruginosus		x
					A084	Circus pygargus		x

Natura 2000 site code	Natura 2000 site name	Type	Natura 2000 site area (ha)	Natura 2000 site area within Pivka Lakes Nature Park buffer zone (ha)	Specie /HT code	Qualifying Natura 2000 habitat types and species	HT area within Pivka Lakes Nature Park buffer zone (ha)	Forest management could influence the species/HT
					A091	Aquila chrysaetos		x
					A103	Falco peregrinus		x
					A104	Bonasa bonasia		✓
					A108	Tetrao urogallus		✓
					A113	Coturnix coturnix		x
					A120	Porzana parva		x
					A122	Crex crex		x
					A214	Otus scops		✓
					A215	Bubo bubo		✓
					A217	Glaucidium passerinum		✓
					A220	Strix uralensis		✓
					A223	Aegolius funereus		✓
					A224	Caprimulgus europaeus		x
					A232	Upupa epops		x
					A234	Picus canus		x
					A236	Dryocopus martius		✓
					A239	Dendrocopos leucotos		✓
					A241	Picoides tridactylus		✓
					A246	Lullula arborea		x
					A247	Alauda arvensis		x
					A275	Saxicola rubetra		x

Natura 2000 site code	Natura 2000 site name	Type	Natura 2000 site area (ha)	Natura 2000 site area within Pivka Lakes Nature Park buffer zone (ha)	Specie /HT code	Qualifying Natura 2000 habitat types and species	HT area within Pivka Lakes Nature Park buffer zone (ha)	Forest management could influence the species/HT
					A307	Sylvia nisoria		x
					A338	Lanius collurio		x
					A383	Miliaria calandra		x

Note: Habitat types, on which forest management could influence and are as well recognized as a relevant habitat type for further discussion, are coloured green. Species, on which forest management could influence and are as well recognized as relevant specie for further discussion, are coloured pink. Some of the species on which forest management could influence are not discussed in following matrices as none of the indicators or threats included their discussion.

Table 3: List of habitat types present on the sites within the Škocjan Caves Regional Park buffer zone and are relevant for further assessment

Natura 2000 site code	Natura 2000 site name	Type	Natura 2000 site area (ha)	Natura 2000 site area within influence area of Park Škocjanske Caves (ha)	Specie /HT code	Qualifying Natura 2000 habitat types and species	ha of HT within influence area of Park Škocjanske Caves (ha)	Forest management could influence the species/HT
SI3000222	Zabiče	SAC	804	802	9110	Luzulo-Fagetum	553	✓
SI3000197	Slavinski Ravnik	SAC	1186	1174	91K0	Fagus sylvatica (Aremonio - Fagion)	455	✓
SI3000231	Javorniki - Snežnik	SAC	44039	7375	9410	Vaccinio-Piceetea	301	✓
					91K0	Fagus sylvatica (Aremonio - Fagion)	4936	✓
SI3000276	Kras	SAC	48041	2247	91K0	Fagus sylvatica (Aremonio - Fagion)	10	✓

Table 4: List of habitat types present on the sites within the Pivka Lakes Nature Park buffer zone and are relevant for further assessment

Natura 2000 site code	Natura 2000 site name	Type	Natura 2000 site area (ha)	Natura 2000 site area within Pivka Lakes Nature Park buffer zone (ha)	Specie /HT code	Qualifying Natura 2000 habitat types and species	HT area within Pivka Lakes Nature Park buffer zone (ha)	Forest management could influence the species/HT
SI3000231	Javorniki - Snežnik	SAC	44.032	11.934	HT-9180	Tilio-Acerion	661	✓
					HT-91K0	Fagus sylvatica (Aremonio-Fagion)	5.821	✓
SI3000232	Notranjski trikotnik	SAC	15.228	56	HT-91K0	Fagus sylvatica (Aremonio-Fagion)	57	✓

Table 5: List of the animal species listed in SDF form that are considered to be particularly threatened by forestry activities and relevant for further assessment within the Škocjan Caves Regional Park buffer zone

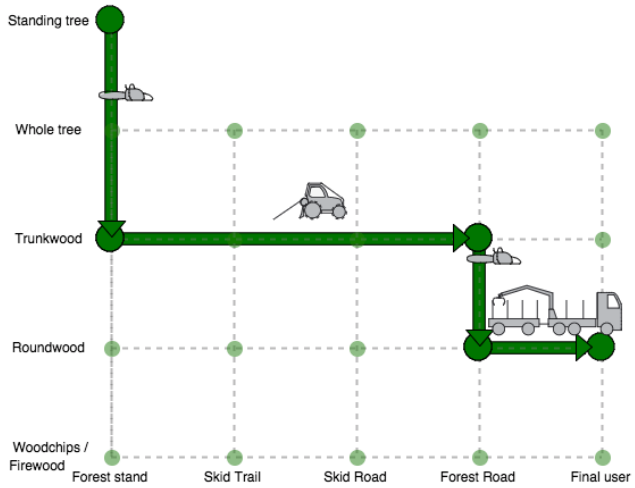
Natura 2000 site code	Natura 2000 site name	Type	Natura 2000 site area (ha)	Natura 2000 site area influence area of Park Škocjanske Caves (ha)	Specie /HT code	Qualifying Natura 2000 habitat types and species	Forest management could influence the species/HT
SI3000223	Reka	SAC	441	441	1304	Rhinolophus ferrumequinum	✓
					1310	Miniopterus schreibersi	✓
					1316	Myotis capaccinii	✓
SI3000231	Javorniki-Snežnik	SAC	44039	7375	1087*	Rosalia alpina	✓
					1088	Cerambyx cerdo	✓
					1089	Morimus funereus	✓
					1303	Rhinolophus hipposideros	✓
					1308	Barbastella barbastellus	✓
					1352*	Canis lupus	✓
					1354*	Ursus arctos	✓
					1361	Lynx lynx	✓
SI3000276	Kras	SAC	48041	2247	1083	Lucanus cervus	✓
					1088	Cerambyx cerdo	✓
					1089	Morimus funereus	✓
					1303	Rhinolophus hipposideros	✓
					1304	Rhinolophus ferrumequinum	✓
					1307	Myotis blythii	✓
					1310	Miniopterus schreibersi	✓
SI5000002	Snežnik-Pivka	SPA	54927	10949	A239	Dendrocopos leucotos	✓
					A030	Ciconia nigra	✓
					A236	Dryocopus martius	✓
					A108	Tetrao urogallus	✓
					A104	Bonasa bonasia	✓
					A223	Aegolius funereus	✓
					A220	Strix uralensis	✓
					A217	Glaucidium passerinum	✓
					A072	Pernis apivorus	✓
					A241	Picoides tridactylus	✓
					A215	Bubo bubo	✓
					A214	Otus scops	✓
SI5000023	Kras	SPA	58752	3117	A072	Pernis apivorus	✓
					A215	Bubo bubo	✓
					A214	Otus scops	✓

Table 6: List of the animal species listed in SDF form that are considered to be particularly threatened by forestry activities and relevant for further assessment within the Pivka Lakes Nature Park buffer zone

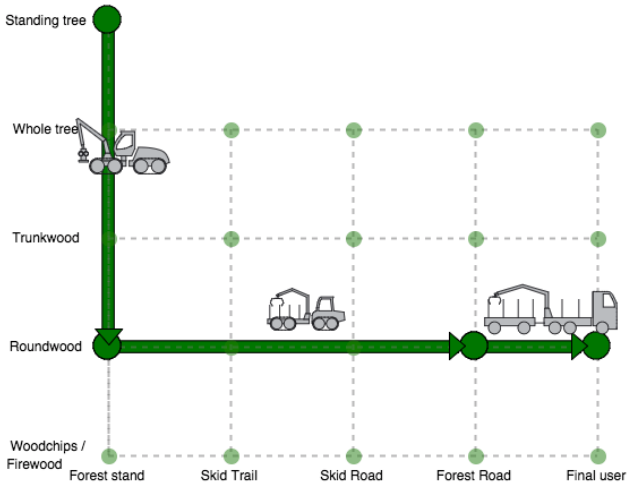
Natura 2000 site code	Natura 2000 site name	Type	Natura 2000 site area (ha)	Natura 2000 site area within Pivka Lakes Nature Park buffer zone (ha)	Specie /HT code	Qualifying Natura 2000 habitat types and species	Forest management could influence the species/HT
SI3000231	Javornik i - Snežnik	SAC	44.032	11.934	SP-1087	Rosalia alpina	✓
					SP-1088	Cerambyx cerdo	✓
					SP-1089	Morimus funereus	✓
					SP-1303	Rhinolophus hipposideros	✓
					SP-1308	Barbastella barbastellus	✓
					SP-1352	Canis lupus	✓
					SP-1354	Ursus arctos	✓
					SP-1361	Lynx lynx	✓
SI3000232	Notranjski trikotnik	SAC	15.228	56	SP-1089	Morimus funereus	✓
					SP-1308	Barbastella barbastellus	✓
					SP-1310	Miniopterus schreibersi	✓
					SP-1323	Myotis bechsteini	✓
					SP-1352	Canis lupus	✓
					SP-1354	Ursus arctos	✓
					SP-1361	Lynx lynx	✓
SI5000002	Snežnik - Pivka	SPA	54.917	13.746	A030	Ciconia nigra	✓
					A072	Pernis apivorus	✓
					A104	Bonasa bonasia	✓
					A108	Tetrao urogallus	✓
					A214	Otus scops	✓
					A215	Bubo bubo	✓
					A217	Glaucidium passerinum	✓
					A220	Strix uralensis	✓
					A223	Aegolius funereus	✓
					A236	Dryocopus martius	✓
					A239	Dendrocopos leucotos	✓
					A241	Picoides tridactylus	✓

Main harvesting practices in Slovenia:

Chain saw - tractor harvesting system is a traditional combination of motor-manual felling with chainsaw and haulage with forestry tractor. Wood cutter fells a tree and immediately afterwards follows the delimbing operation. Cutting is followed by stem wood extraction along the skid-road with tractor using forest winch. The cross cutting of stems to assortments is foreseen at the storage by the side of forest road and then transported to end-user by truck and trailer.



Harvester - Forwarder harvesting system addresses machines for fully-mechanized harvesting. Cutting and assortment production take place along skid trail and is carried out by harvester. Cutting is followed by haulage of assortments with forwarder. After harvesting is completed, transport to end-user is foreseen .



Potential impacts on habitats (according to Directive 92/43/EEC) and tree plantations

Silvicultural and harvesting practices assesed in matrices are adapted to Slovenian legislation and practice. Clear cutting in Slovenia is legally prohibited if not differently defined in Forestry Management Plan due to

silvicultural practices or if it is needed due to salvage cutting or preventive security work. Deforestation is allowed when it is in line with a Spatial Plan that regulates the area. Exception is deforestation on surfaces smaller than 0,5 ha if there no protective forests or forests with special purposes are defined.

Synantropic species are not assessed in the following matrices as we do not recognize them as a relevant threat.

Table 7: Magnitude scale of impact

Magnitude	Impact	Description
	None	The operation will cause no relevant impact or may be beneficial to plant community structure or functionality, with regard to the threat considered.
I	Low	The operation will cause limited impact to plant community structure or functionality, with regard to the threat considered.
II	Medium	The operation will cause significant impact to plant community structure or functionality, with regard to the threat considered.
III	High	The operation will cause extreme impact to plant community structure or functionality, with regard to the threat considered. In this case operation should not be performed.

Table 8: Reversibility scale of impact

Colour	Reversibility	Description
	Short term	Plant community structure or functionality will be unaffected or recover in a short amount of time.
	Medium term	Plant community structure or functionality will recover over a period of time measured in years.
	Long term	Plant community structure or functionality will recover over a period of time measured in decades.
	Irreversibile	Impact is irreversible and plant community will not recover. Operation should not be performed.

Natura 2000 Habitat Code:	9110 Luzulo-Fagetum beech forests											
Action	**Silvicultural and harvesting practices (high forest and coppice)**										**Post harvest management**	
	Thinning / Salvage cutting					Shelterwood cutting						
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
direct removal of natural vegetation	I	I	II	II	II						II	vegetation sampling life-form spectrum/ diversity indices
alteration of floristic composition	I	I	II	II	II						II	
reduction of protected and endemic species population											I	presence of protected and endemic species
introduction of synanthropic species	*	*	*	*	*						*	presence of synanthropic species
introduction of alien species		I	I	I	I						I	presence of alien species
reduction of natural regeneration		I	I	II	II							presence of natural regeneration
damage to natural regeneration	I	II	I	II	II							presence of damages to natural regeneration

Luzulo-Fagetum beech forests are common within the study area and are not problematic with regard to silvicultural and harvesting practices.

Lower intensity of thinning does not cause intense and long term impacts on stand structure.

Haulage is implemented exclusively on forest tracks where damages are more intense. As a consequence, the process of plant community structure or functionality restoration will take longer.

In case of shelterwood cutting bigger areas are opened. Impacts on stand structure and natural regeneration are bigger. Reversibility is assessed as a long term process.

Natura 2000 Habitat Code:	91K0 Illyrian Fagus sylvatica forests (Aremonio-Fagion)											
Action	**Silvicultural and harvesting practices (high forest and coppice)**										**Post harvest management**	
	Thinning / Salvage cutting					Shelterwood cutting						
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
direct removal of natural vegetation	I	I	I	I	I						II	vegetation sampling life-form spectrum /diversity indices
alteration of floristic composition											II	
reduction of protected and endemic species population		I	I	I	I						II	presence of protected and endemic species
introduction of synanthropic species	*	*	*	*	*						*	presence of synanthropic species
introduction of alien species		I	I	I	I						I	presence of alien species
reduction of natural regeneration		I	I	I	I							presence of natural regeneration
damage to natural regeneration	I	II	I	II	II							presence of damages to natural regeneration

Illyrian Fagus sylvatica forests (Aremonio-Fagion) are common within the study area. Due to terrain specifics and accessibility silvicultural and harvesting practices are demanding. Due to terrain specifics thinning with mechanized harvesting causes more intense and long-term impacts on stand structure compared to previous example.

Skidding is implemented exclusively on forest tracks where damages are more intense. As a consequence, the process of plant community structure or functionality restoration will take longer. In case of shelterwood cutting impacts on present protected species is medium and long term as living conditions for growth and reproduction are changed outstandingly.

Natura 2000 Habitat Code:	9410 Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetea)										
Action	**Silvicultural and harvesting practices (high forest and coppice)**									**Post harvest management**	
	Thinning / Salvage cutting					Shelterwood cutting					
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
direct removal of natural vegetation	I	I	II	II	II						III	vegetation sampling life-form spectrum/ diversity indices
alteration of floristic composition											III	
reduction of protected and endemic species population	I	I	I	I	I						II	presence of protected and endemic species
introduction of synanthropic species	*	*	*	*	*						*	presence of synanthropic species
introduction of alien species												presence of alien species
reduction of natural regeneration		I	I	I	I							presence of natural regeneration
damage to natural regeneration	I	II	I	I	II							presence of damages to natural regeneration

Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetea) are specific forest stands that are present on small areas where temperature inversion is present. Thinning in accordance to Forestry Management Plans doesn't have impact on stand structure composition and indirectly improves natural regeneration. Long term impacts on life-form spectrum are not present. Haulage is implemented exclusively on forest tracks where damages are more intense. As a consequence, the process of plant community structure or functionality restoration will take longer. Consequences of shelterwood cutting are high and irreversible impacts that considerably alter tree species composition.

Natura 2000 Habitat Code:	9180* Tilio-Acerion forests of slopes, screes and ravines										
Action	**Silvicultural and harvesting practices (high forest and coppice)**									**Post harvest management**	
	Thinning / Salvage cutting					Shelterwood cutting					
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
direct removal of natural vegetation	I	I	II	II	II						II	vegetation sampling life-form spectrum/ diversity indices
alteration of floristic composition	I	I	II	II	II						II	
reduction of protected and endemic species population											I	presence of protected and endemic species
introduction of synanthropic species	*	*	*	*	*						*	presence of synanthropic species
introduction of alien species		I	I	I	I						I	presence of alien species
reduction of natural regeneration		I	II	II	II							presence of natural regeneration
damage to natural regeneration	I	II	I	II	II							presence of damages to natural regeneration

This habitat type is only present on small areas within the study area, where the soil is humid. As the areas where this habitat type is present are very small, they were not eliminated in sections. This is the reason why not much data is present on the presence of these habitat type.

From the aspect of biomass production, they are not that important as it is mainly high quality roundwood.

Potential impacts on forest categories not included in the “Habitats Directive”

Forest categories not included in the "Habitats Directive”	Coppice beech and oak forests											
Action	**Silvicultural and harvesting practices (high forest and coppice)**										**Post harvest management**	
	Thinning / Salvage cutting					Shelterwood cutting						
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
direct removal of natural vegetation			I	I	I	II	II	II	II	II	II	vegetation sampling life-form spectrum/ diversity indices
alteration of floristic composition			I	I	I	I	I	I	I	I	II	
reduction of protected and endemic species population											II	presence of protected and endemic species
introduction of synanthropic species	*	*	*	*	*	*	*	*	*	*	*	presence of synanthropic species
introduction of alien species						I	I	I	I	I	II	presence of alien species
reduction of natural regeneration		I	I	I	I	I	I	I	I			presence of natural regeneration
damage to natural regeneration		I	I	I	I	I	I	I	I	I		presence of damages to natural regeneration

Coppice beech and oak forests are the most common forest within the study area as a result of traditional land use, where biomass is mostly used as fuel wood.

Traditional silvicultural and harvesting practices are not expected to have high impact on tree species composition or natural regeneration.

Infrastructure for silvicultural and harvesting practices in coppice beech and oak forests is already established. This is reason why no new damages on vegetation and ground are present.

Forest categories not included in the "Habitats Directive"	Black pine plantations											
Action	**Silvicultural and harvesting practices (high forest and coppice)**									**Post harvest management**	
	Thinning / Salvage cutting					Shelterwood cutting						
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
direct removal of natural vegetation			II	II	II						II	vegetation sampling life-form spectrum/ diversity indices
alteration of floristic composition	II	II	II	II	II						II	
reduction of protected and endemic species population											II	presence of protected and endemic species
introduction of synanthropic species	*	*	*	*	*						*	presence of synanthropic species
introduction of alien species											II	presence of alien species
reduction of natural regeneration												presence of natural regeneration
damage to natural regeneration												presence of damages to natural regeneration

Black pine plantations are temporary forest category as a consequence of forest restoration. Natural transfer to deciduous forest is predicted. With rejuvenated cutting the structure and trees composition will be changed to natural deciduous trees.

Plantations are left to natural regeneration, rarely used practice is shelterwood cutting that has bigger impact on tree species composition.

Clearcuttings are forbidden with legislation and are not in practice.

Potential impacts on the animal communities present in the habitats (according to Directive 92/43/EEC)

Following matrices are assessing impacts of silvicultural and harvesting practices as well as post harvest management on the animal communities, present in the habitats. All the relevant species from the SDF form, present within the project area and for which silvicultural and harvesting practices could represent a threat are assesed in the following matrices.

Habitats in which predicted impacts of forest management and silvicultural practices are similar, are lumped in one matrix: *9110 Luzulo-Fagetum* beech forests and 91K0 *Illyrian Fagus sylvatica forests (Aremonio-Fagion).*

Table 9: Magnitude scale of impact

Magnitude	Impact	Description
	None	The operation will cause no relevant impact or may be beneficial to plant community structure or functionality, with regard to the threat considered.
I	Low	The operation will cause limited impact to plant community structure or functionality, with regard to the threat considered.
II	Medium	The operation will cause significant impact to plant community structure or functionality, with regard to the threat considered.
III	High	The operation will cause extreme impact to plant community structure or functionality, with regard to the threat considered. In this case operation should not be performed.

Table 10: Reversibility scale of impact

Colour	Reversibility	Description
	Short term	Plant community structure or functionality will be unaffected or recover in a short amount of time.
	Medium term	Plant community structure or functionality will recover over a period of time measured in years.
	Long term	Plant community structure or functionality will recover over a period of time measured in decades.
	Irreversibile	Impact is irreversible and plant community will not recover. Operation should not be performed.

Natura 2000 Habitat Code:	9110 Luzulo-Fagetum beech forests 91K0 Illyrian Fagus sylvatica forests (Aremonio-Fagion)											
Action	**Silvicultural and harvesting practices (high forest and coppice)**										**Post harvest management**	
	Thinning / Salvage cutting					Shelterwood cutting						
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
Noise	I	I	I	I	I						II	Birds (Non-Strigiformes)
Soil compaction		I		I	I							Ground-active beetles
Decrease of habitat suitability	I	I									III	Xylobiont and Saproxylic beetles; Birds (Strigiformes)
Decrease of the availability of trophic resources	I	I									III	Xylobiont beetles; Birds (non-Strigiformes)
Casualties	I	I									I	Monitoring of carcasses

Leaving decayed wood in the forest is of great importance for Xylobiont and Saproxylic beetles as well as for some bird species.

Excessive deprivation of biomass as a consequence of chipping could have long term negative impact on animal species.

Natura 2000 Habitat Code:	9410 Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetea)										
Action	**Silvicultural and harvesting practices (high forest and coppice)**									**Post harvest management**	
	Thinning / Salvage cutting					Shelterwood cutting					
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
Noise	I	II	I	I	II						II	Birds (Non-Strigiformes)
Soil compaction		II		II	II							Ground-active beetles
Decrease of habitat suitability	I	I									III	Xylobiont and Saproxylic beetles; Birds (Strigiformes)
Decrease of the availability of trophic resources	II	II									III	Xylobiont beetles; Birds (non-Strigiformes)
Casualties	I	I									I	Monitoring of carcasses

Leaving decayed wood in the forest is of great importance for Xylobiont and Saproxylic beetles as well as for some bird species. Especially in Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetea) there is small amount of wood biomass.

Use of heavy machinery for harvesting could impact on increased soil compaction that has negative impacts on ground-active beetles.

Excessive deprivation of biomass as a consequence of chipping could have long term negative impact on animal species.

Natura 2000 Habitat Code:	9180* Tilio-Acerion forests of slopes, screes and ravines										
Action	**Silvicultural and harvesting practices (high forest and coppice)**									**Post harvest management**	
	Thinning / Salvage cutting					Shelterwood cutting					
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
Noise	I	II	I	I	II						II	Birds (Non-Strigiformes)
Soil compaction		III	II	II	III							Ground-active beetles
Decrease of habitat suitability	I	I									III	Xylobiont and Saproxylic beetles; Birds (Strigiformes)
Decrease of the availability of trophic resources	II	II									III	Xylobiont beetles; Birds (non-Strigiformes)
Casualties	I	I									I	Monitoring of carcasses

Where this habitat type is present, the soil load capacity is not high. Heavy machinery used for implementation of harvesting practices could have significant impact on the increased soil compaction and consequently on the presence erosion processes.

Potential impacts on animal communities in habitats not included in the “Habitats Directive”

Forest categories not included in the "Habitats Directive”	Coppice beech and oak forests										
Action	**Silvicultural and harvesting practices (high forest and coppice)**									**Post harvest management**	
	Thinning / Salvage cutting					Shelterwood cutting					
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
Noise	I	II	I	I	II		I			I	II	Birds(Non-Strigiformes)
Soil compaction		I		I	I		II	II	II	II		Ground-active beetles
Decrease of habitat suitability	I	I				II	II	I	I	I	III	Xylobiont and Saproxylic beetles; Birds (Strigiformes)
Decrease of the availability of trophic resources	I	I				II	II	I	I	I	II	Xylobiont beetles; Birds (non-Strigiformes)
Casualties	I	I				I	I	I	I	I	I	Monitoring of carcasses

Coppice beech and oak forests are the most common forest within the study area as a result of traditional land use, where animal species are adapted to the forest management.

Traditional silvicultural and harvesting practices are not expected to have high impact on tree species composition or natural regeneration.

Extreme increas in logging and excessive deprivation of biomass as a consequence of chipping could have long term negative impact on animal species.

Forest categories not included in the "Habitats Directive"	Black pine plantations											
Action	**Silvicultural and harvesting practices (high forest and coppice)**									**Post harvest management**	
	Thinning / Salvage cutting					Shelterwood cutting						
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
Noise		II			II						II	Birds (Non-Strigiformes)
Soil compaction		I		I	I							Ground-active beetles
Decrease of habitat suitability	I	I									III	Xylobiont and Saproxylic beetles; Birds (Strigiformes)
Decrease of the availability of trophic resources	I	I									II	Xylobiont beetles; Birds (non-Strigiformes)
Casualties	I	I									I	Monitoring of carcasses

Black pine plantations are temporary forest category as a consequence of forest restoration. Natural transfer to deciduous forest is predicted. With rejuvenated cutting the structure and trees composition will be changed to natural deciduous trees.

Plantations are left to natural regeneration, rarely used practice is shelterwood cutting that has bigger impact on tree species composition. It could also represent a threat on stability of habitat and consequently impacts on Xylobiont and Saproxylic beetles as well as Birds presence.

Clearcuttings are forbidden with legislation and are not in practice.

Excessive deprivation of biomass as a consequence of chipping could have long term negative impact on animal species.

1.1.2 Abiotic components

Škocjan Caves Regional Park

The Škocjan Caves Regional Park is situated in the Classical Karst in the region between northeastern shore of the Adriatic Sea and part of the continent where scientific exploration of Karst geography started. Škocjan Caves are under UNESCO list of natural and cultural world heritage sites, they are included in the world network of of biosphere reserves (MAB - "Man and the Biosphere") and Ramsar Directory of Wetlands of International Importance. (Park Škocjanske jame, 2018)

At first sight, the Škocjan Karst surface appears to be flat, but in reality, it is heavily broken. This characteristic landscape that developed in limestones is named Karst, the word being derived from the name of the area Karst. Karstic landscape is a specific heritage, where surface and underground are part of a single landscape. The solubility of rocks that form the Earth's surface is the most effective agent of karstification. Calcite, the main constituent in limestone, is dissolved by water and drained through underground channels. (Park Škocjanske jame, 2018)

Škocjan Karst lies on southeastern part of Karst and lies between 420 and 450 m ASL. Despite the first appearance - area seems to be flat, main characteristics of study area are karstic geomorphical phenomenons that appear in small scale. Beside Škocjan caves and all other smaller caves, some main surface geomorpological phenomenons are:

- vrtače (small karst hollows, usually around 10m deep and with diameter around 50m, most frequentwithin study area),
- bigger formation than vrtače are udornice (formed from former caves with collapsed cave ceiling),
- doline (a shallow usually funnel-shaped depression of the ground surface formed by solution in limestone regions)
- caves without ceiling (formation as a consequence of limestone solution; surface – cave ceiling is dissolved and cave opens). (Program varstva in razvoja parka Škocjanske jame za obdobje 2018-2022, 2017)

As well, limestone bedrock defines hydological network within study area. Mostly, underground water bodies are present (where there is limestone bedrock), while surface watercourses only appear where impermeable bedrock. Biggest watercourse within area of influence of Škocjan Caves Regional Park is Reka. Chemical and ecological status of a body of surface water – Reka is defined as good. As well chemical and quantitative water status of body of underground water Obala in Kras z Brkini is good. (Program varstva in razvoja parka Škocjanske jame za obdobje 2018-2022, 2017)

Pivka Lakes Nature Park

The Pivka intermittent karst lakes are a special hydrological feature of the western part of the Javorniki karst massif.

The Pivka basin where the lowland part of the Pivka lakes nature park lies, is a large depression among high karst plateaus of Nanos (1313 m), Hrušica (1264 m), Javorniki (1268), low plateau Slavenski ravnik (600 – 700 m), Snežnik (1796 m), and flysch hills that form catchment area of the Reka river. Its surface gently tilts from the foot of the Snežnik mountain on SE from 620 m to 520 m. The part of the Pivka basin belonging to the natural park was formed in limestone and has some characteristics of a karst polje.

During geological history surface affluents of the Pivka river have due to karstification, especially from the Javorniki mountains, gradually retreated to the underground. The Javorniki range function as a karst aquifer with underground water "reservoir". The area of the karst intermittent lakes of Pivka is mostly of well karstified Cretaceous limestones, permeable rocks with karst-fissured porosity. In these, numerous surface and underground karst features are developed. The layer of soil on the limestone is relatively thin and frequently not consolidated, so the surface is very rocky. In the Pivka basin Quaternary alluvial sediments are deposited on limestones. They are less permeable and act as a local hydrogeological barrier. When, during high waters, the water table rises above this contact, intermittent karst springs emerge and supply the surface stream of the Pivka river. In longer periods without precipitation the water table falls below the contacts and springs dry up. As the alluvial sediment thickness is relatively small, a karst aquifer is developed also below them in the direction towards the Vipava valley.

The water table in the upper part of the Pivka basin is around 10 m below a dry riverbed during low waters, and in the lower part more than 20 m below it. At very high waters some parts of the basin are flooded to an area of 7.5 km^2, about 2.2 km^2 of which belongs to intermittent karst lakes. Floods are regular in autumn, and relatively often in winter and also in spring.

The karst lakes of Pivka are also a kind of intermittent karst springs as water emerges through karst fissures and channels at the bottom or on the slope of depressions, which is how the basins start to fill up with water and form karst lakes. The dry up as the water table falls, the lakes begin to empty and water sinks into fissures and channels underground, including those through which it was previously flowing to the surface.

The lakes differ in their size, altitude and duration. All the 17 are named in this text under biotic elements. Mostly they are active only for a short period of time at the highest waters. Petelinjsko lake has the longest duration of approximately six months. The biggest is Palško lake with the area of more than 1 km^2 and can contain more than 1.5 km^3 of water. The biggest source is the spring from Matijeva cave, which acts as a spring at high waters, but at low waters there is no outflow and the water table can be observed deeper in the cave. Palško lake is on average dry almost three quarters of a year.

Other lakes are smaller, they occur rarely or their duration is only short. Some of them are active only at extremely high waters.

Table 11: Magnitude scale of impact

Magnitude	Impact	Description
	None	The operation will cause no relevant impact or may be beneficial to plant community structure or functionality, with regard to the threat considered.
I	Low	The operation will cause limited impact to plant community structure or functionality, with regard to the threat considered.
II	Medium	The operation will cause significant impact to plant community structure or functionality, with regard to the threat considered.
III	High	The operation will cause extreme impact to plant community structure or functionality, with regard to the threat considered. In this case operation should not be performed.

Table 12: Reversibility scale of impact

Colour	Reversibility	Description
	Short term	Plant community structure or functionality will be unaffected or recover in a short amount of time.
	Medium term	Plant community structure or functionality will recover over a period of time measured in years.
	Long term	Plant community structure or functionality will recover over a period of time measured in decades.
	Irreversibile	Impact is irreversible and plant community will not recover. Operation should not be performed.

Potential impacts on habitats (according to Directive 92/43/EEC)

Erosion types discussed in matrices are adapted to presence of processes and specificity of the study area. As a threat we distinguish between rill and interrill erosion, gully erosion is not present within study area.

Natura 2000 Habitat Code:	9110 Luzulo-Fagetum beech forests											
Action	**Silvicultural and harvesting practices (high forest and coppice)**										**Post harvest management**	
	Thinning /Salvage cutting						Shelterwood cutting					
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
Reduction of deadwood	I	I	I	I	I						III	Deadwood
Reduction of litter cover												Litter
Reduction of litter height												
Reduction of SOC											II	Soil Organic Carbon (SOC)
Presence of Rill erosion		I	II	II	II							Erosion*
Presence of Interrill erosion		I	II	II	II							
Presence of Gully erosion	*	*	*	*	*						*	
Increase of Soil Bulk Density		I	I	II	II							Soil Bulk Density
Fuel model features												Fire risk

Thinnnig has smaller impacts on abiotic component than shelterwood cutting has. In case of shelterwood cutting nutrient leaching is increased, litter cover and height as well as deadwood is reduced. All listed represent a threat for surface and gully erosion and increade of Soil Bulk Density.

Natura 2000 Habitat Code:	91K0 Illyrian Fagus sylvatica forests (Aremonio-Fagion)											
Action	**Silvicultural and harvesting practices (high forest and coppice)**										**Post harvest management**	
	Thinning / Salvage cutting						Shelterwood cutting					
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
Reduction of deadwood	I	I	I	I	I						III	Deadwood
Reduction of litter cover												Litter
Reduction of litter height												
Reduction of SOC											II	Soil Organic Carbon (SOC)
Presence of Rill erosion		I	II	III	III							Erosion*
Presence of Interrill erosion		I	II	III	III							
Presence of Gully erosion	*	*	*	*	*						*	
Increase of Soil Bulk Density		I	I	III	III							Soil Bulk Density
Fuel model features												Fire risk

Thinning has smaller impacts on abiotic component than shelterwood cutting has. In case of shelterwood cutting nutrient leaching is increased, litter cover and height as well as deadwood is reduced. All listed represent a threat for surface and gully erosion and increade of Soil Bulk Density.

Natura 2000 Habitat Code:	9410 Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetea)											
Action	**Silvicultural and harvesting practices (high forest and coppice)**										**Post harvest management**	
	Thinning / Salvage cutting						Shelterwood cutting					
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
Reduction of deadwood	I	I	I	I	I						III	Deadwood
Reduction of litter cover		I										Litter
Reduction of litter height		I										
Reduction of SOC	I	I	I	I	I						III	Soil Organic Carbon (SOC)
Presence of Rill erosion		I	II	II	II						I	Erosion*
Presence of Interrill erosion		I	I	I	I						I	
Presence of Gully erosion	*	*	*	*	*						*	
Increase of Soil Bulk Density		I	I	III	III							Soil Bulk Density
Fuel model features												Fire risk

Thinning has smaller impacts on abiotic component than shelterwood cutting has. In case of shelterwood cutting nutrient leaching is increased, litter cover and height as well as deadwood is reduced. All listed represent a threat for surface and gully erosion and increade of Soil Bulk Density.

In case of Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetea) impacts of use of heavy machinery are high and long term, especially due to extreme conditions and specific terrain.

Natura 2000 Habitat Code:	9180* Tilio-Acerion forests of slopes, screes and ravines											
Action	**Silvicultural and harvesting practices (high forest and coppice)**										**Post harvest management**	
	Thinning / Salvage cutting						Shelterwood cutting					
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
Reduction of deadwood	I	I	I	I	I						III	Deadwood
Reduction of litter cover		I										Litter
Reduction of litter height		I										
Reduction of SOC	I	I	I	I	I						III	Soil Organic Carbon (SOC)
Presence of Rill erosion		I	II	II	II						I	Erosion*
Presence of Interrill erosion		I	II	II	II						I	
Presence of Gully erosion	*	*	*	*	*						*	
Increase of Soil Bulk Density		I	I	III	III							Soil Bulk Density
Fuel model features												Fire risk

Where this habitat type is present, the soil load capacity is not high. Heavy machinery used for implementation of harvesting practices could have significant impact on the increased soil compaction and consequently on the presence of erosion processes. This represents a threat on the abiotic component, especially when harvesting operations are done when soil is wet – threat of erosion is increased.

Potential impacts on forest categories not included in the "Habitats Directive"

Forest categories not included in the "Habitats Directive"	Coppice beech and oak forests										
Action	**Silvicultural and harvesting practices (high forest and coppice)**									**Post harvest management**	
	Thinning / Salvage cutting					Shelterwood cutting					
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
Reduction of deadwood	I	I	I	I	I	II	II	II	II	II	II	Deadwood
Reduction of litter cover		I				II	II	II	II	II		Litter
Reduction of litter height		I				II	II	II	II	II		
Reduction of SOC	I	I	I	I	I	II	II	II	II	II	III	Soil Organic Carbon (SOC)
Presence of Rill erosion		I	I	I	I	II	II	II	II	II	I	Erosion*
Presence of Interrill erosion		I	I	I	I	III	III	III	III	III	I	
Presence of Gully erosion	*	*	*	*	*	*	*	*	*	*	*	
Increase of Soil Bulk Density		I	I	II	II	I	II	II	III	III		Soil Bulk Density
Fuel model features	I	I	I	I	I							Fire risk

Thinning has smaller impacts on abiotic component than shelterwood cutting has. In case of shelterwood cutting nutrient leaching is increased, litter cover and height as well as deadwood is reduced. All listed represent a threat for surface and gully erosion and increase of Soil Bulk Density.

Shelterwood cutting increases threat of presence of gully and surface erosion. In case of use of heavy machinery, increase of Soil Bulk Density is expected.

Forest categories not included in the "Habitats Directive"	Black pine plantations[3]											
Action	**Silvicultural and harvesting practices (high forest and coppice)**										**Post harvest management**	
	Thinning / Salvage cutting						Shelterwood cutting					
THREATS	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Motor-manual felling	Mechanized harvesting	Skidding (winch)	Haulage with tractor and trailer	Haulage with forwarder	Chipping	**INDICATORS**
Reduction of deadwood	I	I	I	I	I						II	Deadwood
Reduction of litter cover		I										Litter
Reduction of litter height		I										
Reduction of SOC	I	I	I	I	I						III	Soil Organic Carbon (SOC)
Presence of Rill erosion		I	I	I	I						I	Erosion*
Presence of Interrill erosion		I	I	I	I						I	
Presence of Gully erosion	*	*	*	*	*						*	
Increase of Soil Bulk Density		I	I	II	II							Soil Bulk Density
Fuel model features	II	II	II	II	II							Fire risk

Thinning has smaller impacts on abiotic component than shelterwood cutting has. In case of shelterwood cutting nutrient leaching is increased, litter cover and height as well as deadwood is reduced. All listed represent a threat for surface and gully erosion and increade of Soil Bulk Density.

Shelterwood cutting increases threat of presence of gully and surface erosion. In case of use of heavy machinery, increase of Soil Bulk Density is expected.

[3] Black pine plantations are temporary forest category as a consequence of forest restoration. Natural transfer to deciduous forest is predicted. With rejuvenated cutting the structure and trees composition will be changed to natural deciduous trees.

1.1.3 Social, economic and demographic components and ecosystem services

Short description

The study area includes municipalities of Divača, Pivka and Ilirska Bistrica. Municipalities Pivka and Ilirska Bistrica belong to Primorsko-notranjska statistical region. Only 3% of the whole Slovenian population lived in this region in 2015. It was ranked by the lowest population density: on average, there were 36 people living on 1 km^2. The natural increase per 1,000 inhabitants was negative (-0.4). 38% of the working population of this region worked in other statistical regions, the large majority in the Osrednjeslovenska region. The average monthly net salary was among the lowest in the country. 85% of overnight stays in this region were generated by foreign tourists, mainly tourists from Italy (14%) (Statistični urad Republike Slovenije, Podatkovni portal SI STAT).

Regional unit Sežana - Karst region (municipality Divača 100%, Ilirska Bistrica 65%, Pivka 37%) is dominated by private forests - 83.6% of the forest area. State forests present 11% and forests of local communities 5.4%. The dominant share of private forest land, small and fragmented forest estate are the main causes for low intensity of forest management. The average forest estate size is 2.18 ha and the average forest plot size is 0.27 ha. In connection with a small forest estate, poorer openness of forests, poorer sites and, consequently, low income from the forest, the interest of forest owners for logging, growing and investing in forests is rather small.

A special feature are former plots of social property in larger complexes, which were of agrarian origin, and with their return to the agrarian communities they became a private property with a large number of owners. The majority of forest owners in the area use their forest only as a casual source of income. The main revenue or compensation for fossil fuels is firewood (Gozdnogospodarski načrt kraškega gozdnogospodarskega območja, 2012).

Socio-Demographic Indicators' Table (Base Values)

The data for socio-demographic indicators were collected from SURS – Statistical office of Slovenia (Statistični urad Republike Slovenije, Podatkovni portal SI STAT).

Socio-Demographic Indicators	Value Before operations				
	Unit of measure	data	Year	Source	territorial reference*
Population	number of inhabitants	23559	2017	SURS	Municipalities in the study area
Population structure	% of population aged under 15 years	14 %	2017	SURS	Municipalities in the study area
	% of population aged 15-64 years	65 %			
	%population aged 65 years and over	21 %			
Per capita family income	mean value of per capita income for resident families close to the protected areas	8738 €	2016	SURS	Primorsko-notranjska statistical region
Unemployment rate	% of persons in work age who are unemployed	9,8 %	2016	SURS	Municipalities in the study area
Educational level	% of persons who have an upper secondary degree	72 %	2016	SURS	Primorsko-notranjska statistical region
Energetic self-sufficiency	% of consumed energy provided by the biomass plant on the total energy consumed	42 %	2016	SURS	Slovenia
* Specify the territory to which the available data refers to (ie, municipality/municipalities, and/or province in the study area etc..)					

Socio-Economic Indicators' Table (Base Values)

The data for socio-economic indicators were collected from AJPES and BIZI.SI (Slovenian business registers). For the calculations of the net income we took the net income from sales (čisti prihodki od prodaje - BIZI). In accordance with the methodology of Slovenian business registers, the number of employees (workforce) is divided into ranks (from – to) and it's not an integer. Individual firms often had 0 employees. In that case we considered 1 employee – self-employed person. For the type of contracts, we assumed that the lowest level of workforce presents the employees with permanent contracts and the highest level the employees with fixed-term contracts.

Socio-Economic Indicators		Value Before operations				
		Unit of measure	data	Year	Source	territorial reference*
Total firms**	firms involved in the biomass harvesting and extraction	Number of firms	57	2017	AJPES	Protected area municipalities
	firms involved in processing and marketing of wood	Number of firms	137	2017	AJPES	Protected area municipalities
	firms involved in bioenergy production and distribution	Number of firms	16	2017	AJPES	Protected area municipalities
	firms involved in satellite activities	Number of firms	58	2017	AJPES	Protected area municipalities
Legal form**	firms involved in the biomass harvesting and extraction	% of individual firms, companies, and cooperatives	Individual firms 51 % Companies 11 % Complementary activity on the farm 35 % Cooperatives 3 %	2016	AJPES	Protected area municipalities
	firms involved in processing and marketing of wood	% of individual firms, companies, and cooperatives	Individual firms 66 % Companies 33 % Complementary activity on the farm 1%	2016	AJPES	Protected area municipalities
	firms involved in bioenergy production and distribution	% of individual firms, companies, and cooperatives	Individual firms 38 % Companies 6 % Complementary activity on the farm 56 %	2016	AJPES	Protected area municipalities
	firms involved in satellite activities	% of individual firms, companies, and cooperatives	Individual firms 74 % Companies 14 % Complementary activity on the farm 7 % Associations 3 % Public institution 2 %	2016	AJPES	Protected area municipalities
Net income**	firms involved in the biomass harvesting and extraction	mean value of net income	191030 €	2016	BIZI	Protected area municipalities
	firms involved in processing and marketing of wood	mean value of net income	821807 €	2016	BIZI	Protected area municipalities
	firms involved in bioenergy production and distribution	mean value of net income	24644 €	2016	BIZI	Protected area municipalities
	firms involved in satellite activities	mean value of net income	172686 €	2016	BIZI	Protected area municipalities
Labour Productivity (LP)**	firms involved in the biomass harvesting and extraction	Mean value of LP	48845 €	2016	BIZI	Protected area municipalities
	firms involved in processing and marketing of wood	Mean value of LP	110484 €	2016	BIZI	Protected area municipalities
	firms involved in bioenergy production and distribution	Mean value of LP	24644 €	2016	BIZI	Protected area municipalities
	firms involved in satellite activities	Mean value of LP	60305 €	2016	BIZI	Protected area municipalities
Workforce**	firms involved in the biomass harvesting and extraction	Number of workers	48 – 64	2016	BIZI	Protected area municipalities
	firms involved in processing and marketing of wood	Number of workers	515 – 887	2016	BIZI	Protected area municipalities
	firms involved in bioenergy production and distribution	Number of workers	7	2016	BIZI	Protected area municipalities
	firms involved in satellite activities	Number of workers	138 - 229	2016	BIZI	Protected area municipalities
Workforce Age**	firms involved in the biomass harvesting and extraction	Mean value of age of workers				
	firms involved in processing and marketing of wood	Mean value of age of workers				

	firms involved in bioenergy production and distribution	Mean value of age of workers				
	firms involved in satellite activities	Mean value of age of workers				
Type of contracts**	firms involved in the biomass harvesting and extraction	Number of employees with fixed-term contract and permanent contract	48 permanent contracts 16 fixed-term contracts	2016	BIZI	Protected area municipalities
	firms involved in processing and marketing of wood	Number of employees with fixed-term contract and permanent contract	515 permanent contracts 372 fixed-term contracts	2016	BIZI	Protected area municipalities
	firms involved in bioenergy production and distribution	Number of employees with fixed-term contract and permanent contract	7 permanent contracts	2016	BIZI	Protected area municipalities
	firms involved in satellite activities	Number of employees with fixed-term contract and permanent contract	138 permanent contracts 91 fixed-term contracts	2016	BIZI	Protected area municipalities
Position or job**	firms involved in the biomass harvesting and extraction	Number of skilled and unskilled employees				
	firms involved in processing and marketing of wood	Number of skilled and unskilled employees				
	firms involved in bioenergy production and distribution	Number of skilled and unskilled employees				
	firms involved in satellite activities	Number of skilled and unskilled employees				
R&D Investments***	firms involved in the biomass harvesting and extraction	A - Mean value of turnover destined in the research and development activity; B - number of patents developed; C - number of employees employed in the research & development activity				
	firms involved in processing and marketing of wood	A - Mean value of turnover destined in the research and development activity; B - number of patents developed; C - number of employees employed in the research & development activity				
	firms involved in bioenergy production and distribution	A - Mean value of turnover destined in the research and development activity; B - number of patents developed; C - number of employees employed in the research & development activity				
	firms involved in satellite activities	A - Mean value of turnover destined in the research and development activity; B - number of patents developed; C - number of employees employed in the research & development activity				
Innovations introduction**	firms involved in the biomass harvesting and extraction	Mean value of number of the adopted certifications				

	firms involved in processing and marketing of wood	Mean value of number of the adopted certifications				
	firms involved in bioenergy production and distribution	Mean value of number of the adopted certifications				
	firms involved in satellite activities	Mean value of number of the adopted certifications				
Tangible Resources**	firms involved in the biomass harvesting and extraction	Mean value of machineries and equipment of firms				
	firms involved in processing and marketing of wood	Mean value of machineries and equipment of firms				
	firms involved in bioenergy production and distribution	Mean value of machineries and equipment of firms				
	firms involved in satellite activities	Mean value of machineries and equipment of firms				

*Specify the territory to which the available data refers to (ie, municipality/municipalities, and/or province in the study area etc..)
** For each phase of supply chain consider the firms operating close to the protected areas, and identified by the following NACE Codes (Rev.2):
biomass harvesting and extraction 02.1; 02.2; 02.4;
processing and marketing of wood 16.1; 16.2; 46.13; 46.73.1; 49.41;
bioenergy production and distribution 35.1;
satellite activities 02.3; 01.7; 91.04; 55.1; 56.1.
*** Insert at least one of the three indicators.
As above, for each phase of supply chain consider the firms operating close to the protected areas, and identified by the following NACE Codes (Rev.2):
biomass harvesting and extraction 02.1; 02.2; 02.4;
processing and marketing of wood 16.1; 16.2; 46.13; 46.73.1; 49.41;
bioenergy production and distribution 35.1;
satellite activities 02.3; 01.7; 91.04; 55.1; 56.1.

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