THE STATE OF THE WORLD's FOREST GENETIC RESOURCES

COUNTRY REPORT

SWITZERLAND

This country report is prepared as a contribution to the FAO publication, The Report on the State of the World's Forest Genetic Resources. The content and the structure are in accordance with the recommendations and guidelines given by FAO in the document Guidelines for Preparation of Country Reports for the State of the World's Forest Genetic Resources (2010). These guidelines set out recommendations for the objective, scope and structure of the country reports. Countries were requested to consider the current state of knowledge of forest genetic diversity, including:

- Between and within species diversity
- List of priority species; their roles and values and importance
- List of threatened/endangered species
- Threats, opportunities and challenges for the conservation, use and development of forest genetic resources

These reports were submitted to FAO as official government documents. The report is presented on www. fao.org/documents as supportive and contextual information to be used in conjunction with other documentation on world forest genetic resources.

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SWITZERLAND
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IMPRESSUM

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SECTION I: EXECUTIVE SUMMARY

In general the Alpine region is genetically very diverse as it offers favorable conditions for differentiation processes and is therefore of importance for the conservation of intraspecific variation of many species. This fact is caused by a huge variation of habitat (steep gradients of abiotic factors within relatively small regions). Furthermore the topographic structure sometimes leads to increased isolation effects (allopatric differentiation).

The priority of natural regeneration in traditional Swiss close-to-nature silviculture led to a continuous reduction of plantations down to a current average of planted trees of around 1 mio pc/y. This partly explains a relatively low interest of practitioners in forest genetics. The need to support the forests in adapting to climate change could well increase interest in forest genetic issues.

Today, knowledge on intraspecific variation is still very incomplete. The assumption of potential ecotypes is possible by taxonomic knowledge (var., subsp., endemic species), morphological and ecological characteristics as well as by genetic analyses. This means that a systematical evaluation and synthesis of all existing data in these fields as well as complementary studies on potential ecotypes are necessary. Before the background of climate change and the consequent necessity to foster the adaptive capacity of forests information on eco-typical differentiation of main species like spruce, beach or silver fir is needed.

In Switzerland efforts of *in situ* conservation of forest genetic resources started relatively early in the late 1980-ies and focused on distribution and genetic constitution of several mainly rare species. Later, a shift in conservation strategies for forest biodiversity lead to a focus on promotion of saprophytic biodiversity in forests (old stands/deadwood management, natural forest reserves), and the efforts of the first in situ conservation phase were somehow discontinued.

The goal of Switzerland in the field of forest genetic resources for the coming years is

- At national level: to implement forest genetic of the national forest policy 2020 and the Swiss Biodiversity Strategy;
- At national and regional level: to deepen knowledge on eco-typical differentiation of main species like spruce, beech or silver fir with a view to climate change adaptation;
- At regional level: to contribute to EUFORGEN commitments;
- At global level: to contribute to the Strategic Plan of the Convention on Biological Diversity and its Aichi targets.

SECTION II: INTRODUCTION TO THE COUNTRY AND FOREST SECTOR

1. Forest management

Data source

Table 1.1: Data sources for forest characteristics and area.

Data source	Year	Quality	Comment
Brändli 2010: NFI Switzerland	2004-2006	H	Forest area by mode of stand regeneration (NFI tab 190)
Brändli 2010: NFI Switzerland	2004-2006	H	Forest area by mode of forest origin (NFI tab 191)
Brändli 2010: NFI Switzerland	2004-2006	H	Forest area by forest function (NFI tab 022)

Methodology

Table 1.2: Classification and definition of forest characteristics and area.

Classification		Definition	Comment
Primary forest		no human activities	
Naturally regenerated forest		Area from natural regeneration + 50% of area from mixed regeneration	incl. naturally regenerated forest
Planted forest	all	Area from artificial regeneration + 50% of area from mixed regeneration	
	reforestation	Area of all planted forest - area of afforestation (artificial forest origin)	
	afforestation	Area from artificial forest origin + 50% of area from mixed forest origin	
Thereof agroforestry systems		Area of forest with agricultural use	

National data

*Table 1.3 (**T1**): Forest characteristics and area.*

Main forest characteristics		Area (ha)	Area (%)	Comment
Primary forest		0	0.0	
Naturally regenerated forest		1‘099‘600	86.0	
Planted forest	reforestation	133’000	10.4	
	afforestation	46’000	3.6	
Total		**1‘278‘600**	**100.0**	
Thereof agroforestry systems		72‘880	5.7	

2. Forest ownership

Data source

Table 2.1: Data sources for forest ownership and area.

Data source	Year	Quality	Comment
Brändli 2010: NFI Switzerland	2004-2006	H	Forest area by ownership category (NFI tab 239/240)

Methodology

Table 2.2: Classification and definition of forest ownership and area.

Classification	Definition	Comment
Public ownership	State, canton, political community, citizens community, corporation	
Private ownership	Individual, company	

National data

*Table 2.3 (**T2**): Forest ownership and area.*

Main forest characteristics	Area (ha)	Area (%)	Comment
Public ownership	878'400	68.7	
Private ownership	400'200	31.3	
Total	**1'278'600**	**100.0**	

3. Trends in forest conservation and management

Data sources

Table 3.1: Data sources for trends in forest conservation and management.

Data source	Year	Quality	Comment
Brändli 2010: NFI Switzerland	2004-2006	H	Forest area (NFI tab 018)
BAFU 2011: Year book	2011	H	Annual plantation of seedlings/plants

National data

The development of forest conservation and management over the past 30 years shows the following trends:

- **Increasing forest area**: average over last decade of 5'950 ha/y (0.49 %/y). This trend concerns primarily forest expansion into abandoned agricultural land in the region of the central alps and southern alps (marginal agricultural land, alpine pasture). Compared to the second last decade with an average of 3'860 ha/y (0.33 %/y) this trend is even increasing.
- **High proportion of natural regeneration**: Traditional Swiss close-to-nature silviculture includes the priorities of natural regeneration as well as of mixture in accordance with the site factors. This led to a continuous reduction of plantations down to an average of plantations in the last decade of 2.1 mio pc/y (according to BFS tab 4.6). Compared to the average of plantations in the second last decade (3.8

mio pc/y, -5.5 %/y) and the third last decade (8.2 mio pc/y, -4.6 %/y) this trend is ongoing and seems to approximate around 1 mio pc/y in the coming years. Plantation with a future average lower than 1 pc/ha/y is negligible and confirms natural regeneration as the standard method.

4. Role of forest resources in relation to demands of forest products

Data source

Table 4.1: Data sources for demands of forest products.

Data source	Year	Quality	Comment
Brändli 2010: NFI Switzerland	2004-2006	H	Forest functions (NFI tab 022)
BAFU 2011: Year book	2011	H	Annual plantation of seedlings/plants

National data

In Switzerland topography leads to a wide range of macrochores with particular site factors as well as regional variation in demands of forest products and services (in order of proportion of relevant forest area and the predominant function):

- Wood production (55.8 %)
- Protection against natural hazards (42.8 %)
- Nature and landscape protection (22.1 %)
- Recreation (9.9 %)
- Agricultural use (agroforestry system) (5.7 %)
- game protection (4.9 %)
- Drinking water protection (4.1 %)

Within this scope the role of forest ressources is as heterogenous and has to fulfill as many actual and optional (global change) demands as possible. This is reached by support of natural mechanisms:

- **High diversity of woody plant species**: as trees and shrubs are main structural elements of forest ecosystems, this guarantees the long term stability and functioning of the ecosystem and secures current and future products and services.
- **High intraspecific genetic variation within woody plant species**: this ensures the adaptation and conservation of species under changing conditions (self-sustainment) and by that secures a high species diversity in the long run.

SECTION III: MAIN BODY OF THE COUNTRY REPORT

1. The current state of forest genetic resources

1.1. Major forest types and main tree species

Data source

Table 5.1: Data sources for forest types.

Data source	Year	Quality	Comment
Brändli 2010: NFI Switzerland	2004-2006	H	Forest area by altitudinal vegetation zone (NFI tab 035)
Brändli 2010: NFI Switzerland	2004-2006	H	Forest area by predominant tree species (NFI tab 029)
Brändli 2010: NFI Switzerland	2004-2006	H	Stem number, volume and other by tree species (NFI tab 065)
Rudow 2012: expert knowledge	1994-2012	H/M	Projects field data, literature, expert knowledge surveys, experiences on species occurance, use/service and threat

Methodology

Table 5.2: Classification and definition of forest types.

Classification		Definition		Comment
EZ Level 1	EZ Level 2	Region	Altitude	
Temperate	TeDo temperate oceanic forest	Southern Alps	Low lands	Attribution to low lands based on height above sea level and depending on exposition and bedrock (NFI tab 033 p 50)
	TeDc temperate continental forest	Jura, Plateau, Pre-Alps, Alps	Low lands	Attribution to low lands based on height above sea level and depending on exposition and bedrock (NFI tab 033 p 50)
	TM temperate mountain systems	Jura, Plateau, Pre-Alps, Alps, Southern Alps	High altitude areas	Attribution to high altitude areas based on height above sea level and depending on exposition (NFI tab 033 p 50)

National data

*Table 3.5 (**T3**): Major forest types and main tree species.*

Major forest types		Area	Woody plant species
EZ Level 1	EZ Level 2	(ha)	Main Tree Species
Temperate	TeDo temperate oceanic forest	71'800 ha (+/- 4%)	*Castanea sativa* *Quercus petraea* *Fraxinus excelsior*
	TeDc temperate continental forest	513'300 ha (+/- 1%)	*Fagus sylvatica* *Fraxinus excelsior* *Acer pseudoplatanus* *Quercus robur* *Quercus petraea* *Pinus sylvestris*
	TM temperate mountain systems	693'600 ha (+/- 1%)	*Picea abies* *Abies alba* *Fagus sylvatica* *Larix decidua* *Pinus sylvestris* *Pinus uncinata* *Pinus cembra*
Total	TeDo/TeDc/TM	1'278'600 ha (+/- 0.1 %)	

1.2. Species diversity and priority species

Data source

Table 6.1: Data sources for species diversity and priority species.

Data source	Year	Quality	Comment
Info Flora 2012 ff.: National Data Center for Swiss Flora	2012	H	List of plant species
Rudow 2011 ff.: eBot dendrology and related data collections	2011	H	List of woody plant species, Dendrological database
Swiss Commission for Wild Plant Conservation 2008: Invasive Neophyten, Schwarze Liste.	2008	H	Black list and watch list of invasive neophytes in Switzerland
Related information in this report			use data (tab 5.3) service data (tab 6.3) threat data (tab 7.3)

Methodology

Table 6.2: Classification and definition of the characterization and prioritisation of priority species.

Classification		Definition	Comment
Charcterization			
type Type of woody plant species	T tree species	Deciduous and coniferous species with acrotonous stem building (tree)	
	O other woody plant species	Deciduous and coniferous species with basitonous stem building (shrub, liana)	

Classification		Definition	Comment
Charcterization			
		or Palm species	
native Nativeness	N native species	Originally native or since less than 500 y introduced	
	E exotic species	Since more than 500 y introduced	
endem Endemism	E1 high	Natural distribution restricted to the region of the alps	
	E2 medium	Natural distribution mainly restricted to the region of the alps and Subpopulations in adjacent european mountain systems	
	E3 low	Natural distribution restricted to middle and southern Europe and Distribution area < 1 mio km2	
group Group of woody plant species	G1 main tree	Native main tree species	Main tree species from tab 3.3
	G2 secondary tree	Native secondary tree species	Main tree species from forest types topic (tab 3.3) Derived from national species list (annex tab 1) and threat data (tab 7.3)
	G3 shrub	Native shrub species	Derived from national species list (annex tab 1) and threat data (tab 7.3)
	G4 dwarf shrub	Native dwarf shrub species	
	G5 exotic	Exotic tree or shrub species	
Priority			
rank Priority rank	1 very high	Very important native main tree species	Main tree species from tab 3.3
	2 high	Other native main tree species or Threatened and potentially threatened native secondary tree species	Main tree species from forest types topic (tab 3.3) derived from national species list (annex tab 1) and threat data (tab 7.3)
	3 medium	Other native secondary tree species or Threatened native shrub and dwarf shrub species or Invasive exotic tree and shrub species	Derived from national species list (annex tab 1) and threat data (tab 7.3)
	4 low	Other native shrub and dwarf shrub species	
	5 very low	Other exotic tree and shrub species	

Classification		Definition	Comment
Charcterization			
reason Reasons for priority			
ESC Economic, social or cultural importance	ESC1 high	Species providing at least 6 different uses and services and a considerable solid wood production	
	ESC2 medium	Species providing 4-6 different uses and services	
	ESC3 low	Species providing 2-3 different uses and services	
T Threat	T1 high	IUCN categories EN an higher	
	T2 medium	IUCN categorie VU	
	T3 low	IUCN categorie NT	
I Invasive neophytes	I1 high	Species of national neophytes black list and strong suppression of natural woody plant community (phytosociology)	
	I2 high	Other species of national neophytes black list	
	I3 medium	Species of national neophytes watch list	

National data

Table 6.3: Overview of species groups for prioritization

Priority	***N***	***Species group***	***n***
1 (very high)	*6*	*Important native main tree species*	*6*
2 (high)	*31*	*Other native main tree species*	*6*
		Threatened native secondary tree species	*17*
		Dangerous invasive neophytes (black list)	*8*
Total 1/2	***37***	***Priority species***	***37***
3 (medium)	*52*	*Other native secondary tree species*	*20*
		Threatened native shrub species	*15*
		Threatened native dwarf shrub species	*17*
4 (low)	*86*	*Other native shrub species*	*60*
		Other native dwarf shrub species	*26*
5 (very low)	*42*	*Other invasive neophytes (watch list)*	*6*
		Forestry exotic tree species	*12*
		Other exotic tree species	*24*
Total 3/4/5	***180***	***Non-priority species***	***180***
Total	***217***	***All species***	***217***

*Table 6.4 (**T4**): Characterization and prioritization of priority species (complete species list in Annex I).*

Woody plant species	**Characterization**				**Prioritization**			
Priority species	type	native	endem	group	rank	reason		
						ESC	T	I
Priority very high (1)								
Abies alba	T	N	E3	1	1	ESC1		
Acer pseudoplatanus	T	N		1	1	ESC1		
Fagus sylvatica	T	N		1	1	ESC1		
Fraxinus excelsior	T	N		1	1	ESC1		
Larix decidua	T	N	E2	1	1	ESC1		
Picea abies	T	N		1	1	ESC1		
Priority high (2)								
Castanea sativa	T	N/E		1	2	ESC2		
Pinus cembra	T	N	E2	1	2	ESC2		
Pinus sylvestris	T	N		1	2	ESC2		
Pinus uncinata	T	N	E2	1	2	ESC2		
Quercus petraea	T	N		1	2	ESC2		
Quercus robur	T	N		1	2	ESC2		
Acer opalus	T	N		2	2	ESC3	T3	
Celtis australis	T	N		2	2	ESC3	T3	
Fraxinus ornus	T	N		2	2	ESC3	T3	
Malus sylvestris	T	N		2	2	ESC3	T2	
Populus alba	T	N		2	2	ESC3	T2	
Populus nigra	T	N		2	2	ESC3	T3	
Pyrus nivalis	T	N		2	2	ESC3	T2	
Pyrus pyraster	T	N		2	2	ESC3	T1	
Quercus cerris	T	N		2	2	ESC3	T3	
Quercus pubescens	T	N		2	2	ESC3	T3	
Salix fragilis	T	N		2	2	ESC3	T3	
Sorbus domestica	T	N		2	2	ESC3	T1	
Sorbus torminalis	T	N		2	2	ESC3	T2	
Sorbus x latifolia	T	N		2	2	ESC3	T2	
Taxus baccata	T	N		2	2	ESC3	T3	
Ulmus laevis	T	N		2	2	ESC3	T1	
Ulmus minor	T	N		2	2	ESC3	T3	
Ailanthus altissima	T	E		5	2			I2
Buddleja davidii	O	E		5	2			I2
Lonicera japonica	O	E		5	2			I2
Prunus laurocerasus	O	E		5	2			I2
Prunus serotina	O	E		5	2			I2
Rhus typhina	O	E		5	2			I2
Robinia pseudoacacia	T	E		5	2			I2
Rubus armeniacus	O	E		5	2			I2

Table 6.5: Potential priority species, but today non-priority species (focus, feasibility).

Woody plant species	**Characterization**				**Prioritization**			
Non-priority species	type	native	endem	group	rank	reason		
						ESC	T	I
Priority medium (3)								
Acer campestre	T	N		2	3	ESC3		
Acer platanoides	T	N		2	3	ESC3		
Alnus glutinosa	T	N		2	3	ESC3		
Alnus incana	T	N		2	3	ESC2		
Betula pendula	T	N		2	3	ESC3		
Betula pubescens	T	N		2	3	ESC3		
Carpinus betulus	T	N		2	3	ESC3		
Juglans regia	T	N/E		2	3	ESC2		
Ostrya carpinifolia	T	N		2	3	ESC2		
Populus tremula	T	N		2	3	ESC3		
Populus x canescens	T	N		2	3	ESC3		
Prunus avium	T	N		2	3	ESC2		
Prunus cerasus	T	N/E		2	3	ESC3		
Salix alba	T	N		2	3	ESC2		
Salix caprea	T	N		2	3	ESC3		
Sorbus aria	T	N		2	3	ESC3		
Sorbus aucuparia	T	N		2	3	ESC3		
Tilia cordata	T	N		2	3	ESC2		
Tilia platyphyllos	T	N		2	3	ESC2		
Ulmus glabra	T	N		2	3	ESC2		
Betula humilis	O	N		3	3		T1	
Colutea arborescens	O	N		3	3		T3	
Cotinus coggygria	O	N		3	3		T3	
Lonicera periclymenum	O	N		3	3		T3	
Mespilus germanica	O	N		3	3		T3	
Myricaria germanica	O	N		3	3		T3	
Salix apennina	O	N		3	3		T2	
Salix caesia	O	N	E2	3	3		T3	
Salix glabra	O	N	E1	3	3		T1	
Salix laggeri	O	N	E1	3	3		T2	
Salix phylicifolia	O	N		3	3		T1	
Salix repens	O	N		3	3		T3	
Salix x hegetschweileri	O	N	E1	3	3		T1	
Staphylea pinnata	O	N		3	3		T2	
Vitis sylvestris	O	N		3	3		T1	
Betula nana	O	N		4	3		T2	
Daphne alpina	O	N		4	3		T3	
Daphne cneorum	O	N		4	3		T1	

Woody plant species	Characterization				Prioritization			
Non-priority species	type	native	endem	group	rank	reason		
						ESC	T	I
Empetrum nigrum	O	N		4	3		T2	
Ephedra helvetica	O	N	E1	4	3		T2	
Rhamnus saxatilis	O	N		4	3		T2	
Rosa chavinii	O	N		4	3		T2	
Rosa gallica	O	N		4	3		T1	
Rosa majalis	O	N		4	3		T2	
Rosa mollis	O	N		4	3		T1	
Rosa obtusifolia	O	N		4	3		T2	
Rosa rhaetica	O	N	E1	4	3		T2	
Rosa sherardii	O	N		4	3		T3	
Rosa stylosa	O	N		4	3		T2	
Salix alpina	O	N	E2	4	3		T1	
Salix myrtilloides	O	N		4	3		T1	
Vaccinium oxycoccos	O	N		4	3		T3	

1.3. Uses and services of woody plant species

Data source

Table 7.1: Data sources for uses and services of priority species.

Data source	Year	Quality	Comment
Rudow 2011 ff.: eBot dendrology and related data collections	2011	H	List of woody plant species, Dendrological database
Rudow 2012: summary of expert knowledge	1994-2012	H/M	Projects field data, literature, expert knowledge surveys, experiences on species occurance, use/service and threat

Methodology

Table 7.2: Classification and definition of uses and services of woody plant species.

Classification		Definition	Comment
use Woody plant species providing products	1 wood	Production of solid wood products	Values: 4 very important, 3 important, 2 considerable, 1 marginal
	2 pulp	Important pulp and paper production	
	3 energ	Considerable production of energy wood	Species with density (stem number) >1pc/ha
	4 food	Non-wood products: Occasional wild fruit collection or Occasional medical use or Honey yield plants	 e.g. *Sambucus nigra* e.g. *Tilia spec., Picea abies* e.g. *Robinia pseudoaccacia*

	5 agrfor	Agroforestry: Selva or Wood pasture	e.g. *Castanea sativa* e.g. *Pyrus pyraster*, *Picea abies*
	6 other	Basket-weaving	e.g. *Salix viminalis Salix purpurea*
service Woody plant species providing services	1 soiwat	Soil and water conservation (incl. protection against erosion)	Species with density (stem number) >1pc/ha
	2 soifert	Soil fertility	e.g. *Tilia spec*, *Alnus glutinosa, Carpinus betulus*
	3 biodiv	Biodiversity conservation	Native woody plant species
	4 cult	Cultural value Symbolic assemblage trees or Symbolic protection plants and winter green	 e.g. *Tilia spec, Quercus spec* or e.g. *Sambucus nigra, Ilex aquifolium, Abies alba*
	5 aest	Aestetic value Particular forest formation or Monumental landmark trees or Particular phenology (blossom, autumn leave)	 e.g. *Larix decidua, Castanea sativa* e.g. *Quercus spec., Tilia spec., Acer pseudoplatanus, Picea abies* e.g. *Prunus avium, Sorbus aria, Acer platanoides*
	6 relig	Religious value	none in Switzerland
	7 other	Protection against natural hazards: Rockfall protection or Avalanche protection	 e.g. *Tilia spec*) or Avalanche protection

National data

*Table 7.3 (**T5/T6**): W*oody plant species providing uses/products and services.

Woody plant species		**Use**						**Service**					
providing uses and services (alphabetical)	ESC	wood	pulp	energ	food	agrfor	other	soiwat	soifert	biodiv	cult	aest	other
Abies alba	ESC1	4	1	1				1		1	1		1
Acer campestre	ESC2			1				1	1	1			
Acer opalus	ESC2	1		1				1	1	1			
Acer platanoides	ESC2	1		1				1	1	1		1	
Acer pseudoplatanus	ESC1	3		1				1	1	1		1	1
Alnus glutinosa	ESC2	1		1				1	1	1			
Alnus incana	ESC2			1				1	1	1			
Betula pendula	ESC2			1				1		1		1	
Betula pubescens	ESC3							1		1			
Carpinus betulus	ESC2			1				1	1	1			

Woody plant species		**Use**						**Service**					
providing uses and services (alphabetical)	ESC	wood	pulp	energ	food	agrfor	other	soiwat	soifert	biodiv	cult	aest	other
Castanea sativa	ESC1	1		1	1	1		1		1		1	1
Celtis australis	ESC3			1				1		1			
Corylus avellana	ESC3				1		1			1			
Fagus sylvatica	ESC1	4	1	1				1		1			1
Fraxinus excelsior	ESC1	3		1				1	1	1			1
Fraxinus ornus	ESC2			1				1	1	1			
Ilex aquifolium	ESC3									1	1		
Juglans regia	ESC2	1			1					1		1	
Juniperus communis	ESC3				1					1			
Larix decidua	ESC1	3		1				1		1		1	1
Larix kaempferi	ESC3	2											
Malus domestica	ESC3				1	1				1			
Malus sylvestris	ESC2				1	1				1		1	
Mespilus germanica	ESC3				1					1			
Ostrya carpinifolia	ESC2			1				1	1	1			
Picea abies	ESC1	4	1	1	1			1		1	1	1	1
Pinus cembra	ESC1	2		1				1		1		1	1
Pinus sylvestris	ESC1	3		1				1		1		1	1
Pinus uncinata	ESC2	1		1				1		1		1	1
Populus alba	ESC3							1	1	1			
Populus nigra	ESC3							1	1	1			
Populus tremula	ESC2			1				1	1	1			
Populus x canescens	ESC3								1	1			
Prunus avium	ESC1	2		1				1	1	1		1	
Prunus cerasifera	ESC3				1					1			
Prunus cerasus	ESC3				1					1			
Pseudotsuga menziesii	ESC3	2											
Pyrus communis	ESC3				1	1				1			
Pyrus nivalis	ESC3				1					1		1	
Pyrus pyraster	ESC2				1	1				1		1	
Quercus cerris	ESC2	1		1				1		1			
Quercus petraea	ESC1	3		1				1		1	1	1	
Quercus pubescens	ESC2	1		1				1		1			
Quercus robur	ESC1	3		1				1		1	1	1	
Quercus rubra	ESC3	2											
Rhododendron ferrugin.	ESC3				1					1			
Rhododendron hirsutum	ESC3				1					1			
Robinia pseudoacacia	ESC2			1	1			1	1				1
Rubus fruticosus	ESC3				1					1			

Woody plant species		Use						Service					
providing uses and services (alphabetical)	ESC	wood	pulp	energ	food	agrfor	other	soiwat	soifert	biodiv	cult	aest	other
Rubus idaeus	ESC3				1					1			
Salix alba	ESC2			1			1	1	1	1		1	
Salix caprea	ESC2			1				1	1	1			
Salix fragilis	ESC3							1	1	1			
Salix purpurea	ESC3						1			1			
Salix viminalis	ESC3						1			1			
Sambucus nigra	ESC3				1					1	1		
Sorbus aria	ESC2			1				1	1	1			
Sorbus aucuparia	ESC2			1				1	1	1			
Sorbus domestica	ESC3				1	1				1			
Sorbus torminalis	ESC3	1			1					1			
Taxus baccata	ESC2			1				1		1			1
Tilia cordata	ESC1	1		1	1			1	1	1	1	1	1
Tilia platyphyllos	ESC1	1		1	1			1	1	1	1	1	1
Ulmus glabra	ESC2	1		1				1	1	1			1
Ulmus minor	ESC3							1	1	1			
Vaccinium myrtillus	ESC3				1					1			
Vaccinium vitis-idaea	ESC3				1					1			
Viscum album	ESC3									1	1		

There are no religious services of woody plant species (e.g. holy trees).

1.4. Threat of woody plant species

Data source

Table 8.1: Data sources for distribution and threat of priority species.

Data source	Year	Quality	Comment
Info Flora 2012 ff.: National Data Center for Swiss Flora	2012	H/M	National distribution
Rudow 2011 ff.: eBot dendrology and related data collections	2011	H/M	Worldwide distribution
Meusel et al 1965 ff.: Chorologie der mitteleuropaischen Flora	1965 ff	H/M	Worldwide distribution
Hörandl 2002: Weiden in Österreich und angrenzenden Gebieten	2002	H	Worldwide distribution
Brändli 2010: NFI Switzerland	2004-2006	H	Total forest area (NFI tab 011) Stem number per species (NFI tab 065)
BAFU 2007: National red list of fern and flowering plants	2007	H/M	Updated file from official publication (2002)

BAFU 2012: List of national priority species	2012	H/M	Updated file from official publication (2010)
Rudow 2012: summary of expert knowledge	1994-2012	H/M	Projects fielddata, literature, expert knowledge surveys, experiences on species occurance, use/service and threat

Methodology

Table 8.2: Classification and definition of distribution and threat of priority species

Classification		**Definition**	**Comment**
Distribution			
area	(1000 ha)	Forest area of species natural distribution	Extrapolation from total forest area and proportion of national distribution
density	(pc/ha)	Average stem number per hectare forest area of species natural distribution	Extrapolation from stem number per species (DBH > 12 cm), completed
proportion	(%)	National proportion of worldwide distribution	Extrapolation from proportion of national distribution and proportion of worldwide distribution
pattern	W widespread	Proportion of national distribution >= 40%	
	R rare	Proportion of national distribution 10-39%	
	L local	Proportion of national distribution <10%	
Threat			
type	2 ecosystem diversity reduction	ecosystem diversity reduction by production forest management, reduction of natural dynamics alluvial forests	
	7 fragmentation	Habitat fragmentation as result of ancient competition for land use	competition for land use since 150 y fixed, but population fragmentation effects in rare species are going on
	10 emission		
category	EX	extinct	
	EW	extinct in the wild	
	CR	critically endangered	
	EN	endangered	adapted red list acc. IUCN criteria
	VU	vulnerable	adapted red list acc. IUCN criteria
Category (IUCN)	NT	near threatened	adapted red list acc. IUCN criteria

Remark: The proportion of natural distribution in Switzerland is vague. The variable resolution of distribution data leads to considerable bias.

National data

*Table 8.3 (**T7**): Distribution and threat of threatened woody plant species.*

Woody plant species	**Distribution**				**Threat**	
Threatened species (alphabetical)	area	density	proport	pattern	type	category
	(1000 ha)	(pc/ha)	(%)			
Acer opalus	128	5	<1	L	2 / 10	NT
Betula humilis	13		<1	R	7 / 10	CR
Betula nana	64		<1	R	7 / 10	VU
Celtis australis	13	1	<1	R	2 / 10	NT
Colutea arborescens	256		<1	L	7 / 10	NT
Cotinus coggygria	64		<1	R	7 / 10	NT
Daphne alpina	64		1	R	7 / 10	NT
Daphne cneorum	64		1	R	7 / 10	EN
Empetrum nigrum	13		<1	R	7 / 10	VU
Ephedra helvetica	13		<1	R	7 / 10	VU
Fraxinus ornus	64	2	<1	R	2 / 10	NT
Lonicera periclymenum	767		1	W	7 / 10	NT
Malus sylvestris	640	<1	<1	W	2 / 7 / 10	VU
Mespilus germanica	256		1	L	7 / 10	NT
Myricaria germanica	512		1	W	7 / 10	NT
Populus alba	512	<1	<1	W	2 / 7 / 10	VU
Populus nigra	767	<1	1	W	2 / 10	NT
Pyrus nivalis	13	<1	<1	R	2 / 7 / 10	VU
Pyrus pyraster	128	<1	<1	L	2 / 7 / 10	EN
Quercus cerris	13	2	<1	R	2 / 10	NT
Quercus pubescens	256	5	1	L	2 / 10	NT
Rhamnus saxatilis	64		<1	R	7 / 10	VU
Rosa chavinii	64		2	R	7 / 10	VU
Rosa gallica	64		<1	R	7 / 10	EN
Rosa majalis	256		<1	L	7 / 10	VU
Rosa mollis	13		<1	R	7 / 10	EN
Rosa obtusifolia	767		1	W	7 / 10	VU
Rosa rhaetica	13		<1	R	7 / 10	VU
Rosa sherardii	256		<1	L	7 / 10	NT
Rosa stylosa	128		<1	L	7 / 10	VU
Salix alpina	512		10	W	7 / 10	CR
Salix apennina	13		<1	R	7 / 10	VU
Salix caesia	128		2	L	7 / 10	NT
Salix fragilis	256	<1	<1	L	2 / 10	NT
Salix glabra	13		<1	R	7 / 10	EN
Salix laggeri	64		2	R	7 / 10	VU
Salix myrtilloides	13		<1	R	7 / 10	CR
Salix phylicifolia	13		<1	R	7 / 10	CR

Woody plant species	Distribution				Threat	
Threatened species (alphabetical)	area	density	proport	pattern	type	category
	(1000 ha)	(pc/ha)	(%)			
Salix repens	767		1	W	7 / 10	NT
Salix x hegetschweileri	128		5	L	7 / 10	EN
Sorbus domestica	64	<1	<1	R	2 / 7 / 10	EN
Sorbus torminalis	256	<1	<1	L	2 / 7 / 10	VU
Sorbus x latifolia	13	<1	<1	R	2 / 7 / 10	VU
Staphylea pinnata	256		1	L	7 / 10	VU
Taxus baccata	1'023	1	1	W	2 / 10	NT
Ulmus laevis	128	<1	<1	L	2 / 7 / 10	EN
Ulmus minor	256	<1	<1	L	2 / 10	NT
Vaccinium oxycoccos	767		1	W	7 / 10	NT
Vitis sylvestris	13		<1	R	7 / 10	CR

1.5. Forest reproductive material

Data source

Table 9.1: Data sources for forest reproductive material.

Data source	Year	Quality	Comment
BAFU 2012: National register of seed stands	2012	H	Seed sources
Fürst 2010: Report of the national seed agency	2010	H/M	data on demand and offers of seeds by forest tree nurseries 2008-2010
BAFU 2011: Year book	2011	H	Annual plantation of seedlings/plants
Peter 2012: expert knowledge	2012	H/M	Representative proportions of production of seedlings/plants for plantation

1.5.1. Methodology

Table 9.2: Classification and definition of the forest reproductive material of priority species

Classification		Definition	Comment
Seed sources	Seed stands (pc)	Number of selected seed stands	OECD category A
	Area (ha)	Area of selected seed stands	OECD category A
Seed production	Seed (kg/y)	Rough estimate of amount of yearly collection from documented seed sources	Extrapolation from data on demand and offer by nurseries 2008-2010
Plantation	Plants (pc)	Rough estimate of number of yearly produced and planted seedlings/plants	Extrapolation from data on sells of a representative nursery in relation to national overall plantation statistics 2008-2010
	Plants (%)	Rough estimate of proportion of yearly produced and planted seedlings/plants	

1.5.2. National data

Table 9.3: Selected seed sources (OECD category A)

Woody plant species	Native	Seed sources	Area	Comment
		(pc)	(ha)	
Abies alba	N	33	204.38	
Acer platanoides	N	4	28.08	
Acer pseudoplatanus	N	31	65.29	
Alnus glutinosa	N	5	2.33	
Alnus incana	N	8	3.40	
Alnus viridis	N	4	26.20	
Betula pendula	N	2	1.20	
Carpinus betulus	N	10	38.72	
Castanea sativa	N/E	1	4.80	
Fagus sylvatica	N	53	1‘087.40	
Fraxinus excelsior	N	28	60.52	
Juglans nigra	E	2	2.80	
Juglans regia	N/E	6	6.02	
Larix decidua	N	14	85.43	
Picea abies	N	55	467.78	
Pinus cembra	N	9	227.18	
Pinus mugo	N	3	47.60	
Pinus nigra	E	3	3.53	
Pinus sylvestris	N	13	43.94	
Pinus uncinata	N	1	0.35	
Populus nigra	N	1	?	no area data
Populus tremula	N	1	?	no area data
Prunus avium	N	11	6.27	
Pseudotsuga menziesii	E	12	11.68	
Quercus petraea	N	17	93.56	
Quercus pubescens	N	1	1.25	
Quercus robur	N	31	178.78	
Quercus rubra	E	9	10.57	
Sorbus aria	N	3	1.20	
Sorbus aucuparia	N	9	5.94	
Sorbus torminalis	N	4	2,21	
Tilia cordata	N	15	62.38	
Tilia platyphyllos	N	2	1.53	
Ulmus glabra	N	1	0.18	

*Table 9.4 (**T8a**): Seed production from documented seed sources*

Woody plant species	Native	Seed	Seed sources	Comment
		(kg/y)	(pc)	
Abies alba	N	50	10	
Acer campestre	N	5	2	
Acer opalus	N	1	1	
Acer platanoides	N	30	2	
Acer pseudoplatanus	N	50	2	
Alnus glutinosa	N	4	3	
Alnus incana	N	2	3	
Alnus viridis	N	1	1	
Betula pendula	N	3	1	
Carpinus betulus	N	15	2	
Castanea sativa	N/E	75	2	
Fagus sylvatica	N	30	5	
Fraxinus excelsior	N	20	3	
Juglans regia	N/E	50	3	
Larix decidua	N	10	10	incl. 2 provenances from Poland
Malus sylvestris	N	0.5	2	
Picea abies	N	50	10	
Pinus cembra	N	1	1	
Pinus nigra	E	0.5	1	
Pinus strobus	E	0.5	1	
Pinus sylvestris	N	1	2	
Prunus avium	N	15	2	incl. 1 provenance gen. improved
Prunus domestica	N	0.5	1	
Pseudotsuga menziesii	E	10	5	incl. 4 provenances from USA
Pyrus pyraster	N	0.5	2	
Quercus petraea	N	700	3	
Quercus robur	N	500	3	
Quercus rubra	E	40	1	
Sorbus aria	N	1	2	
Sorbus aucuparia	N	0.5	1	
Sorbus domestica	N	0.5	2	
Sorbus torminalis	N	0.5	1	
Taxus baccata	N	0.5	1	
Tilia cordata	N	10	3	
Tilia platyphyllos	N	15	3	
Ulmus glabra	N	5	2	
Ulmus laevis	N	1	2	
Ulmus minor	N	0.5	1	

There is no information on systematical provenance tests and there is no genetically improved material used in Swiss forest.

*Table 9.5 (**T8b**): Plantation*

Woody plant species	**Plants**	**Proportion**	**Comment**
	(1000 pc)	(%, trees)	
Frequently planted trees (ranked)	>1	>0.1	
Picea abies	773	51.5	
Pseudotsuga menziesii	109	7.3	
Quercus robur	94	6.3	
Abies alba	82	5.5	
Acer pseudoplatanus	79	5.2	
Larix decidua	48	3.2	
Abies nordmanniana	45	3.0	
Alnus glutinosa	32	2.1	
Prunus avium	32	2.1	
Quercus petraea	30	2.0	
Fagus sylvatica	27	1.8	
Tilia cordata	13	0.9	
Alnus incana	11	0.7	
Sorbus aucuparia	10	0.6	
Carpinus betulus	9	0.6	
Acer campestre	7	0.5	
Acer platanoides	7	0.4	
Betula pendula	7	0.5	
Pinus silvestris	7	0.5	
Tilia platyphyllos	7	0.5	
Ulmus glabra	6	0.4	
Fraxinus excelsior	5	0.3	
Juglans regia	5	0.4	
Picea pungens	5	0.3	
Pyrus pyraster	4	0.2	
Sorbus aria	4	0.3	
Larix kaempferi	3	0.2	
Malus sylvestris	3	0.2	
Prunus mahaleb	3	0.2	
Sorbus torminalis	3	0.2	
Acer opalus	2	0.2	
Pinus nigra	2	0.1	
Populus nigra	2	0.1	
Quercus rubra	2	0.1	
Salix caprea	2	0.2	
Taxus baccata	2	0.1	
Ulmus minor	2	0.1	
Other planted trees (alphabethic)	<1	<0.1	
Abies grandis	<1	<0.1	

Woody plant species	Plants	Proportion	Comment
	(1000 pc)	(%, trees)	
Castanea sativa	<1	<0.1	
Ginkgo biloba	<1	<0.1	
Juglans nigra	<1	<0.1	
Liriodendron tulipifera	<1	<0.1	
Morus alba	<1	<0.1	
Picea omorika	<1	<0.1	
Pinus cembra	<1	<0.1	
Pinus mugo arborea	<1	<0.1	
Pinus strobus	<1	<0.1	
Populus alba	<1	<0.1	
Populus tremula	<1	<0.1	
Prunus domestica	<1	<0.1	
Quercus pubescens	<1	<0.1	
Robinia pseudoaccacia	<1	<0.1	
Salix alba	<1	<0.1	
Salix fragilis	<1	<0.1	
Sequoiadendron gigant	<1	<0.1	
Sorbus chaemespilus	<1	<0.1	
Sorbus domestica	<1	<0.1	
Sorbus mougeotii	<1	<0.1	
Thuja plicata	<1	<0.1	
Ulmus laevis	<1	<0.1	
Planted shrubs	>1		
Alnus viridis	1.0		
Amelanchier ovalis	4		
Berberis vulgaris	7		
Cornus mas	14		
Cornus sanguinea	15		
Coronilla emerus	4		
Corylus avellana	6		
Cotinus coggygria	2		
Crataegus monogyna	3		
Cytisus scoparius Link	2		
Evonymus europaea	26		
Genista tinctoria	1		
Hedera helix	1		
Hippophae rhamnoides	5		
Ilex aquifolium	1		
Juniperus communis	2		
Ligustrum vulgare	22		
Lonicera alpigena	1		

Woody plant species	Plants	Proportion	Comment
	(1000 pc)	(%, trees)	
Lonicera coerulea	2		
Lonicera nigra	5		
Lonicera xylosteum	19		
Mespilus germanica	1		
Prunus padus	12		
Prunus spinosa	30		
Rhamnus alpinus	2		
Rhamnus catharticus	23		
Rhamnus frangula	12		
Ribes alpinum	4		
Ribes uva-crispa	3		
Rosa abietina	1		
Rosa arvensis	7		
Rosa canina	18		
Rosa corymbifera	2		
Rosa glauca	4		
Rosa majalis	6		
Rosa micrantha	2		
Rosa pendulina	4		
Rosa pimpinel	3		
Rosa rubinigosa	10		
Rosa tomentosa	2		
Rosa villosa	2		
Rosa vosagiaca	3		
Salix appendiculata	2		
Salix nigricans	1		
Salix purpurea	5		
Salix viminalis	2		
Sambucus nigra	15		
Sambucus racemosa	1		
Staphylea pinnata	1		
Viburnum lantana	26		
Viburnum opulus	26		
Vinca minor	2		

In Switzerland planting activities were continuously reduced to actual level of 1.5 mio trees (60% conifers, 40% deciduous, plus several shrubs) with a view to enrich naturally regenerating areas with especially desired species (e.g. spruce or Douglas fir in a matrix of naturally regenerating matrix of deciduous trees).

1.6. Genetic characterization (intraspecific variation)

In general the Alpine region offers favorable conditions for differentiation processes and is therefore of importance for the conservation of intraspecific variation of many species. This fact is caused by a huge variation of habitat (steep gradients of abiotic factors within region) up to naturally non-wood area, i.e. inner limits of the distribution area (sympatric differentiation). Furthermore it is caused by the topographic structure with increased isolation effects (allopatric differentiation).

Today knowledge on intraspecific variation is still very incomplete. But the assumption of potential ecotypes is possible by taxonomic knowledge (var., subsp., endemic species), morphological and ecological characteristics as well as by genetic analyses. This means that a systematical evaluation and synthesis of all existing data in these fields as well as complementary studies on potential ecotypes are necessary. A better knowledge on ecotypes is especially needed in connection with adaptation measures due to climate change.

Data source

Table 10.1: Data sources for genetic characterization.

Data source	Year	Quality	Comment
Rudow 2012: summary of expert knowledge	1994-2012	H/M	Projects field data, literature, expert knowledge surveys, experiences on species occurance, use/service and threat

Methodology

Table 10.2: Classification and definition of genetic characterization studies.

Classification		Definition	Comment
Genetic characterization studies	Populations (Individuals) (pc)	Number of analised populations and Individuals	
	Number Marker type (pc, text)	Number and type of used markers	

National data

*Table 10.3 (**T9**): Knowledge on genetic characterization.*

Woody plant species	Populations (Individuals)	Number (Marker type)	Comment, Publication
	(pc)	(pc)	
Abies alba	20 (2'000)	10 Isoenzyme	Hussendörfer 1996
Abies alba	18 (1'800)	14 Isoenzyme	Hussendörfer 1999
Castanea sativa	1 (164)	8 nDNA	Gobbin et al 2007
Picea abies	20 (2'000)	18 Isoenzyme	Müller-Starck 1995 Bonfils et al 1996
Picea abies	97 (1'105)	3 cpDNA	Vendramin et al. 2000
Picea abies	36 (720)	2 mtDNA	Gugerli et al. 2001
Picea abies	369 (4'876)	2 mtDNA	Tollesfrud et al. 2008
Pinus cembra	39 (624)	4 cpDNA	Gugerli et al 2009
Pinus cembra	28 (831)	3 cpDNA	Höhn et al 2009
Populus nigra, Populus x deltoides	29 (1'372)	1/2 cpDNA/nDNA	Csencsics et al 2009
Quercus petraea	28 (2'800)	17 Isoenzyme	Finkeldey 2001 Finkeldey et al 2001
Quercus petraea, Quercus robur, Quercus pubescens	181 (1'036)	10 cpDNA	Matyas et al 2001
Sorbus domestica	7 (544)	14 Isoenzyme	Wagner 1998
Sorbus domestica	2 (189)	9 nDNA	Kamm et al 2009 Kamm et al 2011
Sorbus domestica	2 (49/189/1'183)	9 nDNA	Kamm et al 2010 (Individuals: mat/pat/child)
Sorbus torminalis	11 (724)	7 Isoenzyme	Menn 1998
Sorbus torminalis	2 (123)	7 Isoenzyme	Hoebee et al. 2006
Sorbus torminalis	26 (573)	5 nDNA	Hoebee et al. 2007
Taxus baccata	14 (276)	4 nDNA	Hilfiker et al 2004

2. The State of *in situ* genetic conservation

2.1. Conservation in protected areas (national parks, reserves)

There is no consistent analysis of synergetic conservation of forest trees and other woody plant species in existing national parks or forest reserves.

Actual parks and reserves cover a forest area of 53'010 ha (4.6% of total forest area) of which 415 natural forest reserves with an area of 29'087 ha and 424 special forest reserves with an area of 23'923 ha. Forest in national parks and natural forest reserves can play an important role for the genetic conservation of the main tree species (competitor strategy, e.g. *Fagus sylvatica*) as well as of secondary tree species and shrub species that settle on extreme sites (stess tolerator strategy, e.g. *Pinus sylvestris, Staphylea pinnata*). Furthermore, the genetic conservation of several tree and shrub species can be realized in existing special forest reserves (e.g. selva management, coppicing management) with targeted silvicultural measures for the promotion of the relevant species or specific forest ecosystems. But, up to now there is no systematic assessment of the existing forest reserves on behalf of conservation of forest genetic resources.

2.2. *In situ* conservation programmes/units

Data source

Table 11.1: Data sources for in situ conservation programmes/units.

Data source	Year	Quality	Comment
Bolliger 2012: Forest reserves policy (SZF)	2012	H	Area of forest reserves
Bolliger 2012: BGI survey	2012	H/M	Data of BGI units
Rudow 2007: SEBA GCU report	2007	H	EUFORGEN CAP proposal
Rudow 2012: expert knowledge from EUFORGEN working group 1 on conservation strategies	2007	H	EUFORGEN 2012ff worklist

Methodology

Table 11.2: Classification and definition of in situ conservation programmes/units.

Classification		Definition	Comment
Populations	(pc)	number of selected seed stands	
Area	(ha)	area of selected seed stands	

National data

*Table 11.3 (**T10**): In situ conservation programmes/units.*

Woody plant species	Populations	Area	Comment, >> Purpose
	(pc)	(ha)	
Ancient programme of gene conservation unit	5	663	BGI (1995-2004) >> dynamic GCU (protection status, partly without contract*)
Abies alba	3	512 100 4.5	Risoud, Le Chenit, VD Ochsenboden, Region Sierre, VS (*) Satz, Tschlin, GR (*)
Picea abies	2	512 24	Risoud, Le Chenit VD Scatlé, Brigels GR
Quercus petraea	1	22.5	Galm, FR
Proposed potential gene conservation units	(30)	(> 4500 ha)	SEBA GCU / EUFORGEN CAP (2007) >> proposal (no protection status!)
Acer platanoides	(3)	(> 600 ha)	Region Glarner Unterland, GL Region Jurasüdfuss Areuse, NE Basel, BS
Fraxinus excelsior	(3)	(46 ha)	Villnachern, AG Tägerwilen, TG Scheuren, BE
Populus nigra	(4)	(155 ha)	Preonzo, TI Region Chur, GR Region Alte Aare, BE Region Aubonne, VD
Prunus avium	(3)	(306 ha)	Tägerwilen, TG Baar, ZG Riedholz, SO
Pyrus pyraster	(3)	(> 600 ha)	Region Romont, BE Thalheim, AG Region Elfingen, AG
Sorbus domestica	(2)	(> 400 ha)	Region Schaffhausen, SH Region Genf, GE
Sorbus torminalis	(5)	(> 1000 ha)	Region Nozon, VD Region Elfingen, AG Region Kyburg, ZH Region Weinland, TG/ZH Region Schaffhausen, SH
Tilia cordata	(4)	(> 800 ha)	Quarten, SG Region Rheinau, ZH Region Hasliberg, BE Region Valle Onsernone, TI
Tilia platyphyllos	(4)	(484 ha)	Wölflinswil, AG Region Leissigen, BE Gaumois, JU Region Monte S. Giorgio, TI
Ulmus laevis	(2)	(175 ha)	Basel, BS Region Neuenburgersee, NE

Internationally expected dynamic conservation units	18		Acc. to DCU, EUFORGEN (2012ff) >> worklist (no protection status!)
Abies alba	+1		continuing/completing BGI
Castanea sativa	2		using SEBA CASTANEA data
Fagus sylvatica	2		using NFI data
Fraxinus excelsior	2		using SEBA GCU data
Picea abies	+1		continuing/completing BGI
Pinus brutia	0		not native in Switzerland
Pinus cembra	1		using NFI data and genetic data
Pinus halepensis	0		not native in Switzerland
Pinus nigra	0	0	not native in Switzerland
Pinus sylvestris	2		using NFI data
Populus nigra	2		using SEBA POP + SEBA GCU data
Populus tremula	2		using NFI data
Quercus petraea	+1		continuing/completing BGI
Sorbus torminalis	2		using SEBA GCU and genetic data
Possible complements	26		Acc. to priority species list >> priority species (\ neophytes)
Acer opalus	2		using NFI data + INFOFLORA data
Acer pseudoplatanus	2		using NFI data
Celtis australis	1		data deficient (research)
Fraxinus ornus	1		data deficient (research)
Larix decidua	1		using NFI data
Malus sylvestris	2		data deficient (research)
Pinus uncinata	1		using NFI data
Populus alba	2		data deficient (research)
Pyrus nivalis	2		data deficient (research)
Quercus cerris	1		data deficient (research)
Quercus pubescens	2		using NFI data + INFOFLORA data
Quercus robur	2		using NFI data + genetic data
Salix fragilis	2		data deficient (research)
Sorbus x latifolia	1		data deficient (research)
Taxus baccata	2		using SEBA data
Ulmus minor	2		data deficient (research)

2.3. Constraints and future priorities for *in situ* conservation

2.3.1. General

There is no continuous development of *in situ* conservation of forest genetic resources in Switzerland. The efforts started relatively early in the late 1980-ies. Since then the knowledge on distribution and genetic constitution of several mainly rare species could have been established. But the realization of *in situ* conservation programs with protected gene conservation units was confronted with structural problems in a small and densely populated country. Furthermore the reorganization of the relevant national administration and of the forest sciences department at the national university led to a temporary suspension of the genetic conservation topic since 2004. In the meanwhile conservation strategies for forest biodiversity focused on the promotion of rare and scattered tree species (sensitization, silvicultural knowledge) and the promotion of saprophytic biodiversity in forests (old stands/deadwood management, natural forest reserves).

The fact that *in situ* conservation of forest genetic resources in Switzerland until recently was focused on rare species is also linked to a very strong trend in Swiss sylviculture towards predominantly natural regeneration with planting activities of currently yearly rates of not more than 1.5 mio trees (60% conifers, 40% deciduous, plus several shrubs). Plantations are mainly done with a view to enrich naturally regenerating areas with desired species (e.g. spruce or Douglas fir in a matrix of naturally regenerating matrix of deciduous trees).

Before the background of climate change and the consequent necessity to foster the adaptive capacity of forests there is a growing interest to know more about eco-typical differentiation data of main species like spruce, beach or silver fir).

2.3.2. Constraints

- There is a significant lack of knowledge for many priority species: partially even missing distribution data as well as morpho- and/or ecotypical differentiation data and genetic data.
- Structural problems concerning low scale patterns in ownership and traditionally multifunctional use of forest area are complicating the necessary precedency of genetic conservation in dynamic conservation units and the respective contracting.
- Continuous reorganization and currently few capacities of national forest administration led to a lack of strategy and resources for research and realization of programs.

2.3.3. Future priorities

1. Decision on long term strategy and road map (2013-2020) for the realization of a national *in situ* conservation program for priority species in accordance with available resources.
2. Realization of most important/urgent *in situ* gene conservation measures:
   - 2.1. Establishment of *in situ* conservation units after reconsideration of EUFORGEN expectations and synergies with other conservation and biodiversity activities, in particular the Swiss Biodiversity Strategy (currently expected EUFORGEN core units for selected model species in Switzerland: 18 units for 12 species).
   - 2.2. Establishment of a GIS database for forest genetic resources integrating existing and new data (conservation units, forest reserves, seed stands).
   - 2.3. Integration of forest practice in all evaluation and selection processes for dynamic conservation units, especially with a view to increase adaptive capacity in Swiss sustainable forest management (sensitization, collaboration – cf. SEBA methodology)
3. Research on most important basic knowledge
   - 3.1. Assessment of existing forest reserves for synergetic use as *in situ* conservation units for main tree species.
   - 3.2. Assessment of existing selected seed stands for synergetic use as *in situ* conservation units for several tree species.
   - 3.3. Coordination of research activities on basic knowledge (distribution, ecotype variation, genetic constitution) of priority species at universities and research institutes.
   - 3.4. Integration of aspects of adaptation to climate change, e.g. adaptive capacity of main tree species.

3. The state of *ex situ* genetic conservation

3.1. *Ex situ* conservation programs/units

Data source

Table 12.1: Data sources for ex situ conservation programs/units.

Data source	Year	Quality	Comment
Peter 2011: List of ex situ conservation and seed orchards	2011	H	Conservation units from Pflanzgarten Lobsigen, KAWA Bern
Burkart 2012: List of ex situ conservation and seed orchards	2011	H	Conservation units from WSL and cantonal forest officeces
Rudow 2007: SEBA GCU report	2007	H	EUFORGEN CAP proposal

Methodology

Table 12.2: Classification and definition of ex situ conservation programs/units.

Classification		Definition	Comment
native	N native species	originally native or since less than 500 y introduced	
	E exotic species	since more than 500 y introduced	
stands	(pc)	number of provenance stands	
acces.	(pc)	number of accessions	
clones	(pc)	number of clones per accession	
area	(ha)	area of conservation unit	

National data

*Table 12.3 (**T11**): Ex situ conservation programs/units.*

Woody plant species	native	stands	acces.	clone	area	Comment, >> Purpose
		(pc)	(pc)	(pc)	(ha)	
Canton Bern *ex situ* programme	N	269	841	(1-2)	4.84	KAWA BE (1996-2012) >> conservation and seed orchard
Acer pseudoplatanus	N	29	78	(1-2)	0.31	Seedorf, BE
Acer platanoides	N	27	70	(1-2)	0.32	Wohlen, BE
Alnus glutionosa	N	23	63	(1-2)	0.35	Wohlen, BE
Juglans regia	N/E	?	55	(1-2)	0.56	Gampelen, BE
Malus sylvestris	N	11	78	(1-2)	0.23	Bargen, BE
Populus nigra	N	?	47	(1-2)	0.05	Seedorf, BE (Mutterstockquartier)
Prunus avium	N	32	67	(1-2)	0.34	Wohlen, BE
Pyrus pyraster	N	12	80	(1-2)	0.30	Bargen, BE
Sorbus domestica	N	80	98	(1-2)	1.38	Biel, BE
Tilia cordata	N	23	72	(1-2)	0.37	Seedorf, BE
Tilia platyphyllos	N	23	57	(1-2)	0.40	Wohlen,, BE
Ulmus laevis	N	9	76	(1-2)	0.24	Seedorf, BE

Woody plant species	native	stands	acces.	clone	area	Comment, >> Purpose
		(pc)	(pc)	(pc)	(ha)	
Reserach institute WSL *ex situ* programme	N		ca.115	1		WSL & forest office AG, BS/BL >> conservation and seed orchard
Prunus avium	N		ca. 35	1		Möhlin, AG
Prunus avium	N		ca. 35	1		Wölflinswil, AG
Sorbus torminalis	N		ca. 45	1		Aesch, BL

In general ex situ units are multifunctional, providing conservation and seed production, in some cases they are improved to a little extent by targeted selection of types of high silvicultural quality (PLUS trees).

There are no germplasm banks for forest woody plant species.

3.2. Constraints and future priorities for *ex situ* conservation

General

There is mainly one cantonal actor carrying out *ex situ* conservation of forest genetic resources in Switzerland. Up to now, all together 14 conservation and seed orchards have been established for 13 main and secondary tree species. In general the accessions are coming from the western part of Switzerland all within the temperate continental forest zone (TeDc). The provenances could be named “Northern Switzerland”.

Constraints

- Continuous reorganization and currently few capacities of national forest administration led to a lack of strategy and resources for research and realization of programs.
- This led to a significant lack of knowledge for many priority species: partially missing distribution data as well as morpho- and/or ecotypical differentiation data and genetic data.

Future priorities

1. Decision on long term strategy and road map (2013-2020) for the realization of a national *ex situ* conservation program for priority species in accordance with available resources.
2. Realization of most important/urgent *ex situ* gene conservation measures:
   2.1. Maintenance and monitoring of existing *ex situ* conservation units (in Switzerland: 14 units for 13 species).
   2.2. Complement existing *ex situ* conservation and seed orchards (number of accessions) and complement *ex situ* conservation units for threatened secondary tree species.
   2.3. Establishment of a GIS database for forest genetic resources integrating existing and new data (conservation units, forest reserves, seed stands).
   2.4. Integration of aspects of adaptation to climate change, e.g. adaptive capacity of main tree species.

4. The state of use and sustainable management of forest genetic resources

4.1. International seed transfer

Data source

Table 13.1: Data sources for international transfer of plant material.

Data source	Year	Quality	Comment
Fürst 2010: Report of the national seed agency	2010	H/M	data on import and export of plant material

Methodology

Table 13.2: Classification and definition of international transfer of plant material.

Classification		Definition	Comment
native	N native species	originally native or since more than 500 y introduced	
	E exotic species	since less than 500 y introduced	
seed quantity	(kg)		
Number propagules	(pc)		
Number seedlings	(pc)		

National data

*Table 13.3 (**T12**): International transfer of plant material.*

Woody plant species	native	Seed		Propagule		Plant		Comment, >> Purpose
		Import	Export	Import	Export	Import	Export	
		(pc)	(pc)	(pc)	(pc)	(pc)	(ha)	
	N							
	N							
	N							
	N							
	N							

Seed transfer to Switzerland has been very active from the 1880ies on until the 1930ies. Since then the supply steadily decreased and its is almost inexistent today. No further Information available for the time being.

4.2. Improvement programs

There are no regular improvement programmes for forest woody plant species. Only some non-systematical approaches exist for the improvement of exemplary species:

- Partially selection of PLUS trees for seed orchards (e.g. *Prunus avium, Sorbus torminalis, Acer pseudoplatanus*) in the frame of double function of conservation and seed orchards (cf. chapter 3.1 *Ex situ* conservation programs/units).
- Partially selection of resistant clones against pathogens (e.g. *Ulmus glabra, Castanea sativa*).

4.3. Availability of information and material from breeding programmes

There is no information system on breeding programs and improved plant material.

5. The state of national programs, research, education, training and legislation

*Table 14 (**T17**): Institutions involved with conservation and use of forest genetic resources*

Name of Institution	Type of Institution	Activities/Programs	Contact Information
Federal office for the environment (BAFU)	Federal administration		
Forest Division	Divison	Forest Program Switzerland 2004-2015	Rolf Manser +41 31 324 78 39 rolf.manser@bafu.admin.ch
Species, Habitat, Ecological Networks Section	Section of the Species, Ecosystems, Landscapes Division	Parks and inventories, red list of threatened species, black list of dangerous neophytes	Sarah Pearson Perret +41 31 322 68 66 sarah.pearson@bafu.admin.ch
NFA forest biodiversity, forest reserves, deadwood	Part of Wildlife and Forest Biodiversity Section of the Species, Ecosystems, Landscapes Division	NFA forest biodiversity, forest reserves	Markus Bolliger +41 31 324 77 87 markus.bolliger@bafu.admin.ch
Forest Products and Services and Forest Quality	Section of the Forest Division	Forest genetic ressources, international relations (e.g. FAO)	Silvio Schmid +41 31 324 78 77 silvio schmid@bafu.admin.ch
Swiss Federal Institute for Forest, Snow and Land-scape Research (WSL)	National research		
Ecological Genetics	Group of the Biodiversity and Conservation Biology Division	Genetic analysis of several tree species	Felix Gugerli +41 44 739 25 90 felix.gugerli@wsl.ch
Swiss Federal Institute of Technology (ETH)	National research and education		
Forest Management	Group of the Terrestrial Ecosystems Institute (Dep. Environmental Systems Sciences)	Silviculture, Forest genetic ressources, national coordinator EUFORGEN	Peter Rotach +41 44 632 32 10 peter.rotach@env.ethz.ch
Forest Management, Forest Ecology	Groups of the Terrestrial Ecosystems Institute (Dep. Environmental Systems Sciences)	Dendrology/Dendro-ecology, Promotion of are tree species, contributor EUFORGEN	Andreas Rudow +41 44 632 32 13 andreas.rudow@env.ethz.ch
Other institutions	Services and projects		
National Data and Information Center for the Swiss Flora (info flora)	National Service Center	Flora, Red list of threatened species, Black list of invasive neophytes	Stefan Eggenberg 41 22 418 51 98 stefan.eggenberg@infoflora.ch
Biodiversity Monitoring Switzerland (BDM)	National Project (private office)	Biodiversity Monitoring	Urs Hintermann +41 61 717 88 88 hintermann@hintermannweber.ch

5.1. National programmes

The new **Swiss Biodiversity Strategy** (2012) notes that gaps exist in the knowledge about genetic diversity and that the following measures have already been carried out in the area of FGR: maximum possible level of natural regeneration, use of seed material for planting that is suited to the location, promotion of rare tree species, designation of genetic reserves (forests of particular genetic interest).

The strategic objectives of the Swiss Biodiversity Strategy incorporate the following points in relation to FGR:

- Close-to-nature silviculture (7.1.2): natural regeneration; regeneration that is suited to local conditions; consideration of existing structural diversity; soil-conserving wood harvesting.
- Natural forest dynamics/process protection (7.1.2): forest reserves (in particular for the FGR of main, important tree species), dead wood, complementary targeted promotion of species.
- Improvement of the conservation status of national priority species (7.3): prioritisation based on threat, the responsibility of Switzerland and urgency; habitat protection and complementary species-specific action plans; prevention of the import and spread of invasive species.
- Strategy for the conservation of genetic diversity (7.4): priority measures for the conservation of genetic diversity and avoidance of genetic erosion.
- Recording of genetic resources (7.4): basis for the establishment and prioritisation of conservation measures; development of genetic variation as a criterion for protected and networked areas.
- Ratification of the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilisation (Access and Benefit-Sharing – ABS) (7.4): partial revision of the Federal Act on the Protection of Nature and Cultural Heritage (drafting of new legislative provisions)

Concrete measures are currently being developed in the context of the action plan for the implementation of the Swiss Biodiversity Strategy.

The **Swiss National Forest Programme 2004-2015** was designed as an action programme. The specific objectives with the associated indicators and target values for 2015 are defined under the overall objective "Biodiversity is conserved" (4.3.2). These encompass the promotion of genetic diversity:

- Forests with special interventions (managed protected forests and genetic reserves) to promote biodiversity: promotion of species, genetic traits and special management forms.

In terms of measures, to guarantee the protection of the forest ecosystem (5.3), in addition to the adoption of a general ecological standard, it is aimed to establish biodiversity priority areas:

- Large-scale species and genetic conservation programme: development and implementation of specific promotion and genetic conservation programmes for priority species.

The **Forest Policy 2020** does not adopt the requirements of the Swiss National Forest Programme 2004-2015 on forest genetic conservation (5.3) and those of the Swiss Biodiversity Strategy (7.4). It does not incorporate any concrete objectives or measures for the conservation of forest genetic resources. Due to this clear contradiction with the Swiss Biodiversity Strategy, which was published at the same time as the Forest Policy 2020 and with the involvement of the same authorities, it must be assumed that this was an oversight. The need for measures to conserve the genetic variability of native forest tree species with the aim of promoting self-conservation and adaptability to climate changes is undisputed today.

There is no **national coordination mechanism** established in Switzerland.

In general **support and funding** for FGR has declined over the past 10 years. This is caused by the high complexity and costs of adequate measures on the one hand (inventory of metapopulation structures and genetic variation) as well as by the limited finances and the urgency of other tasks on the other hand (establishment of regular NFA forest biodiversity programmes).

5.2. Research, education and training

The budget allocated to FGR research is marginal and its proportion within forest research is very low (< 1%).

The only studies in forest management in Switzerland are a BSc and MSc study at Federal Institute of Technology (ETH Zurich): Environmental Sciences, with major in Forest and Landscape Management. In this studies one course is offered touching the general aspects of FGR with focus on genetic methods: LV 701-1676-01L Landscape Genetics (Holderegger, Bolliger, Gugerli).

Table 15: Needs and priorities for developing FGR research and education.

Needs	**Priority level**			
	not applicable	low	medium	high
Integration of FGR into education program			**X**	
Coordination of research activities on basic knowledge (distribution, ecotype variation, genetic constitution) of priority species at universities and research institutes			**X**	
Funds for particular research on exemplary EUFORGEN model species (distribution, ecotype variation, genetic constitution)				**X**

5.3. National legislation

There is no legal framework particularly focusing forest genetic resources. But legislation basis is sufficient to achieve the main FGR goals:

- Forest reproductive material and genetic reserves
- Research and development
- Biological diversity of the forest
- Protection of plant species
- Biotope protection

Moreover, there are draft legal measures concerning genetic resources in the Federal Act on the Protection of Nature and Cultural Heritage that may enter into force with the entering into force of the Nagoya Protocol for Switzerland.

Federal Act on Forest (ForA) / Ordinance on Forest (ForO)

Forest reproductive material and genetic reserves

ForA, Chap. 4: Maintenance and Use of the Forest, Sect. 1: Forest Management,
Art. 24 Forest reproductive material

…

[2] *The Federal Council issues regulations on the origin, use, trading and safeguarding of forest reproductive material.*

ForO, Chap. 4: Maintenance and Use of the Forest, Section 2: Forest Reproductive Material,
Art. 21 Production and use

[1] *The cantons shall guarantee the supply of appropriate suitable forest reproductive material.*

[2] *The competent cantonal forest authority shall select the forests stands, from which forest reproductive material may be obtained. It shall notify the seed stands to the Federal Office.*

[3] *It shall control the commercial and industrial production of seeds and plant parts and issues certificates of origin.*
[4] *Only forest reproductive material of certified origin may be used for forestry purposes.*
[5] *The Federal Office shall advise the cantons about:*
a. the production, supply and use of forest reproductive material;
b. the safeguarding of genetic diversity.
[6] *It keeps a register of the seed stands and a register of the genetic reserves.*

Research and development

ForA, Chap. 5: Promotional Measures, Sect. 1: Training, Advice, Research and Data Acquisition, Art. 31 Research and development
[1] *The Confederation may commission or provide funding for the following purposes:*
…
b.research and development of measures for the protection of the forest against harmful effects;
c. research and development of measures aimed at protecting human life and significant material assets against natural events;
…
[2] *It may establish and operate research institutes.*

Biological diversity of the forest

ForA, Chap. 5: Promotional measures, Sect. 2: Financing, Art. 38[1] Biological diversity of the forest
[1] *The Confederation provides financial assistance for measures that contribute to the conservation and improvement of biological diversity in the forest, in particular for:*
a.the protection and maintenance of forest reserves and other ecologically valuable forest habitats;
…
e.the collection of forest reproductive material.
[2] *It provides financial assistance:*
a. for measures under paragraph 1 letters a–d: as global payments on the basis of programme agreements concluded with the cantons;
b. for measures under paragraph 1 letter e: by a ruling of the Federal Office.
[3] *The level of the financial assistance is based on the significance of the measures in relation to biological diversity and the effectiveness of the measures.*

ForO, Chap. 4: ForO, Chap. 6: Financial Assistance (excluding Investment Credits) and Compensatory Payments , Sect. 2: Measures, Art. 41 Biological diversity of the forest
[1] *The level of global financial assistance for measures that contribute to the maintenance and improvement of the biological diversity of the forest is based on:*
a. the number of hectares of forest reserves that are to be designated and maintained;
…
d. the extent and quality of the measures for the promotion of animal and plant species, the conservation of which is a matter of priority for biological diversity;
…
g. the quality of the services provided.
[2] *The amount is negotiated between the Federal Office and the canton concerned.*
[3] *The financial assistance may only be allocated, if the protection of the ecological as listed under paragraph 1 letters a and c–f is guaranteed contractually or in any other suitable way.*

Federal Act on the Protection of Nature and Cultural Heritage (NCHA) / Ordinance non the Protection of Nature and Cultural Heritage (NCHO)

Protection of plant species

NCHA, Sect. 3: Protection of Indigenous Flora and Fauna, Art. 18 Protection of animal and plant species

[1] The extinction of indigenous animal and plant species must be prevented by preserving sufficiently extensive habitats (biotopes) and by other appropriate measures. These measures must pay due regard to agricultural and forestry interests deserving protection.

[1bis] Special protection shall be given to riparian zones, fenlands and mires, rare forest communities, hedgerows, thickets, dry grasslands and other sites that play a role in preserving the ecological balance or which provide especially favourable conditions for biocoenoses.[1]

…

[3] The Confederation may promote the resettlement in suitable sites of species that have become extinct in the wild in Switzerland or whose numbers are threatened.

…

Biotope protection

NCHA, Sect. 3: Protection of Indigenous Flora and Fauna, Art. 18a[1] Biotopes of national importance

[1] The Federal Council shall designate biotopes of national importance after consulting the cantons. It shall define the location of these biotopes and specify the protection objectives.

[2] The cantons shall make arrangements for the protection and upkeep of biotopes of national importance. They shall take appropriate measures in good time and ensure that they are implemented.

…

Art. 18b[1] Biotopes of regional and local importance and ecological compensation

[1] The cantons are responsible for the protection and upkeep of biotopes of regional and local importance.

…

NCHO, Sect. 3: Protection of Indigenous Flora and Fauna, Art. 14[1] Biotope protection

[1] Biotope protection, combined in particular with ecological compensation measures (Art. 15) and the species protection provisions (Art. 20), is intended to ensure the survival of indigenous wild flora and fauna.

[2] Biotopes shall be protected in particular by:

…

d. the establishment of buffer zones to provide adequate ecological protection;

e. the preparation of basic scientific material.

[3] Biotopes shall be designated as deserving protection on the basis of:

a. biotopes types characterised in particular by indicator species, as specified in Annex 1;

b. plant and animal species protected under Article 20;

…

d. threatened and rare plant and animal species cited in the Red Lists issued or approved by the FOEN;

e. additional criteria, such as species mobility requirements or ecological networks.

[4] The cantons may adapt the lists referred to in paragraph 3 letters a—d to regional circumstances.

…

Red List and List of national priority species

The federal office for the environment edits the official national Red Lists as well as of the List of national priority species. The IUCN criterion A, focusing the changes in population size over 10 years or three generations, in general for woody plant species is highly underestimated. Therefore the priority species of FGR has to be adapted/completed (as realized in list of priority species in chap. 1.2.).

Needs and priorities

*Table 16 (**T18**): Needs and priorities for developing FGR legislation.*

Needs	**Priority level**			
	not applicable	low	medium	high
Improve forest genetic resources legislation (adaptation/complement of red list and list of priority species)			**X**	
Improve reporting requirements (database)				**X**
Consider sanction for non-compliance		**X**		
Create forest genetic resources targeted regulations (NFA programme)				**X**
Improve effectiveness of forest genetic resources regulations (NFA programme)				**X**
Enhance cooperation between forest genetic resources national authorities			**X**	
Create a permanent national commission for conservation and management of forest genetic resources			**X**	

5.4. Public awareness

There is no specific awareness programme for FGR in Switzerland.

*Table 17 (**T19**): Needs and priorities for raising awareness of FGR.*

Needs	**Priority level**			
	not applicable	low	medium	high
Prepare targeted forest genetic resources information				**X**
Prepare targeted forest genetic resources communication strategy		**X**		
Improve access to forest genetic resources information			**X**	
Enhance forest genetic resources training and education		**X**		
Improve understanding of benefits and values of forest genetic resources				**X**

6. The state of regional and international collaboration

6.1. International agreements

United Nations Conference on Environment and Development / Sustainable Development

- 1992, Rio de Janeiro, Convention on Biological Diversity (CBD)
- (2012, Rio de Janeiro, no decisions/declarations with relevance for FGR!)

Forest Europe (earlier Ministerial Conference on Protection of forests in Europe)

- 1990, Resolution S2: Genetic resources
- 1993, Resolution H2: General Guidelines for the Conservation of the Biodiversity of European Forests.
- 1993, Resolution H4: Strategies for a Process of Long-term Adaptation of Forests in Europe to Climate Change.
- 1998, Resolution L2/A1: Pan-European Criteria and Indicators for Sustainable Forest Management.
- 2003, Resolutions V4: Conserving and Enhancing Forest Biological Diversity in Europe.
- 2007/2011, further Declarations and Decisions do maintain these resolutions.

The improved **Pan-European Criteria and Indicators** – List of quantitative Indicators (2002, MCPFE Expert Level Meeting) include the following criteria and indicators with relevance for FGR:

- C4.6 Genetic resources: Area managed for conservation and utilization of forest tree genetic resources (*in situ* and *ex situ* conservation) and area managed for seed production.
- C4.7 Threatened forest species: Number of threatened forest species, classified according to IUCN Red List categories in relation to total number of forest species.

European Forest Genetic Resources Program (EUFORGEN)

For the implementation of resolution S2 of the european ministerial conference in Strasbourg, in 1994, the European Forest Genetic Resources Programme (EUFORGEN) has been established. EUFORGEN supports national FGR programmes by promoting the international exchange of information, defining joint conservation strategies, developing guidelines and tools as well as by initiating research projects. Switzerland is member and can contribute within the EUFORGEN working groups. In return member countries have to follow the common standards and procedures (e.g. EUFGIS database, dynamic gene conservation units for 12 exemplary model species).

Legally binding agreement for forests in Europe

There are ongoing negotiations on the content and the institutional setting of such an agreement, planned for adoption at a Ministerial Conference end of 2013. However the scope will be rather like a framework agreement without addressing genetic forest resources in detail.

6.2. International collaboration

*Table 18 (**T20**): Needs and priorities for raising awareness of FGR.*

Network name	Activities	Genus/species
EVOLTREE (EFI)	Information exchange: Networks, Platforms, Study sites, Training	for genus/species see: http://www.evoltree.eu/
EUFORGEN	Information exchange: Networks, Workshops, National reports	http://www.euforgen.org/
EUFORGEN	Development of technical guidelines: Contributions within species focused networks	for genus/species see: http://www.euforgen.org/publications/technical_guidelines.html
EUFORGEN	Development of shared databases: EUFORGEN distribution maps	for genus/species see: http://www.euforgen.org/distribution_maps.html
EVOLTREE (EFI)	Development of shared databases: marker library, pedigrees, georeferenced data viewer etc.	for genus/species see: http://www.evoltree.eu/index.php/e-resources http://gd2.pierroton.inra.fr/gd2/home?page=home
EUFORGEN	Development of shared databases: EUFGIS database (no national focal point today, upload data expected)	for genus/species see: http://portal.eufgis.org/
EUFORGEN	Dynamic gene conservation units (in situ) for 12 model species (expected)	*Abies alba* *Castanea sativa* *Fagus sylvatica* *Fraxinus excelsior* *Picea abies* *Pinus cembra* *Pinus nigra* *Pinus sylvestris* *Populus nigra* *Populus tremula* *Quercus petraea* *Sorbus torminalis*

*Table 19 (**T21**): Needs and priorities for international collaboration and networking.*

Needs	Priority level			
	not applicable	low	medium	high
Understanding the state of diversity			**X**	
Enhancing *in situ* management and conservation				**X**
Enhancing *ex situ* management and conservation			**X**	
Enhancing use of forest genetic resources		**X**		
Enhancing research			**X**	
Enhancing education and training		**X**		
Enhancing legislation		**X**		
Enhancing information management and early warning systems for forest genetic resources.			**X**	
Enhancing public awareness		**X**		

7. Access to forest genetic resources and sharing of benefits arising from their use

7.1. Access

There is no legal framework particularly focusing on access and benefit sharing (ABS) for forest genetic resources. However, Switzerland signed the Nagoya Protocol on access to genetic resources and the fair and equitable sharing of benefits arising from their utilization (Nagoya Protocol) and is currently working towards it ratification, including on new legal measures addressing ABS for all genetic resources.

Moreover, on behalf of phytosanitary aspects some regulations with relevance for FGR do exist:

- Import of forest reproductive material

Verordnung über forstliches Vermehrungsgut, VfV (Ordinance on Forest Reproductive Material) and Plant Protection Ordinance (PlantPO)

Import of forest reproductive material

VfV, Sect. 3: Import and Export, Art. 6 Official certificate for importation
[1] *For the importation of forest reproductive material, the importer shall present an official certificate that corresponds to the exemplar in Annex 5.*
[2] *Another official certificate shall suffice, insofar as it contains equivalent information.*

PlantPO, Chap. 2: Handling of particularly hazardous harmful organisms, goods that potentially carry particularly hazardous harmful organisms and of particularly hazardous weeds, Section 2: Import, Art. 6 Import bans

…

[5] *Goods whose import is prohibited are listed in Annex 3, Part A.*

PlantPO, Annex3A: Goods whose import is prohibited
Abies Mill., Cedrus Trew, Chamaecyparis Spach, Juniperus L., Larix Mill., Picea A. Dietr., Pinus L., Pseudotsuga Carr. and Tsuga Carr. plants, apart from seeds and fruit (non-European countries);
Castanea Mill. and Quercus L. plants, with leaves, apart from seeds and fruit (non-European countries);
Populus L. plants, with leaves, apart from seeds and fruit (North American countries);
…
Chaenomeles Lindl., Cydonia Mill., Crataegus L., Malus Mill., Prunus L., Pyrus L. and Rosa L. plants, intended for planting, apart from dormant plants without leaves, flowers and fruit (non-European countries);
…

The above mentioned species have to fulfill respective qualifications for the import and export within Europe (PSV, Annex 4 and 5).

7.2. Sharing of benefits

So far the use of forest genetic resources in Switzerland is free and no mechanisms for sharing benefits arising out of the use of forest genetic resources exist.

8. Contribution of forest genetic resources to food security and poverty reduction

Today, the forest woody plant species for food security or livelihood have little economic value in Switzerland. However these trees, its fruits and its management have still a remarkable cultural value for the whole society and for tourism. There are also trends to revive some of the traditions, e.g. different chestnut products or wild pear brandy.

Since medieval warm period the culture of Sweet chestnut (*Castanea sativa*) and Walnut (*Juglans regia*) in forest like orchards (ital.. *selva*) was important for subsistence agriculture in some regions of Switzerland. But last forest crop uses in remote countrysides (alpine valleys) stopped in the 1940ies.

Furthermore, some wild fruit woody plant species have played a role for farm animal nutrition or food security in times of hunger crisis, e.g. Beech (*Fagus sylvatica*), Oak (*Quercus robur, Quercus petraea*), Wild cherry (*Prunus avium*), Blackthorn (*Prunus spinosa*), Wild pear (*Pyrus pyraster*) and Wild apple (*Malus sylvestris*), Hazel (*Corylus avellana*) a.o..

ANNEX I: COMPLETE SPECIES LIST

Table 20: Characterization and pririoritization of woody plant species (for legend see methodology table 6.2).

Woody plant species	**Characterization**				**Prioritization**			
Priority species	type	native	endem	group	rank	reason		
						ESC	T	I
Abies alba	T	N	E3	1	1	ESC1		
Abies grandis	T	E		5	5			
Abies nordmaniana	T	E		5	5			
Acer campestre	T	N		2	3	ESC2		
Acer monspessulanum	T	E		5	5			
Acer opalus	T	N		2	2	ESC2	T3	
Acer platanoides	T	N		2	3	ESC2		
Acer pseudoplatanus	T	N		1	1	ESC1		
Aesculus hippocastanum	T	E		5	5			
Ailanthus altissima	T	E		5	2			I2
Alnus glutinosa	T	N		2	3	ESC2		
Alnus incana	T	N		2	3	ESC2		
Alnus viridis	O	N	E2	3	4			
Amelanchier ovalis	O	N		3	4			
Andromeda polifolia	O	N	?	4	4			
Arctostaphylos alpina	O	N	?	4	4			
Arctostaphylos uva-ursi	O	N	?	4	4			
Berberis vulgaris	O	N		3	4			
Betula humilis	O	N		3	3		T1	
Betula nana	O	N		4	3		T2	
Betula pendula	T	N		2	3	ESC2		
Betula pubescens	T	N		2	3	ESC3		
Buddleja davidii	O	E		5	2			I2
Buxus sempervirens	O	N		3	4			
Calluna vulgaris	O	N	?	4	4			
Carpinus betulus	T	N		2	3	ESC2		
Castanea sativa	T	N/E		1	2	ESC1		
Catalpa bignonioides	T	E		5	5			
Celtis australis	T	N		2	2	ESC3	T3	
Chamaecyparis lawsoniana	T	E		5	5			
Clematis alpina	O	N	E3	3	4			
Clematis vitalba	O	N		3	4			
Colutea arborescens	O	N		3	3		T3	
Cornus mas	O	N		3	4			
Cornus sanguinea	O	N		3	4			
Cornus sericea	O	E		5	5			I3

Woody plant species	**Characterization**				**Prioritization**			
Priority species	type	native	endem	group	rank	reason		
						ESC	T	I
Corylus avellana	O	N		3	4	ESC3		
Cotinus coggygria	O	N		3	3		T3	
Cotoneaster integerrimus	O	N	?	4	4			
Cotoneaster tomentosus	O	N	?	4	4			
Crataegus laevigata	O	N		3	4			
Crataegus monogyna	O	N		3	4			
Cryptomeria japonica	T	E		5	5			
Cydonia oblonga	T	E		5	5			
Cytisus scoparius	O	N		3	4			
Daphne alpina	O	N		4	3		T3	
Daphne cneorum	O	N		4	3		T1	
Daphne laureola	O	N	?	4	4			
Daphne mezereum	O	N	?	4	4			
Daphne striata	O	N	?	4	4			
Dryas octopetala	O	N	?	4	4			
Empetrum nigrum	O	N		4	3		T2	
Ephedra helvetica	O	N	E1	4	3		T2	
Erica carnea	O	N	?	4	4			
Euonymus europaea	O	N		3	4			
Fagus sylvatica	T	N		1	1	ESC1		
Ficus carica	T	E		5	5			
Frangula alnus	O	N		3	4			
Fraxinus excelsior	T	N		1	1	ESC1		
Fraxinus ornus	T	N		2	2	ESC2	T3	
Ginkgo biloba	T	E		5	5			
Hedera helix	O	N		3	4			
Hippocrepis emerus	O	N	?	4	4			
Hippophaë rhamnoides	O	N		3	4			
Ilex aquifolium	O	N		3	4	ESC3		
Juglans nigra	T	E		5	5			
Juglans regia	T	N/E		2	3	ESC2		
Juniperus communis	O	N		3	4	ESC3		
Juniperus sabina	O	N		3	4			
Laburnum alpinum	O	N	E3	3	4			
Laburnum anagyroides	O	N	E3	3	4			
Larix decidua	T	N	E2	1	1	ESC1		
Larix kaempferi	T	E		5	5	ESC3		
Ligustrum vulgare	O	N		3	4			
Liriodendron tulipifera	T	E		5	5			
Loiseleuria procumbens	O	N	?	4	4			

Woody plant species	**Characterization**				**Prioritization**			
Priority species	type	native	endem	group	rank	reason		
						ESC	T	I
Lonicera alpigena	O	N	E3	3	4			
Lonicera caerulea	O	N		3	4			
Lonicera henryi	O	E		5	5			I3
Lonicera japonica	O	E		5	2			I2
Lonicera nigra	O	N		3	4			
Lonicera periclymenum	O	N		3	3		T3	
Lonicera xylosteum	O	N		3	4			
Mahonia aquifolium	O	E		5	5			I3
Malus domestica	T	E/N		5	5	ESC3		
Malus sylvestris	T	N		2	2	ESC2	T2	
Mespilus germanica	O	N		3	3	ESC3	T3	
Myricaria germanica	O	N		3	3		T3	
Olea europaea	T	E		5	5			
Ostrya carpinifolia	T	N		2	3	ESC2		
Paulownia tomentosa	T	E		5	5			I3
Picea abies	T	N		1	1	ESC1		
Picea sitchensis	T	E		5	5			
Pinus cembra	T	N	E2	1	2	ESC1		
Pinus mugo	O	N	E2	3	4			
Pinus nigra	T	E		5	5			
Pinus strobus	T	E		5	5			
Pinus sylvestris	T	N		1	2	ESC1		
Pinus uncinata	T	N	E2	1	2	ESC2		
Platanus orientalis	T	E		5	5			
Platanus x hispanica	T	E		5	5			
Polygala chamaebuxus	O	N	?	4	4			
Populus alba	T	N		2	2	ESC3	T2	
Populus balsamifera	T	E		5	5			
Populus deltoides	T	E		5	5			
Populus nigra	T	N		2	2	ESC3	T3	
Populus tremula	T	N		2	3	ESC2		
Populus trichocarpa	T	E		5	5			
Populus x canescens	T	N		2	3	ESC3		
Populus x euramericana	T	E		5	5			
Prunus armeniaca	T	E		5	5			
Prunus avium	T	N		2	3	ESC1		
Prunus cerasifera	T	E/N		5	5	ESC3		
Prunus cerasus	T	N/E		2	3	ESC3		
Prunus domestica	T	E/N		5	5			
Prunus laurocerasus	O	E		5	2			I2

Woody plant species	**Characterization**				**Prioritization**			
Priority species	type	native	endem	group	rank	reason		
						ESC	T	I
Prunus mahaleb	O	N		3	4			
Prunus padus	O	N		3	4			
Prunus serotina	O	E		5	2			I2
Prunus spinosa	O	N		3	4			
Pseudotsuga menziesii	T	E		5	5	ESC3		
Pyrus communis	T	E/N		5	5	ESC3		
Pyrus nivalis	T	N		2	2	ESC3	T2	
Pyrus pyraster	T	N		2	2	ESC2	T1	
Quercus cerris	T	N		2	2	ESC2	T3	
Quercus petraea	T	N		1	2	ESC1		
Quercus pubescens	T	N		2	2	ESC2	T3	
Quercus robur	T	N		1	2	ESC1		
Quercus rubra	T	E		5	5	ESC3		
Rhamnus alpinus	O	N	E3	3	4			
Rhamnus catharticus	O	N		3	4			
Rhamnus pumila	O	N	?	4	4			
Rhamnus saxatilis	O	N		4	3		T2	
Rhododendron ferrugineum	O	N	?	4	4	ESC3		
Rhododendron hirsutum	O	N	?	4	4	ESC3		
Rhus typhina	O	E		5	2			I2
Ribes alpinum	O	N	?	3	4			
Ribes nigrum	O	E		5	5			
Ribes petraeum	O	N	?	3	4			
Ribes rubrum	O	E		5	5			
Ribes uva-crispa	O	N	?	3	4			
Robinia pseudoacacia	T	E		5	2	ESC2		I2
Rosa canina	O	N	?	3	4			
Rosa chavinii	O	N		4	3		T2	
Rosa gallica	O	N		4	3		T1	
Rosa majalis	O	N		4	3		T2	
Rosa mollis	O	N		4	3		T1	
Rosa obtusifolia	O	N		4	3		T2	
Rosa rhaetica	O	N	E1	4	3		T2	
Rosa sherardii	O	N		4	3		T3	
Rosa stylosa	O	N		4	3		T2	
Rubus armeniacus	O	E		5	2			I2
Rubus fruticosus	O	N	?	3	4	ESC3		
Rubus idaeus	O	N	?	3	4	ESC3		
Ruscus aculeatus	O	N	?	3	4			
Salix alba	T	N		2	3	ESC2		

Woody plant species	**Characterization**				**Prioritization**			
Priority species	type	native	endem	group	rank	reason		
						ESC	T	I
Salix alpina	O	N	E2	4	3		T1	
Salix apennina	O	N		3	3		T2	
Salix appendiculata	O	N	?	3	4			
Salix aurita	O	N	?	3	4			
Salix bicolor	O	N	?	3	4			
Salix breviserrata	O	N	?	4	4			
Salix caesia	O	N	E2	3	3		T3	
Salix caprea	T	N		2	3	ESC2		
Salix cinerea	O	N	?	3	4			
Salix daphnoides	O	N	?	3	4			
Salix eleagnos	O	N	?	3	4			
Salix foetida	O	N	?	3	4			
Salix fragilis	T	N		2	2	ESC3	T3	
Salix glabra	O	N	E1	3	3		T1	
Salix glaucosericea	O	N	?	3	4			
Salix hastata	O	N	?	3	4			
Salix helvetica	O	N	?	3	4			
Salix herbacea	O	N	?	4	4			
Salix laggeri	O	N	E1	3	3		T2	
Salix myrsinifolia	O	N	?	3	4			
Salix myrtilloides	O	N		4	3		T1	
Salix pentandra	O	N	?	3	4			
Salix phylicifolia	O	N		3	3		T1	
Salix purpurea	O	N	?	3	4	ESC3		
Salix repens	O	N		3	3		T3	
Salix reticulata	O	N	?	4	4			
Salix retusa	O	N	?	4	4			
Salix serpillifolia	O	N	?	4	4			
Salix triandra	O	N	?	3	4			
Salix viminalis	O	N	?	3	4	ESC3		
Salix waldsteiniana	O	N	?	3	4			
Salix x hegetschweileri	O	N	E1	3	3		T1	
Sambucus nigra	O	N	?	3	4	ESC3		
Sambucus racemosa	O	N	?	3	4			
Sequoiadendron giganteum	T	E		5	5			
Sorbus aria	T	N		2	3	ESC2		
Sorbus aucuparia	T	N		2	3	ESC2		
Sorbus chamaemespilus	O	N	?	3	4			
Sorbus domestica	T	N		2	2	ESC3	T1	
Sorbus torminalis	T	N		2	2	ESC3	T2	

Woody plant species	**Characterization**				**Prioritization**			
Priority species	type	native	endem	group	rank	reason		
						ESC	T	I
Sorbus x latifolia	T	N		2	2		T2	
Staphylea pinnata	O	N		3	3		T2	
Taxus baccata	T	N		2	2	ESC2	T3	
Thuja plicata	T	E		5	5			
Tilia cordata	T	N		2	3	ESC1		
Tilia platyphyllos	T	N		2	3	ESC1		
Trachycarpus fortunei	O	E		5	5			I3
Tsuga heterophylla	T	E		5	5			
Ulmus glabra	T	N		2	3	ESC2		
Ulmus laevis	T	N		2	2		T1	
Ulmus minor	T	N		2	2	ESC3	T3	
Vaccinium microcarpum	O	E		5	5			
Vaccinium myrtillus	O	N	?	4	4	ESC3		
Vaccinium oxycoccos	O	N		4	3		T3	
Vaccinium uliginosum	O	N	?	4	4			
Vaccinium vitis-idaea	O	N	?	4	4	ESC3		
Viburnum lantana	O	N	?	3	4			
Viburnum opulus	O	N	?	3	4			
Viburnum rhytidophyllum	O	E		5	5			I3
Viscum album	O	N	?	4	4	ESC3		
Vitis sylvestris	O	N		3	3		T1	
Vitis vinifera	O	E		5	5			

(Grade of endemism not complete/consistent for all species)