



MINISTERO DELL'AMBIENTE
E DELLA TUTELA DEL TERRITORIO E DEL MARE



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THE
ALPINE
CONVENTION
IS THE FIRST
INTERNATIONAL
TREATY FOR
THE PROTECTION
AND PROMOTION
OF THE SUSTAINABLE
DEVELOPMENT
OF A CROSS-BORDER
MOUNTAINOUS
REGION

italian presidency 2013-2014
alpine convention

Workshop

"The services of the Alpine forests ecosystems as a natural, economic and cultural asset for a regional and European green economy"

Pieve di Cadore (BL)

12 September 2014



REGIONE DEL VENETO





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The function of forest ecosystems in the regulation of the hydrogeological cycle in the Alpine mountain environment



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Content of the Presentation



- + Introduction
- + Main functions of Alpine forest ecosystems in terms of the water cycle
- + The Alpine Forest Ecosystems and the purpose water protection (ES)
- + Adaptive forest management strategies & examples of their application
- + Summary

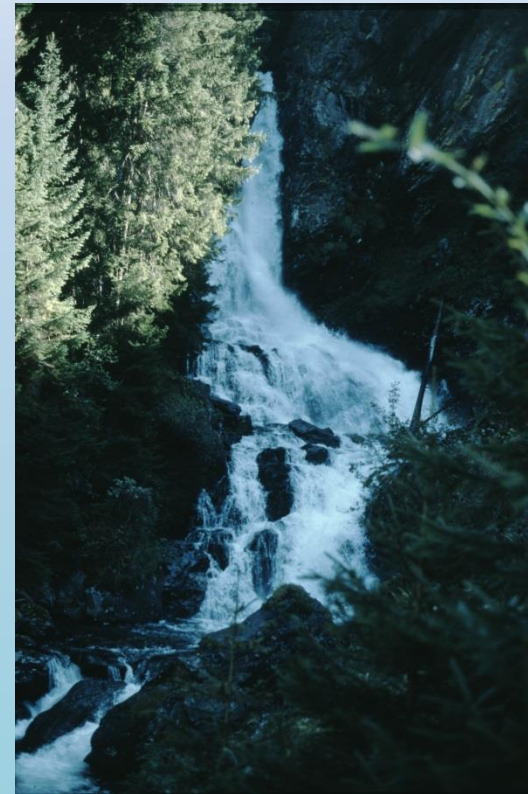


Introduction

- + Forest Ecosystems are a prominent land cover type in the case of various watersheds on our planet
- + Drinking water supply stemming from forested watersheds is regarded as more secure in comparison to e.g. watersheds with agricultural land cover
- + The significance of a secure and high-quality drinking water supply is raising, especially in current times
- + The Alpine mountainous environment comes into the focus of attention, due to its high proportion of forest ecosystems
- + Many huge cities actually derive their drinking water supply from Alpine forested watersheds: (AT) City of Vienna, Salzburg, Innsbruck, Graz, etc.

The Functions of Alpine Forest Ecosystems – Water Cycle

- + Alpine Forest Ecosystems provide various functions within the context of the water cycle
- + They are of relevance for **provisioning** (e.g. drinking water supply) and **regulating** (e.g. flood-prevention) **Ecosystem Services**
- + The Forest Functions can be influenced by human activities, like e.g. forest management, hunting activities, tourism, etc.
- + For the sustainable provision of those Ecosystem Services, the **Water Protection Functionality** of the forest ecosystems has to be on its highest level



Water Protection Functionality (WPF) of Forest Ecosystems

What constitutes the WPF of Forest Ecosystems? (E.g.)

- + *Good infiltration conditions for precipitation water (Forest soils)*
created by root chanells, macro pores from soil fauna, ecto-humus layers, etc.
- + *Water & Snow Storage and Retention*
Soil water storage, interception storage, snow storage
- + *Stabilization of the Soil- and Humus Formations*
The dense root network stabilizes the soil compartments at the sites
- + *Prevention or Mitigation of Erosion Processes*
Prevention or Mitigation of Rock Fall, Land Slides & Avalanches
- + *Filtration of Precipitation Water*
Forest Soils are a natural filter for various substances

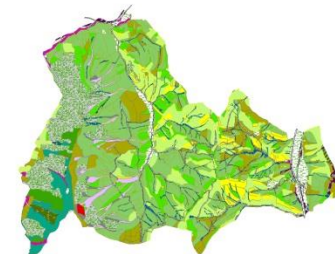
How should the forest ecosystems look like?

In order to provide a high level of WPF, forest ecosystems should be or show --

- + *Continuous Cover Forest Systems*
(as true alternative to the age-class system)
- + *High degree of tree species diversity* (according to natural vegetation)
- + *Provide a dense forest cover* (70 – 90 % montane, 60 – 80 % subalpine)
- + *Multi-Layered und Uneven-Aged Forest stands*
- + *Successful and diverse Natural Regeneration Process*
- + *Adaptability to Climate Change (Autochthonous tree species)*
- + *High level of Stability and Resilience of the Forest Ecosystems*

The Target Source Water Protection

- + Knowledge about the distribution of the natural forest communities
- + This serves for the definition of the ***Target Forest Type***
- + A detailed forest site mapping survey was the data base
- + The ***Forest Hydrotope Model (FoHyM)*** was created out of it
- + Water suppliers funded this in Austria
(City of Vienna and City of Waidhofen / Ybbs)
- + They fulfilled this also in the course of EU-funded projects



Legend:

Wildalpen

Forest-Hydrotopes (incl. Nr.)

- Red-Pine-Forest (untypical variant) (201)
- Red-Pine-Forest (typical variant) (202)
- La-Sp-Fi-Be-Forest, sunny slopes & md - mh (501)
- Sp-Fi-Be-Forest, md (502)
- Sp-Fi-Be-Forest, humid (503)
- Sp-Fi-Be-Forest, humid + loamy soils (504)
- Be-Ma-Fi-Sp-Forest on valley-rubble sites (505)
- La-Sp-Fi-Be-Forest on boulder sites (506)
- Pine-Forest + Sp-Fi-Be-Forest [complex] (507)
- Sp-Fi-Ju-Be-Forest on pastured valley-rubble sites (508)
- Sp-Fi-Be-Forest, moderate acidic soils (509)
- Sp-Fi-Be-Forest, hu, on Werfener Layers (601)
- Sp-Fi-Be-Forest, ih, on Werfener Layers (602)
- HM Sp-Fi-Be-Forest, humid (701)
- HM Sp-Fi-Be-Forest, mh (702)
- HM La-Sp-Fi-Be-Forest on boulder sites (703)
- HM Sp-Fi-Be-Forest with rocky strips (705)
- Typical Maple-Ash-Forest (801)
- Special Maple-Ash-Forest (803)
- Alder-Forest on Werfener Layers (901)
- Alder-Forest on Carbonates (902)
- Alder-Ash-Maple-Floodplain Forest (904)
- Alder-Willow-Gallery Forest (905)
- Sp-Fi-Forest on silicatic bedrocks (1001)
- Sp-Forest on boulder + rubble sites (1002)
- Sp-(La-Dp)_forest with peat moss (1003)
- SA Spruce-Larch-Forest (1101)
- SA Larch-Spruce-Forest on boulder sites (1102)
- SA Spruce Forest with rocks + dolines (1103)
- SA Hochstauden-Spruce Forest (1104)
- SA Sp-Fi-Forest on Dystric Planosol (1105)
- SA Hochstauden-La-Sp-Forest (1106)
- Larch-Beech-Fir-Forest (1201)
- Diverse Larch-Forests (1202)
- Larch-Forest on rubble sites (1203)
- Dwarf Pine-Forest on timber sites (1301)
- Original Dwarf Pine-Forest belt (1302)
- Ma-Be-Fi-Forest on ditch sites (1401)
- Rock-Forests (1501)
- Ditches without trees (1402)
- Ditches with rocks + rubble (1403)
- Water areas (1404)
- Rock-Sites (1601)
- Rubble-Sites (1602)
- Rubble-Sites with vegetation (1603)
- Avalanche Strip (1701)
- Meadows (1801)
- Dolines (1802)
- Further sites / settlement areas (1803)

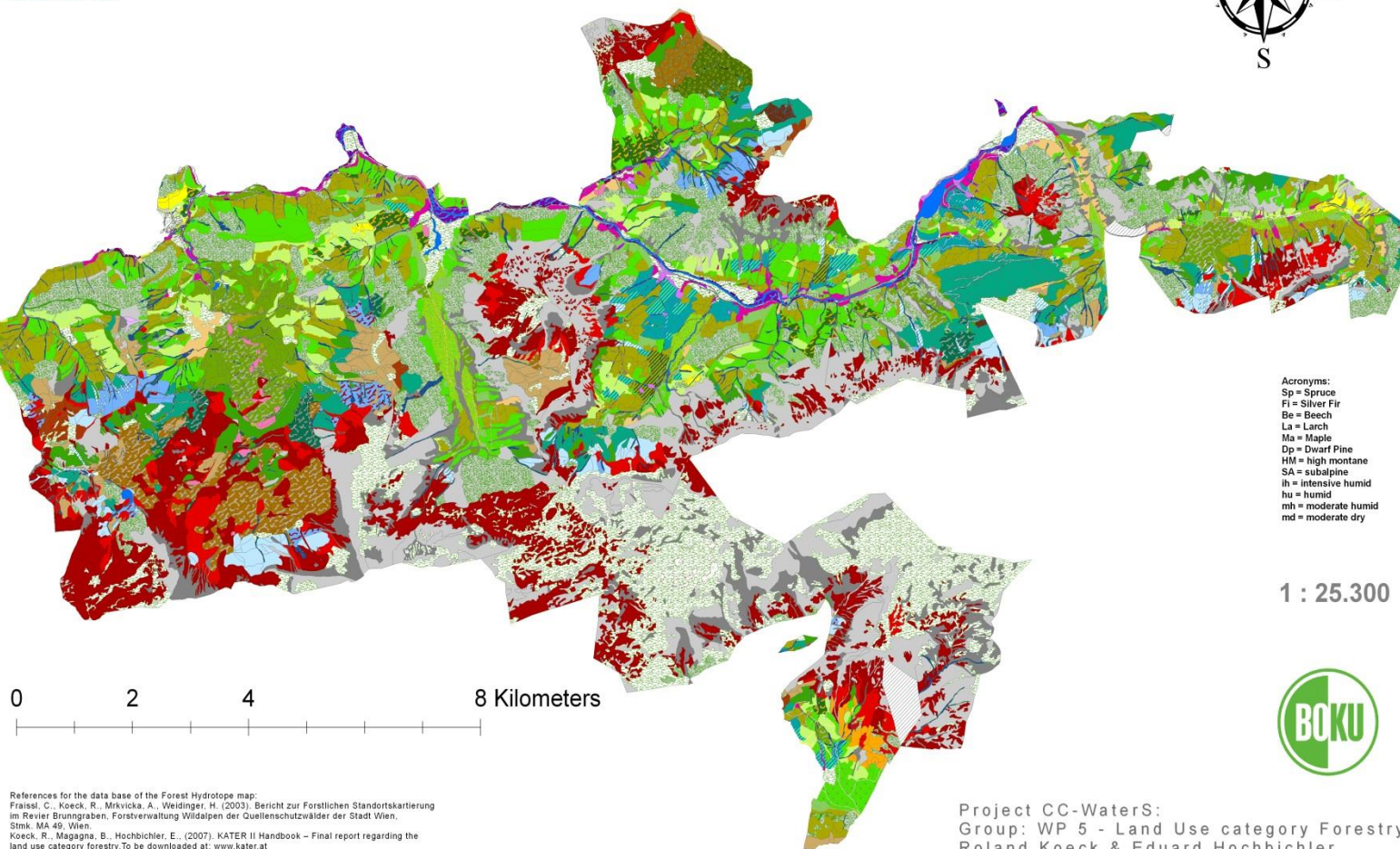
Acronyms:
Sp = Spruce
Fi = Silver Fir
Be = Beech
La = Larch
Ma = Maple
Dp = Dwarf Pine
HM = high montane
ih = intensive humid
hu = humid
mh = moderate humid
md = moderate dry

1 : 25.300



Project CC-WaterS:
Group: WP 5 - Land Use category Forestry
Roland Koeck & Eduard Hochbichler
GIS-Concept & Realization: Roland Koeck
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University of Natural Resources and
Applied Life Sciences, Vienna
February 2010

References for the data base of the Forest Hydrotopes map:
Fraissl, C., Koeck, R., Mrkvicka, A., Weidinger, H. (2003). Bericht zur Forstlichen Standortskartierung im Revier Brunngraben. Forstverwaltung Wildalpen der Quellschutzwälder der Stadt Wien. Stmk. MA 49, Wien.
Koeck, R., Magagna, B., Hochbichler, E., (2007). KATER II Handbook - Final report regarding the land use category forestry. To be downloaded at: www.kater.at
Koeck, R., Mrkvicka, A., Weidinger, H. (1996). Bericht zur Forstlichen Standortskartierung im Revier Siebensee. Forstverwaltung Wildalpen der Quellschutzwälder der Stadt Wien. Stmk. MA 49, Wien.
Koeck, R., Mrkvicka, A., Weidinger, H. (1997). Bericht zur Forstlichen Standortskartierung im Revier Schreier. Forstverwaltung Wildalpen der Quellschutzwälder der Stadt Wien. Stmk. MA 49, Wien.
Koeck, R., Mrkvicka, A., Weidinger, H. (1999). Bericht zur Forstlichen Standortskartierung im Revier Brunnsee. Forstverwaltung Wildalpen der Quellschutzwälder der Stadt Wien. Stmk. MA 49, Wien.
Koeck, R., Mrkvicka, A., Weidinger, H. (2000). Bericht zur Forstlichen Standortskartierung im Revier Gschöder. Forstverwaltung Wildalpen der Quellschutzwälder der Stadt Wien. Stmk. MA 49, Wien.
Koeck, R., Mrkvicka, A., Weidinger, H. (2000). Bericht zur Forstlichen Standortskartierung im Revier Buchberg. Forstverwaltung Wildalpen der Quellschutzwälder der Stadt Wien. Stmk. MA 49, Wien.
Koeck, R., Mrkvicka, A., Weidinger, H. (2001). Bericht zur Forstlichen Standortskartierung im Revier Weichselboden. Forstverwaltung Wildalpen der Quellschutzwälder der Stadt Wien. Stmk. MA 49, Wien.



Why is the Natural Forest Community so Important?

- + It provides the highest degree of forest ecosystem stability and resilience
- + This is the most important feature for a high level of water protection functionality (WPF) of the alpine forest ecosystems
- + Both water provision for drinking water supply and water regulation for flood prevention are influenced positively by natural tree species sets
- + Also forest ecosystem adaptability under climate change can be supported by tree species diversity
- + All that differs substantially from Alpine timber-yield focused forestry, where e.g. homogeneous Norway Spruce plantations are created

Adaptive Forest Management for Water Protection

- + Forest Management can either support the WPF of forest ecosystems or diminish / destroy it
- + The most adverse technique are Clear-Cuts (water contamination, erosion, ...)
- + Also the use of heavy machinery (tractor-skidders) can be dangerous
- + For the Alpine Forest Ecosystems, adaptive forest management with the purpose of water protection is essential
- + The use of the Alpine Space for settlement purposes and the use of water resources for drinking water supply depend on that

Adaptive Forest Management for Water Protection

- + For water Protection Purposes we have to provide/support a low disturbance regime for our forest ecosystems
- + If natural forest areas show high level of stability and tree species diversity, etc. – it is possible to suspend management measures
- + For other forest areas, forest management can create adequate forests – continuous cover forest systems, tree species diversity, forest structure, etc.
- + Small scale silvicultural techniques and concepts are demanded – like: Group Selection System, Gap-Cuts, Single Tree Harvests, etc.
- + The successful Natural Regeneration Process is essentially:
 - ***forest ecologically sustainable wild ungulate densities, wild predators***

Demand for a high degree of WPF

- + A high degree of water protection functionality (WPF) is demanded for all forest ecosystems within Alpine watersheds
- + Especially forests within gully systems deserve special attention regarding their WPF, for both drinking water protection and flood prevention
- + In the case of homogeneous forest plantations, tree species diversity has to be established (PNV)



Extreme Gully Site in the Niedere Tauern region (Austria) after a heavy thunderstorm



Homogeneous Norway spruce plantation in the Northern Limestone Alps (Austria)



Natural Forest Communities in the subalpine zone of the Limestone Alps

Examples of the Application of Water Protection (At)

- + In Austria the city of Vienna and the city of Waidhofen / Ybbs have fundamental interest in the application of drinking water protection concepts
- + Also the Federal Ministry of Agriculture, Forestry, Environment and Water Management will start up a funding system for applied water protection measures in forest ecosystems (drinking water & flood prevention)
- + The city of Vienna is far developed: Transfer of money from Vienna Water to the Municipal Forest Department (Payment for Ecosystem Service Provision)
- + Waidhofen / Ybbs will set up a funding system for forest owners in their drinking water protected area (PES System in Elaboration)
- + The Federal Funding System is also in elaboration

Projects of thematic interest (data available)

→ Interreg SEE Project CC-WaterS:

(already finished)

www.ccwaters.eu (Output Documentation)



Jointly for our common future

→ Interreg SEE Project CC-WARE

(work in progress)

www.ccware.eu (Output Documentation)



Summary

- + The Water Protection Functionality of forest ecosystems is of crucial interest for the provision of Ecosystem Services like drinking water protection and flood prevention
- + The forest ecosystems have to show a high level of stability and resilience
- + Tree species diversity according to the natural vegetation and a diverse forest structure are important
- + Forest management has to adapt to the purpose of water protection
- + Clear Cuts have to be avoided and a Continuous Cover Forest system has to be established
- + Transfer payments for drinking water protection are quite new in Austria, different situations have been recognized

Acknowledgements

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- The city of Waidhofen / Ybbs
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- The Italian Presidency of the Alpine Convention for the invitation



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Thank you for your attention!

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