4.10 Switzerland: Our forests for human health - Forest ecosystems, forest management and Forest Therapy as a tool in integrative prevention and treatment of non-communicable diseases

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4.10.1 Forests and Forest Therapy in Switzerland – demands and opportunities

Switzerland is best known for its mountains which are not only high in elevation and covered by amazing glaciers but also consists of remarkable natural mountainous forests. Next to wood production, forests in Switzerland also play an important role in natural hazards mitigation (e.g. avalanches, floods, rock falls, erosion) as they protect more than 130,000 buildings and thousands of kilometres of roads and rail lines (FAO, UNECE, 2018). Swiss forest management is hence adapted to meet these patterns and is further developed towards a greater integration of biodiversity and recreational aspects. In Switzerland, forests are subjected to a high level of legal protection (forest law), which means that, for example, clear cutting and land clearing are prohibited. The forest cover in Switzerland comprises nearly 1.3 million ha and is growing within the last decades. Nearly 30% is privately owned and belongs to almost 250,000 forest owners. Due to these small-scale forest ownership structures, Switzerland is - among forest experts - also known for its traditionally grown silviculture based on single tree selection. It is a ‘close to nature’ management system, resulting in forests which are rich in structural diversity in terms of forest composition (e.g., tree age, tree dimension, tree species and multiple tree layer), enhancing biodiversity.

The political system in Switzerland is a ‘direct democracy’ which allows people to have direct influence on politics not only by means of political election, but also by voting on a specific topic. In a 2009 referendum vote, Swiss people had decided, by almost 70%, that ‘complementary medicine’ had to be better integrated into the health care system. Accordingly, a new article on complementary medicine was added to the Federal Constitution (Art. 118a BV). The Therapeutic Products Act (HMG; SR 812.21) was revised in terms of safeguarding the diversity of therapeutic products in

complementary medicine. Additionally, as a result of the revised Medical Professions Act (MedBG; SR 811.11) complementary medicine is now integrated into the curriculum of universities for the legal recognition of paramedical professions (allied health providers).

Beyond that, an increasing number of Swiss people, physicians, therapists and patients are demanding the incorporation of nature as a setting for health promotion processes. Therefore, in Switzerland there is a good possibility to establish and accept forest-based interventions in prevention and therapy for non-communicable diseases. Currently, we are at the beginning of this movement. Some enthusiastic therapists offer forest mindfulness-based activities or there are even non-professional coaches who proclaim themselves to be "Forest Therapy coaches". In this context, Forest Therapy is at risk of being professionally devalued and not accepted.

Therefore, in 2017 we launched a Forest Therapy Task Force of experts from forestry, medicine and public health. Currently, we are working on a joint project 'Our forests for human health' with the following goals and activities:

- Analyses of health-promoting forest ecosystem services on the basis of selected case studies. Additionally, we want to develop related principles and recommendations for forest maintenance and management.
- Determining preferences of Forest Therapy users with regard to the desired forest qualities.
- Identification of all multisectoral and interdisciplinary key players (stakeholder analyses), their roles and interests.
- Development of a concept for the implementation and dissemination of Forest Therapy in Switzerland in prevention, therapy, rehabilitation and secondary prevention as well as a corresponding toolbox with methods and best-practice examples.
- Conducting out a clinical randomized cross-over study with patients in a cardiological rehabilitation clinic to get evidence-based recognition of forest interventions.
- Implementation of further training events on Forest Therapy for interested stakeholders.

4.10.2 Forest ecosystem services

Since the turn of the millennium, ecosystem services have been the guiding paradigm in science for the sustainable use of ecosystems trying in an attempt to link services and wellbeing. Ecosystem services are defined as goods and services of ecosystems that directly or indirectly contribute to

human-wellbeing in terms of economic, material, psychological, physiological, emotional or social benefits (MEA, 2005; TEEB, 2010).

The Common International Classification of Ecosystem Services (CICES) distinguishes more than 95 ecosystem services (Haines-Young and Potschin, 2019), of which more than 40 services are relevant to forests (Forest Ecosystem Services, FES; see Pan Bern, 2019), e.g.:

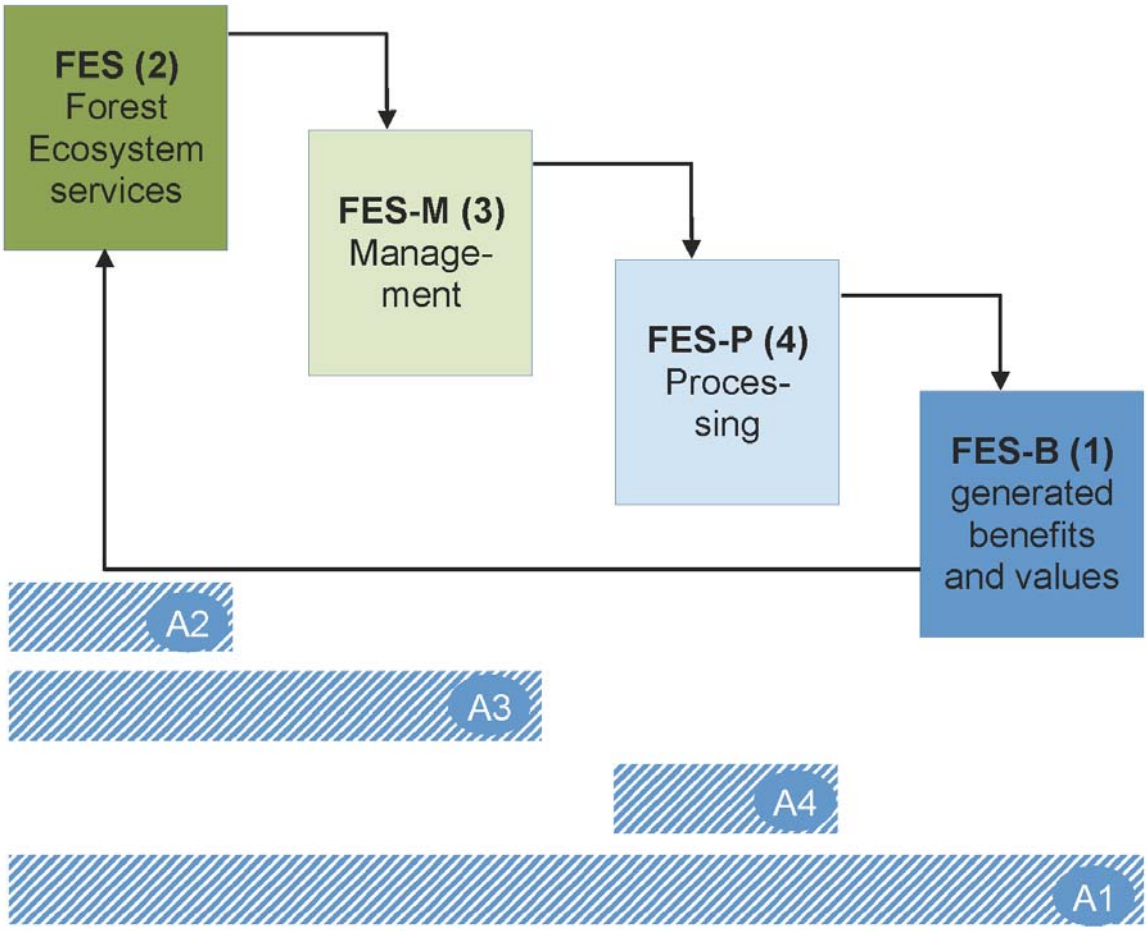
- provisioning of plant biomass, e.g. for wood production or wood energy
- regulation of atmospheric conditions, e.g., air pollution reduction
- regulation of water resource impacts, e.g., storm water runoff reduction (natural hazard mitigation, e.g. flooding)
- regulation of temperature, e.g., energy savings, mitigation of the urban heat island effect
- transformation of biochemical or physical anthropogenic inputs to ecosystems, e.g., mediation of nuisances
- offer divers interactions with forests, also known as 'cultural ecosystem services' through varied perceptions and experiences:
  - physical, e.g. active or passive
  - intellectual and mental, e.g. science, education, aesthetics
  - spiritual, e.g. symbolic, religious, existence, bequest.

The link between ecosystem services and human benefits can be portrayed with the 'ecosystem service cascade' (Potschin-Young and Haines-Young et al., 2017, see also Spangenberg et al., 2014). The cascade differentiates among a) the provided ecosystem services and their underlying biophysical structures or processes and b) benefits for human wellbeing as well as c) the values that are generated for human mankind (see also subsequent explanations and Figure 4.9). Furthermore, the 'production boundary' between a) and b) is mentioned within the cascade model, pointing out that ecosystem management provides and improves the desired ecosystem services to some extent – unless this boundary was only mentioned and not incorporated as a consistent component in the model.

The production boundary relates to ecosystem management (or ecosystem-based management), which is defined "as the management of natural systems that integrates the scientific principles of ecology and values of sustainability into the institutional, economic, and sociopolitical dimensions of natural resource management" (Grumbine, 1994, in: Speenberger et al., 2019).

We are convinced that as a first step, it would be important to know and document all the services and benefits forest ecosystems provide. Yet, it is equally important to know a) how the forest has to be managed to realize the desired benefits and values and b) how humans can mobilize, acquire and appropriate those services to optimize their benefits and values.

Therefore, we further developed and adapted the 'cascade model' by Potschin-Young and Haines-Young et al. (2017) for Swiss purposes and, in particular, for the application of FES (Pan Bern 2019, see Figure 4.9). We have also determined that the cascade should be read, not bottom up but starting at the end which is why we have changed the order of the numbers.



A1 Assessment of FES generated benefits and values (FES-B): What are the impacts on, e.g., human health?

A2 Assessment of FES**:** What are the relevant forest ecosystem services providing the expected impacts on, e.g., human health?

A3 Assessment FES-Management (FES-M): What is the required forest management to maintain and manage the needed FES?

A4 Assessment of FES processing (FES-P): Which additional activities are needed to create interactions among forests, forest ecosystem services, forest management and forest visitors?

Fig. 4.9: The 'forest ecosystem cascade' (Pan Bern, 2019, further developed based on Potschin-Young and Haines-Young et al., 2017)

Shown in Figure 4.9 is the following example of a traditional forest service *wood production*:

- FES-B (1) FES generated benefits and values: people having and enjoying, for instance, their wooden furniture
- FES (2) Forest Ecosystem Service: wood growth through forest ecosystems
- FES-M (3) FES management: foresters managing the forests to optimize wood production and to provide desired wood assortment in the long term
- FES-P (4) FES processing: further processing wood along the value chain to make wood available as timber (e.g., harvesting, sawing, manufacturing etc.)

There are several important gaps of knowledge and open questions in the understanding of the FES cascade in the context of forest health promotion and Forest Therapy interventions. In our project we will therefore study and answer the following four key questions based on concrete cases studies:

- Which forest ecosystem services are relevant for human health promotion?
- How do different forests impact the outcomes of Forest Therapy interventions?
- Through what kind of forest management measures or silvicultural systems can health effects be enhanced?
- How are FES-Management activities financed? How does the PES (Payment for Ecosystem Services) function?
- Can Forest Therapy interventions be adapted according to the specific forest environment?

4.10.3 Forest ecosystem management for therapeutic benefits

In an urbanized society forests are perceived as wild and pure nature, even though forests are continuously managed in most cases. In Switzerland, forests can be reached by everybody within short timeframes (on average, in 10 minutes) and are, irrespective of the forest ownership, freely accessible. This makes Forest Therapy interventions readily available for everybody to join and incorporate such exercises into their daily lives. When one visits a forest, one should not forget that every forest belongs to somebody and is managed by someone else. The management must be in line with regulations as well as the aims of the forest owner. Furthermore, under forest laws, some types of activities require formal authorization, which should be taken into account when offering forest-based activities.

Elements of the 'Forest Ecosystem cascade'	Key questions	FTA 'Receptivity' / multisensory perception	FTA 'Psychological biography work'
FES (2) Forest Ecosystem Service	What are the most relevant FES?	Physical perception and experience	Spiritual and mental perception and experience
FES-M (3) FES Management	What are the major maintenance and ecosystem management measurements?	Increase structural diversity in terms of availability of situations varying in, for example: 1 light conditions, colour patterns (visual) 2 Avifauna (hearing)	Increase structural diversity in terms of: 3 Trees varying in species, shapes and habits as well as ages
FES-P (4) FES Processing	What are the processing activities based on FES?	Guiding and accompanying sensory perception, deceleration and pointing at varying forest stimuli and the following, e.g. body resonance	Communicating symbolic tree character, psychological guidance and accompaniment
FES-B (1) FES-based Benefits and Values	What are the major values and benefits which are derived from these FES and its processing?	Stress reduction and recovery, psycho-emotional stabilization Lower treatment needs	Recognizing and interpreting one's own life situation or stories (biographical work)

Fig. 4.10: 'Forest ecosystem cascade' and forest therapeutic applications (FTA) (source: Pan Bern, 2019)

The therapeutic interventions and benefits may differ from forest to forest, from person to person and their context as well as from different clinical approaches. Several questions therefore arise in connection with forest management:

- What are the impacts of forest management regimes on FES linked to human health?
- What opportunities exist for forest owners and managers? How can therapeutic benefits be integrated into forestry measures and how can they be put to good use?
- What kind of PES (payment for ecosystem services) can be established?
- Which forests, forest types, forest structures are desired by the users, patients in general and patients with special illness?

Figure 4.11 explains potential differences between two possible therapeutic applications in relation to the 'Forest ecosystem cascade'.

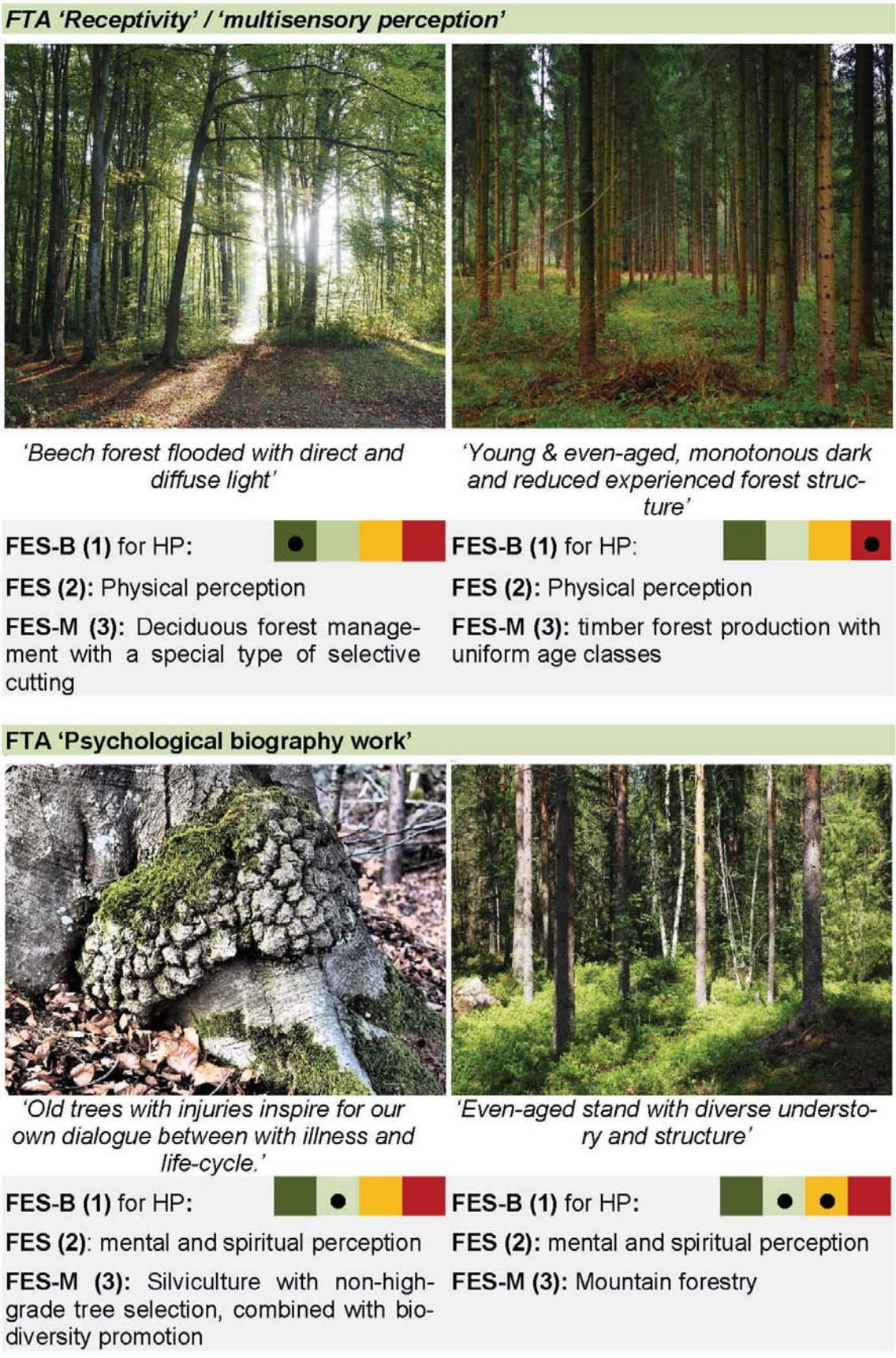


Fig. 4.11: Visualized and rated examples of varying forests in relation to aspects of the 'Forest ecosystem cascade' (Pan Bern 2019, photo courtesy Andreas Bernasconi)

Legend for Figure 4.11: FES Forest Ecosystem Services, FES-B FES generated benefits and values for HP health promotion – ranging from dark green 'very good' to red 'very bad'; FES-M FES Management

4.10.4 Forest Therapy in cardiovascular rehabilitation - an efficacy study in Switzerland

Plea for opening up to Forest Therapy in cardiology

With reference to Sections 2.1, 2.3, 2.4, 2.6. and 3.2 in this handbook the accompanying problems associated with coronary heart disease (CHD) described in the following should serve as a plea for opening up to Forest Therapy in the treatment of CHD:

Not only cardiac findings contribute to the unfavorable course of the disease, but also depression and anxiety. Three to twelve months after a cardiac event, up to 75% of patients with initial depression are still considered depressed (Frasure-Smith et al., 2000a). In these patients, mortality was significantly more frequent within four to six months after acute myocardial infarction (AMI) than in patients without diagnosed depression (Ladwig et al.. 1991). Within the first four weeks after AMI, patients with increased depression values needed a prolonged hospital stay, and thus, generated higher hospital costs (Frasure-Smith et al., 2000b).

In addition, depressed patients rarely reach the goals of rehabilitation: They continue to smoke more frequently (Ladwig et al., 1994), they are less physically active (Mayou et al., 2000) and they reduced excess weight less often than non-depressive patients (Guiry et al., 1987).

Besides depression, anxiety as a transient emotional state was associated with an increased mortality within 18 months of surgery (Thomas et al., 1997). A proneness to anxiety was shown to be the strongest single predictor for cardiac problems within six months after coronary bypass surgery (Hermann-Lingen, 2001).

Depression and anxiety are in a negative alliance with the autonomic nervous system. They reduce the physiological variability of the autonomic nervous system at the expense of an increased sympathetic activity (Stein et al. 2000). In patients with CHD, reduced heart rate variability is a risk factor for dying from heart disease (Blaeser-Kiel et al., 2000; Freedland et al., 2009).

Accordingly and to control depression and anxiety related to heart disease, and to regulate autonomic nerve system in favour of increased parasympathetic nervous activity, treatment opportunities beyond traditional psychotherapy and/or psychotropic drugs should be offered. To this end, Forest Therapy can and should be considered as an important integrative element within a complete treatment concept.

Presentation of a clinical trial

The majority of the clinical trials on Forest Therapy for cardiovascular diseases originate from Asia (see Sections 2.1, 2.3, 2.4 and 2.6). Since the understanding of disease, disease perception and disease behaviour are, among others, culturally influenced. Hence, studies on the effects of forests on specific disease patterns and target parameters should be replicated at least, in part, in Western cultures.

If Forest Therapy is to find acceptance in Switzerland as an integrative public health approach alongside established medical treatment methods, the country-specific evidence of efficacy and cost-effectiveness is required. Both, elaboration of forest ecosystem services in the context of health promoting, and evaluation of patients subjective perception of beneficial forest environments is needed (see Section 4.10.3 above). This data would establish the critical need for a multi-disciplinary collaboration of actors from medicine, forestry, health policy and health insurance funds from the very beginning.

On this basis, we have planned a clinical randomized cross-over study on Forest Therapy with approximately 100 patients in inpatient rehabilitation after severe heart disease and invasive surgery. The clinic is located in the Swiss Jura, surrounded by forests.

The purpose of the study is to investigate the efficacy of mindful walking in a defined forest environment on two consecutive days. After a two-days hiatus, for control purposes, the same intervention is to take place in the sports hall of the clinic, where different physiotherapy treatments are normally administered.

Target parameters for the investigation of the efficacy of forest intervention in comparison with indoor intervention are psycho-emotional parameters, which are recorded by using the STATE-TRAIT anxiety inventory (Spielberger et al., 2004). In addition, selected indicators of heart rate variability will be assessed. By means of a questionnaire, patients are supposed to indicate which forest environments they found most beneficial for their own wellbeing.

4.10.5 Conclusion and further steps

We are strongly convinced that if one wants to achieve long-term and sustainable recognition for Forest Therapy among the Swiss population as well as in preventive and therapeutic applications, a close cooperation among experts in medicine, therapy, public health and above all the forest is indispensable. Therefore, we pursue three approaches as an essential beginning:

- incorporating different professional perspectives by acting interdisciplinary and multi-professional in terms of:
  - raising awareness and recognition of forest management with a focus on a) the knowledge of underlying and health promoting forest ecosystem services (FES), b) the FES based benefits for human health and wellbeing and c) health promoting adaptive forest planning and management based on corresponding needs and demands and assuring PES.
  - health promotion with a) primary prevention for healthy people, secondary prevention and therapy as well as rehabilitation and curation and b) stress reduction through mindfulness-based forest applications, concrete psychological and physiological interventions and further developments
- multilevel approach, e.g., comprising the local, state/canton and national anchoring with different stakeholders
- bottom up approach, e.g., through community-based initiatives or activities initiated by local public health players.

These three perspectives involve different mindsets, needs and opportunities, not only of different target groups, such as patients/clients, doctors/therapists/coaches but also for foresters and forest owners as well as the forest itself.

In order to consolidate ongoing and future activities in Switzerland, raising awareness and a mutual understanding for all involved professionals and furthermore professionalising and standardising activities using health promoting forest ecosystem services, we, as an initial step, created an interdisciplinary Forest Therapy Task Force. The task group is organising different networking and further training events for interested clinical, therapeutic and silvicultural professionals since 2018. Furthermore, we are conducting and guiding the above-mentioned joint project ‘Our forests for human health’. Therefore, we will establish an interdisciplinary panel of experts developing a concept for Forest Therapy in Switzerland. A consequent integration of medical aspects as well as of forest ecosystem service management and the valorization for forest owners is an indispensable prerequisite for a sustainable, long-term Forest Therapy application in Switzerland.

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