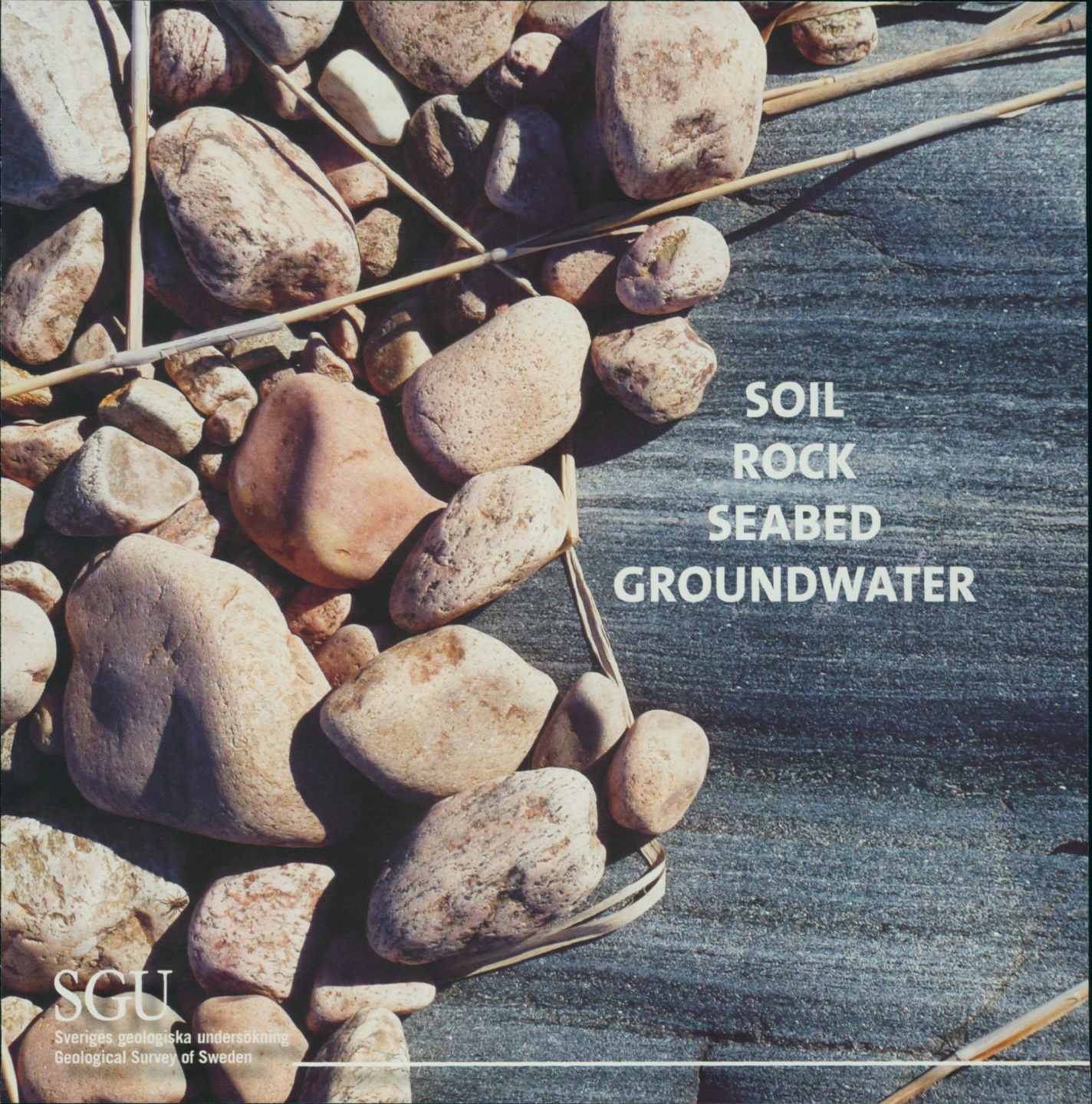


SGU
Sveriges geologiska undersökning
Geological Survey of Sweden

Moraine terrain, Kinna.

Welcome to SGU

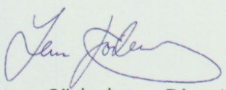
The Geological Survey of Sweden (SGU) is the authority that deals with matters concerning groundwater, soil, bedrock and seabed in Sweden. With advanced surveying methods and analysis, we gather, process and provide geological information for the benefit of society.

By the greater use of geological information in physical planning, society has a lot to gain. Therefore, SGU is actively working to increase the use of geological information. Some of the benefits that geological information contributes to are improved groundwater protection, environment-friendly and more appropriate land use, greater resource efficiency in the mineral processing industry and a faster development towards a non-toxic environment.

Sweden is rich in natural resources such as groundwater, minerals and rock. However, the management of these resources requires great respect for the environment, as well as for other interests in society. Thanks to our expertise in all aspects concerning bedrock, soil and water, SGU can provide substantial benefits to society in cooperation with local authorities, companies, county administrative boards and other authorities. In today's global world, international cooperation is increasingly important. Therefore, SGU has an active exchange with our sister organisations in the EU, within many different areas.

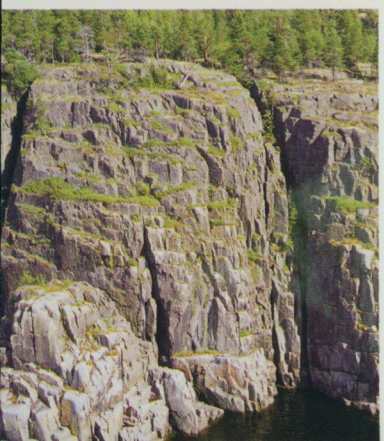
SGU is assigned to support Sweden's mining and mineral processing industry. The commitment includes developing of a sustainable supply of materials, for example by recycling scrap metal and old mining waste, and by replacing natural gravel with crushed rock. SGU also strives to spread awareness of environmental impact and working environment in the mining industry to countries where this knowledge is less well developed. Within SGU is also the independent decision-making body Bergsstaten, which decides on permits for exploration and mining.

Lena Söderberg, Director-General



Lena Söderberg, Director-General

SGU's vision
Sweden has a sustainable social development. Land and water are used and developed for purposes best suited for them. The mineral processing industry and other natural resource sectors are vigorous and takes responsibility.



SGU – the authority for matters related to groundwater, soil & rock

SGU is a Swedish authority founded in 1858, and responsible for issues related to the country's geological status and mineral management. The authority provides geo-scientific information and administers Sweden's former underground storage of fuel.

Europe faces major challenges and opportunities where knowledge of soil, bedrock and water may be crucial for such things as safe foodstuff. To guarantee sufficient access to food and water, we must safeguard the quality of our groundwater resources and soil types, and in order to do so the natural resources must be known. SGU's geological know-how, data and information provide support when facing the upcoming challenges.

Appropriate use of soil, rock and groundwater
To make well-founded decisions in community development, geological information is necessary. We offer support by collecting and providing basic geological information and expert evaluations. We also improve and clarify SGUs work on the environmental objectives, climate issues and ecosystem services. We cooperate with other authorities, companies and organisations, and provide open data both to the business community and the public sector. We take an obvious position in the planning processes of local and county administrative boards.

Sustainable utilisation of the country's mineral resources
Geological information and knowledge of Sweden's assets are needed in order to create sound preconditions for a sustainable utilisation of Sweden's mineral resources. We support this by being active throughout the entire mineral processing chain, from exploration to aftertreatment and recycling, by actively contributing to the EUs Raw Materials Initiative, by improving SGUs work on sustainable develoment and natural resource issues, as well as by actively participating in the development of legislation and control instruments.

An attractive, accessible, efficient and important authority
To carry out our assignments in the best possible way, a well-functioning, flexible, efficient and competent organisation is required. We achieve this by establishing consensus on fundamental values, by developing leadership, by making SGU even more visible and by creating a secure and active administration of our information.

SGU nationally and internationally

Geological knowledge is necessary in order to understand and use the environment in a long term sustainable way. SGU's most important task is to supply geological information to meet the needs of society, both in the short and the long term.

SGU has wide-ranging and exciting activities. The authority's geologists are concerned, among other things, with collecting, documenting and adapting information on Sweden's geology so that it can be used within, for example, community development, environmental care and exploration.

SGU's Head Office is situated in Uppsala but we also have a number of local offices throughout Sweden. In all, the authority has a staff of some 220.

SGU is organised under the Ministry of Enterprise and Innovation, and it is the government that decides on the preconditions for the Authority's work. Furthermore, the work of SGU – like other Swedish authorities – is directed by the general regulations on economic control and by the authority and obligations of the authorities.

Collaboration projects

Many of the questions that SGU are working on, and not least those relating to risks and the identification of risks, concern the areas of responsibility of other authorities and organisations, for example environmental work, water as a foodstuff, geographical information and radiation protection.

International cooperation

Geology is an international science that concerns the study of the earth and its history, as well as the processes and occurrences that build up and still form conditions on the Earth.

The EU plays a key role for SGU's international undertakings. SGU is represented in a number of work groups and committees in which the work focuses on questions that concern the environment, raw materials and the exchange of information connected with earth sciences.

EuroGeoSurveys (EGS) is the integrating organisation for the geological surveys in 30 European countries. The principal task of the organisation is to shed light on the geoscientific questions in an EU context. Examples of ECS projects are the geochemical mapping of agricultural and pasture land in Europe (Gemas) and geochemistry in an urban environment (Urge).

Today, over a million people in Sweden have private water supplies. This means that some 15 per cent of the population have their own wells.

A well should be located so that it is protected from pollutants such as sewage, manure heaps, arable land, etc. Since groundwater flows in most cases follow the gradient of the land, wells should be sited in a higher location than the sources of pollution – and preferably 50 meters away from them.

The best water in the world

Water is one of the most important natural assets and the most important foodstuff. Access to clean water is crucial for all of society. SGUs information on groundwater is an important input in the planning of Sweden's water supply. SGU is responsible for the Swedish environmental objective Good-Quality Groundwater.

SGUs groundwater information is used in matters that concern land use and physical planning in general. This could be basic input for environmental impact assessments, for action plans, for protection of the groundwater and in the construction of roads, disposal sites and industrial plants.

Environmental monitoring of groundwater

To be able to follow the impact of acidification, eutrophication and the fallout of airborne metals into the groundwater, SGU monitors the groundwater and its chemical composition. The measurements provide knowledge of variations in the groundwater in relation to geology, topography and climate.

Since the measuring stations are situated in areas free from impact from local pollution sources, they can also be regarded as reference stations and thus be used to follow up on effects of efforts for reducing the impact of airborne pollution on the environment.

Good-Quality Groundwater

The Swedish Government and Parliament have decided that Sweden, by the next generation, shall have solved the biggest environmental problems. 16 **environmental objectives** describe how Sweden wants the environment to be by then.

SGU is responsible for the **environmental objective** Good-Quality Groundwater. This means that we together with other authorities and interested parties – are to collect data, develop suitable indicators, report on goal fulfilment, propose additional efforts and in other respects work to achieve the environmental goal.

Reduction in the use of natural gravel

Natural gravel deposits are of great importance for drinking water supplies, and more. Several activities at SGU support work to reduce the use of natural gravel, and to gradually phase out natural gravel pits and replace them with bedrock quarries.

Marine geology

The sea is a natural resource, which provides us with energy, food, raw materials, recreation and transport routes. Securing these valuable services for the future requires sustainable planning and administration based on profound knowledge of the sea and its ecosystems.

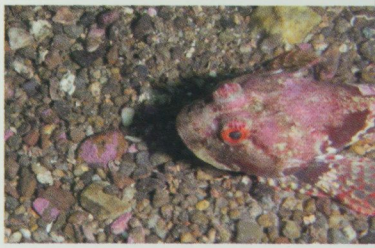
Knowledge of the physical characteristics, conditions, processes, content of toxins and nutrients, and an understanding of the factors that influence them, is an important aspect of the work to map the marine environment and the preconditions for blue growth in and around the Baltic Sea.

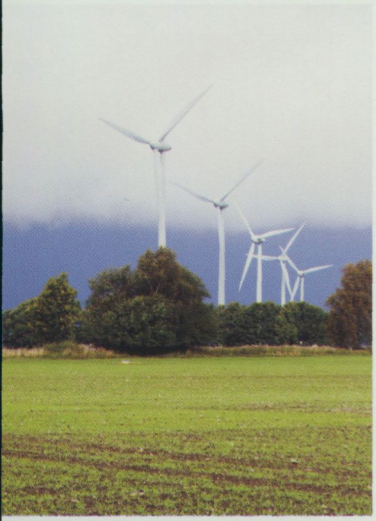
Contaminated sediment
In marine environments and lakes, the sediments in deposition areas contain deposited metals and resistant organic compounds. By collecting sediment samples, SGU studies variations in concentrations over of time. As a result of erosion or oxidation, metals and organic substances can circulate from the sediment into the water. When metals and organic substances are released, there is an increased risk of uptake in organisms and further distribution of toxins through the ecosystem.

Fibre banks
During recent years, SGU has conducted several projects in order to identify and assess the extent of fibre banks and to investigate their environmental chemical status. The results will contribute to achieve a number of environmental goals, including a non-toxic environment. The results can also be used as input when decisions are made to cost-efficiently direct and conduct further investigations and decontamination efforts in areas considered to have got the most environmental disturbance.

Sustainable coastal zone and marine planning
In order to implement sustainable ecosystem-based marine planning in Sweden, extensive knowledge and planning input is needed. SGU is developing cartographic data and information adapted to current requirements and challenges within Swedish coastal zones and marine planning and environmental administration. The information can be used when deciding on matters such as gravel pit operations, suitable areas for wind or wave power plants, how to handle of dredged material, etc.

With aid from our specially equipped vessels Ocean Surveyor and Ugglan, an inventory of the seabed geology is being made in order to gain knowledge of rock and soil beneath the sea. We are also taking sediment samples that show the distribution of environmentally hazardous substances.





To secure future Swedish supplies of construction materials, such as crushed rock, gravel and sand, a materials supply plan has to be drawn up before each construction project. SGU has developed a method description for a regional materials supply plan – a useful aid when a region wants to develop infrastructure and housing construction in a sustainable way.

Physical planning

In a wide sense, physical planning is planning of society and its development. Geological information and knowledge are important decision basis for a sustainable development, especially for built up environment and land and water management.

Planning and land use
Geological information is relevant and quality assured input, of considerable importance to many problems and planning issues. The information can be used for assessments of ground stability, ground conditions, groundwater occurence and natural resources such as peat, natural gravel and rock suitable for crushing. SGU's role is to provide this information and to make sure it results in good plans and decisions.

Soil type geological and marine geological mapping along the coast of Skåne
The problems with shore erosion along parts of Skåne's coast are substantial. Furthermore, climate changes are assumed to cause high sea water levels, which make the problem worse. To get better possibilites to evaluate the sensitivity to erosion, SGU has made an inventory of the areas around Skåne's seashores, on the seabed and on land. The information can be used as input for planning of the coastal zones and for matters concerning land and seabed use.

Open data
Information free to access and use is referred to as Open data. SGU has developed several such services within the environment and groundwater area. SGU is of the opinion that access to the authority's data is beneficial both to the own work, as well as to society in general. For a long time we have worked to provide our data in simple and free applications, such as the web based Map generator and our Map viewer.

Sulphide soils – a potential environmental problem
In areas with sulphide soils, acidic sulphate soils are often formed. This frequently has an extremely negative effect on the water chemistry in watercourses. High concentrations of metals and low pH values could in certain situations result in fish-kill. Ditching and other forms of excavation are activities that expose the soils to oxygen and thus affect the environment negatively. SGU has mapped out where in Sweden you can encounter sulphide soils. This information is of use to the building industry, among others.

Contaminated areas

One of Sweden's environmental objectives is A Non-Toxic Environment. As the responsible authority, SGU actively work to achieve this goal by investigations and by remediations of contaminated areas.

There are some 80 000 potential or confirmed contaminated areas in Sweden. About 1300 of these are judged to pose extremely serious risks to people's health or environment, and probably need remediation.

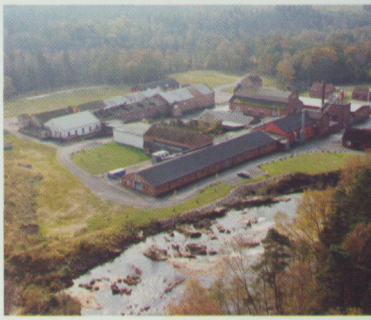
A Non-Toxic Environment
SGU contributes to the work on the environmental objective A Non-Toxic Environment by investigating, surveying, and dealing with contaminated areas so that they will not pose any threat to human health or environment.

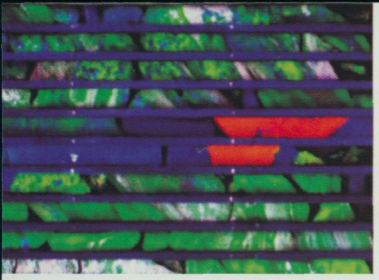
Aftertreatment of contaminated areas
Since 2006 SGU has served as the responsible authority for investigations of contaminated areas. Since 2010 SGU is also responsible for treatment of contaminated areas where a former government player previously has been responsible. SGU also cooperates with the Swedish Environmental Protection Agency and county administrative boards in aftertreatment of contaminated areas that, according to the Swedish Environmental Code, lack a responsible party. At request from local authorities, we can then be the principal for objects for which the local authority is not judged to have the capacity to run the survey or carry out the aftertreatment.

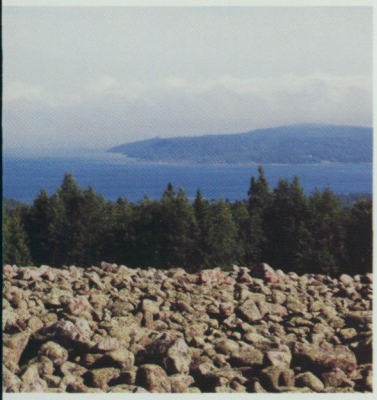
Dioxin decontamination in Marieberg
SGU has served as the principal for Sweden's largest dioxin decontamination assignment to date – the decontamination of Marieberg's old sawmill, located outside Kramfors. A total of 52 000 tons of contaminated soil and rock have been replaced by backfill. The aftertreatment has dealt with the existent risks, so that the area can continue to be used as workplace, summer accommodation and as a recreation area.

The sawmill in Marieberg operated from the 1860s until July 1970. The contaminants, which are mostly dioxins, originate from the last 30 years of operation, when the timber was treated with a wood protection substance (Dowicide) against sapstain molds. Dioxins are extremely toxic, they break down very slowly and are bio-accumulated, which gives them high priority in environmental work.

The environmental objective A Non-Toxic Environment: "The occurrence of man-made or extracted substances in the environment must not represent a threat to human health or biological diversity. Concentrations of non-naturally occurring substances will be close to zero and their impacts on human health and on ecosystems will be negligible. Concentrations of naturally occurring substances will be close to background levels."







This is the average quantities of minerals you use during your life:

- Copper: 0.6 tons
- Gold: 11 grams
- Zinc: 0.35 tons
- Cement: 33 tons
- Iron: 15 tons
- Lead 0.4 tons
- Clay: 9.7 tons
- Ballast: 775 tons
- Other minerals and metals: 30 tons

Rich in metals and minerals

Sweden is a mining and mineral processing country with ample access to metals and minerals. The supply of ore and minerals has to a large extent contributed to the national wealth and welfare of present-day Sweden.

Modern society is entirely dependent on its access to metals and minerals. Without them, products such as mobile phones, computers, solar panels, wind power plants and windows could not be manufactured.

SGU promotes a sustainable utilisation of Sweden's mineral resources

To increase the resource efficiency in society, SGU has made an inventory of the extraction and recycling potential of the Swedish metal and mineral assets. SGU has evaluated the ore potential in the Swedish bedrock, but also looked at the potential for landfill mining and urban mining. Recycling is one of the most energy-efficient ways to reduce the impact of mining and mineral processing on the environment, but it will take decades before recycling can replace primary production of metals.

The Barents Project

As a step in Sweden's mineral strategy, which aims at a long-term sustainable use of our mineral assets when it comes to ecological, social and cultural values, SGU has conducted a major inventory of parts of Norrbotten and Västerbotten – the Barents Project. The research from the last 50 years has changed the view on geological development. With a modern viewpoint and modern investigation methods, we now have better knowledge of our northern counties. This approach has been extremely fruitful and is something we will continue to develop.

Core samples

SGUs core sample archives, located at the Malå office, consist of over 3 million metres of core samples from more than 18 000 boreholes from all over Sweden. New core samples are constantly added. Over 230 000 metres of samples have been scanned, and data are continuously being made available via sgu.se.

For many of the core samples there are mapping reports, results from geophysical borehole measurements and chemical analyses. This information can be used within geological knowledge development, mineral exploration and ore-related research.

Mining Inspectorate of Sweden

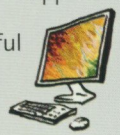
The Mining Inspectorate of Sweden (Bergsstaten) is the department of SGU that deals with matters concerning exploration and mining. Bergsstaten is directed by the Inspector of Mines, who makes decisions in accordance with the Swedish Minerals Act.

Bergsstaten reviews permits for investigation and processing of mineral deposits. Another important task is to supervise observance of the Swedish Minerals Act.

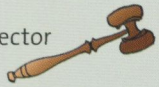
Bergsstaten also provides information about legislation and ongoing exploration and processing to companies, interested parties, authorities, media and the general public.

From exploration to mine

It takes several years for a deposit to become a mine. Simplified, this is what happens:



1. You have an idea of where there could be a deposit. You find useful and interesting maps in SGU's databases.
2. An application for an investigation permit is submitted to Bergsstaten. The Inspector of Mines either grants or rejects the application.
3. A work plan illustrating how the work could be carried out is drawn up and distributed to those concerned.



4. If extraction or winning is considered to be feasible, the Inspector of Mines decides to issue a processing concession.
5. The Land and Environment Court reviews grant of an environmental permit in line with the Swedish Environmental Code. The permit includes a decision on financial security for aftertreatment.
6. The Inspector of Mines decides on land regulation in accordance with the Minerals Act.
7. The local authority decides on building and land permit in accordance with the Planning and Building Act.

8. Winning or extraction of the deposit may begin.

At present there are 18 active mines in Sweden. Of these, 15 are metal extraction mines. Bergsstaten visits all of them once a year for inspection. During the visit the current information, the mining activity and the geology are reviewed, along with mine surveying and mine or field visits.

Project leader: Thomas Eliasson, Åsa Lindh, Lars Claeson Magdalena Thorstrink, Curt Fredén, Britt-Marie Ek, Carl Erik Alrawk, Thomas Adolfsén, Lotta Lewin Pihlblad, Leif Bildström, Åsa Persson, Åse Wästberg, Erik Jonsson och Niklas Juhojuntti: Illustrationer: Art Anna, Anna Jonson.

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