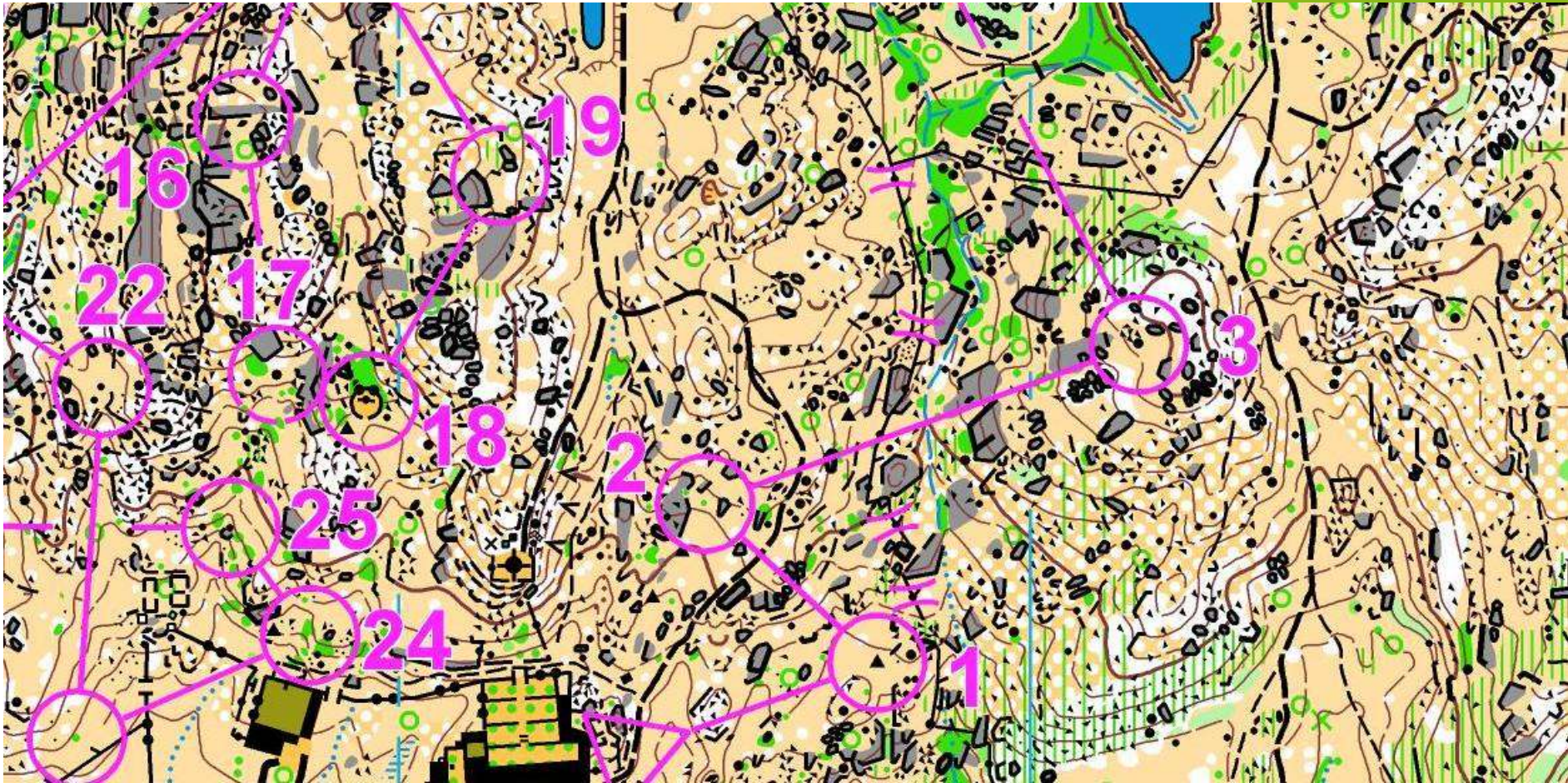


# LEGIBILITY OF ORIENTEERING MAPS: EVOLUTION AND INFLUENCES



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# Legibility of maps

- Maps are special printed products, where the legibility is regularly limited due to the complexity of the map content:
  - ❑ the users are sometimes not familiar with the text elements on the maps;
  - ❑ there are different features mapped, and the users may focus on any of them;
  - ❑ some of the features can be emphasized at the expense of other features.
- The graphical representation of features is a result of the long-term experience of cartography, which was a well-researched topic in the last centuries.
- **Maps are generally used in good, possibly in perfect circumstances.** Therefore, the mapmakers do not have to take into account this factor when they design their maps.
- **Orienteering maps are used in special circumstances** that are at orienteering events: in running, when weather conditions may affect the visibility, or even at night.

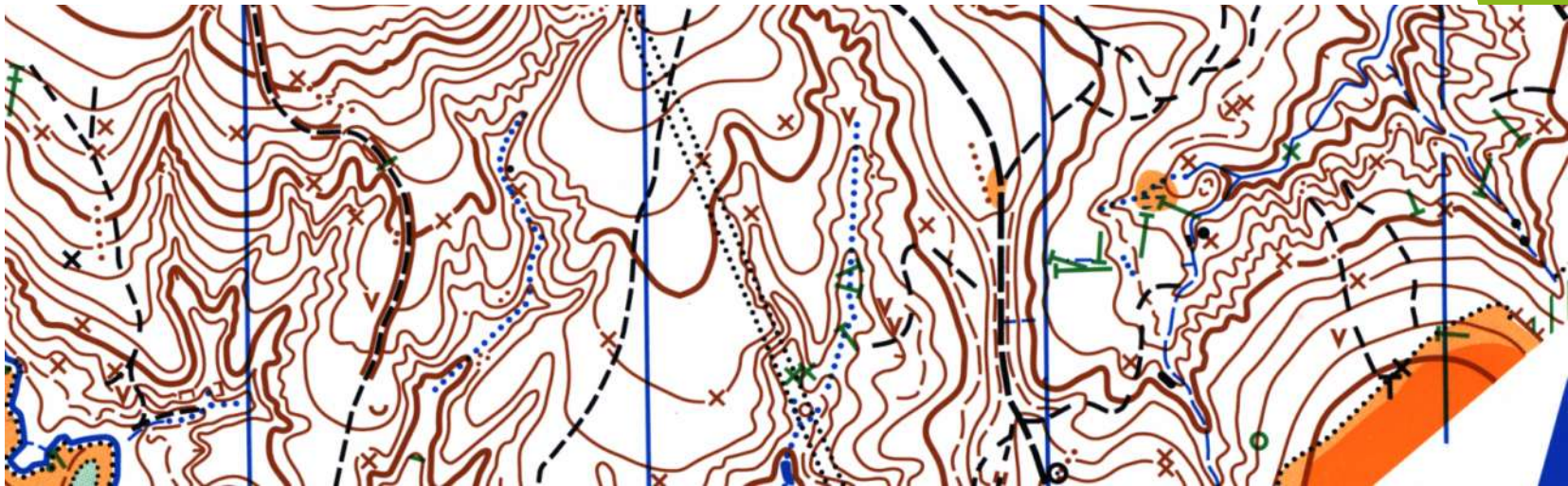
# Map specifications of orienteering maps

- During the early period of orienteering, extracts of large scale civil topographic or tourist maps were commonly used.
- According to running speed and course length, the scale of maps was 1:20,000–1:40,000 (1:50,000–1:100,000 in the early years).
- In some countries, topographic maps were classified (Eastern Europe); in other areas, the largest available scale of topographic maps was only 1:50,000.
- The first color orienteering map was published in Norway in 1950, but took additional 15–20 years, while colour maps were used on every orienteering map.
- **The International Orienteering Federation (IOF) was founded in 1961.**
- In 1965, the Map Committee of the IOF was formed.
- The first issue of the **International Specification of Orienteering Maps (ISOM)** was ratified in **1969**. This issue was still not a 'specification' but rather a 'guideline'.
- Next versions: 1975, 1982, 1990, 2000.



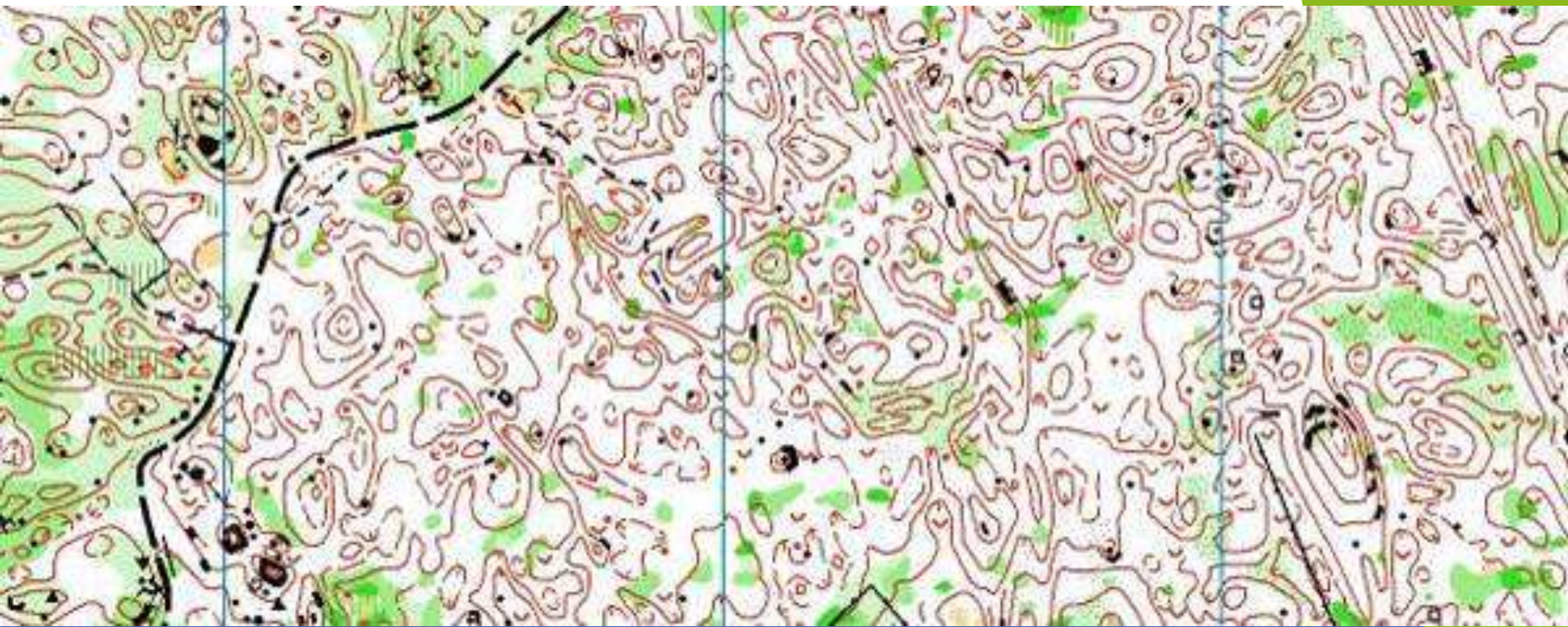
# The legibility issue of orienteering maps in general

- Map-reading requires the competitor to attend to and extract information from the map during visual examination **in running speed**.
- Most orienteering maps contain an **enormous amount of information**, far too much for any map reader to perceive and process rapidly.
- One of the ways in which orienteering maps differ from other topographical maps is in the **amount of fine relief detail** that is included.



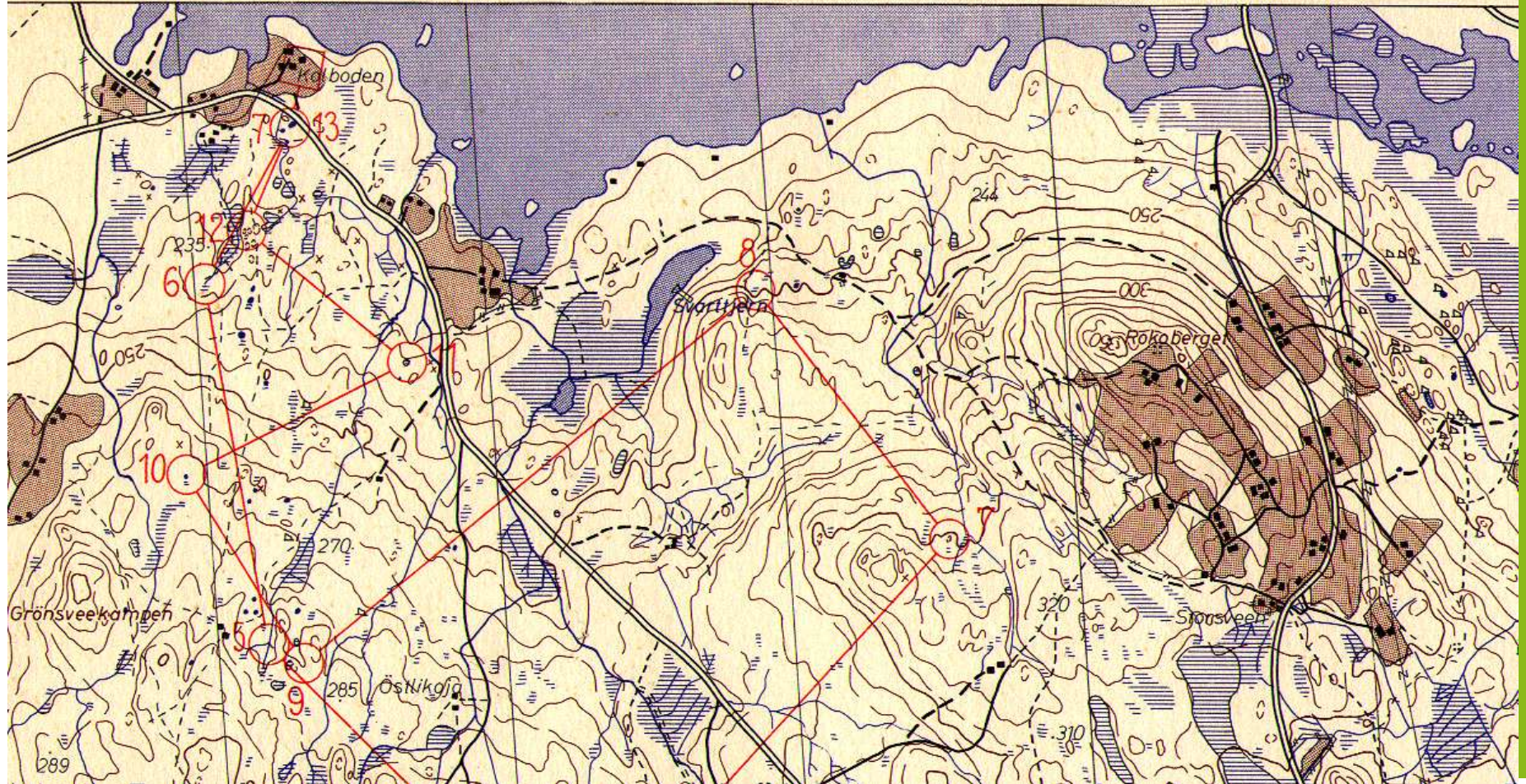
# The legibility issue of orienteering maps in general

- The best strategy of map reading (especially in orienteering) is the **selectivity**; the competitors attend to certain types of information and ignore or rather only pay minimal attention to other kinds of information.

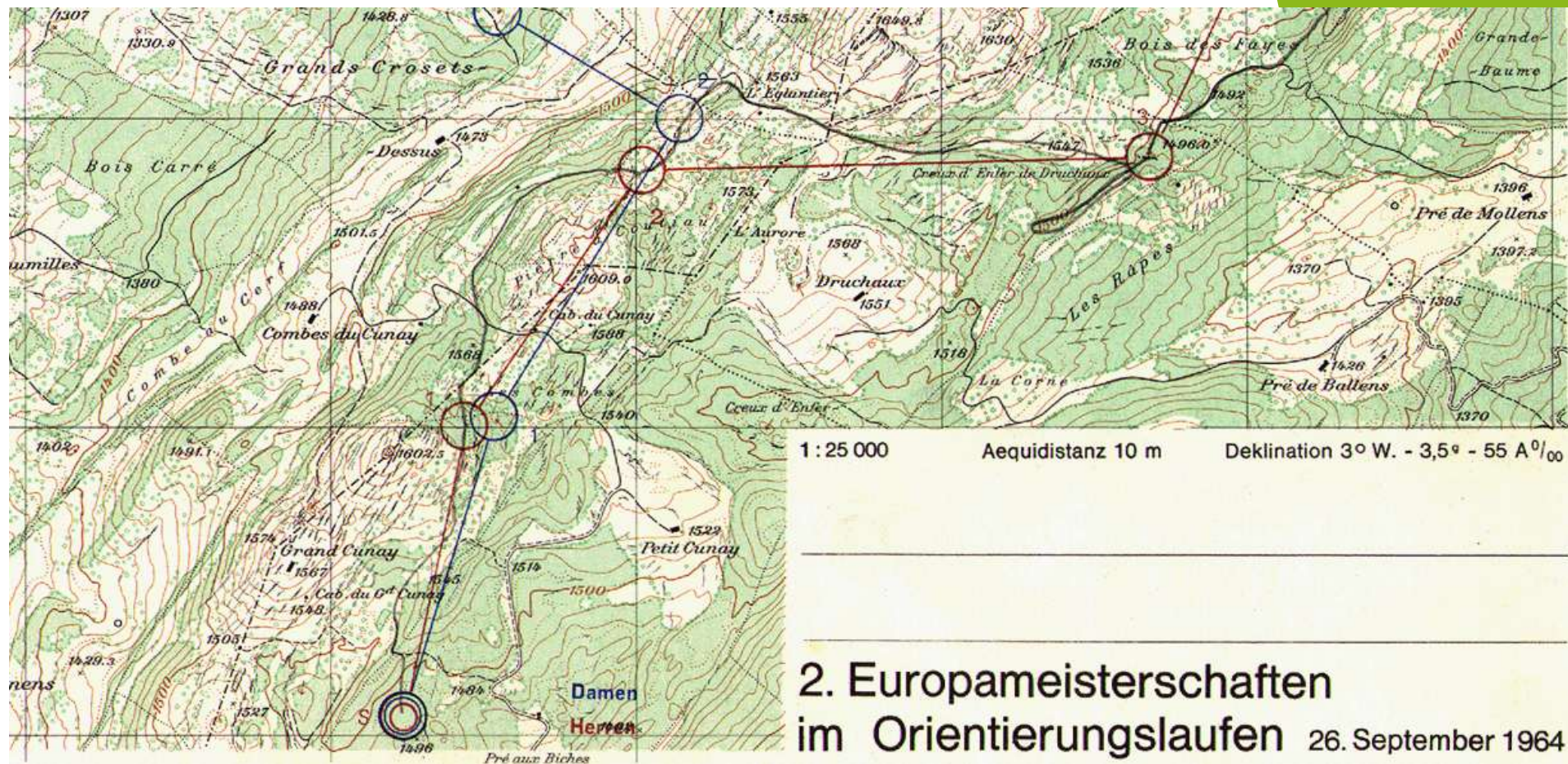


# European Orienteering Championships, Norway, 1962

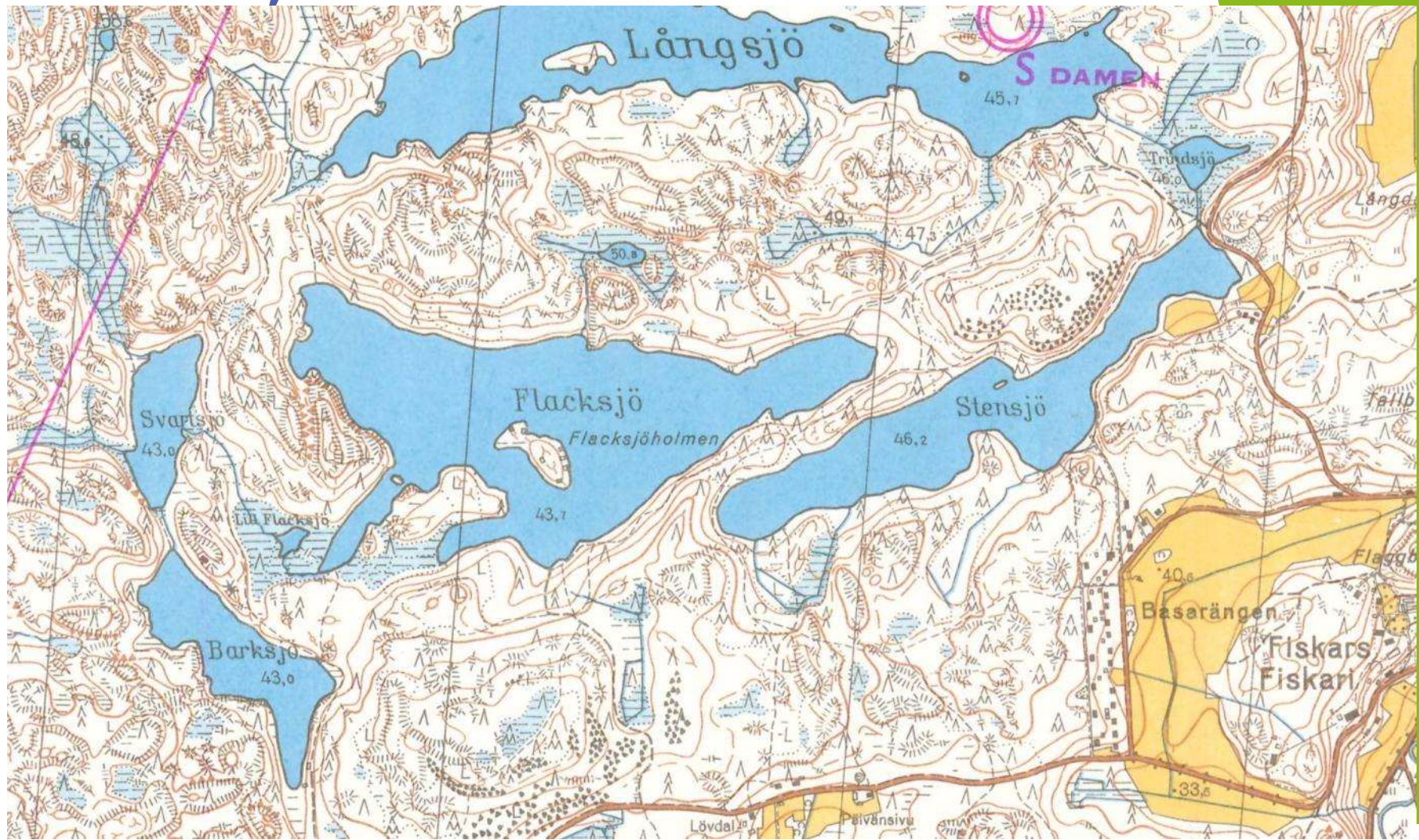
DIE EUROPAMEISTERSCHAFT IM ORIENTIERUNGSLAUF 1



# European Orienteering Championships, Switzerland, 1964

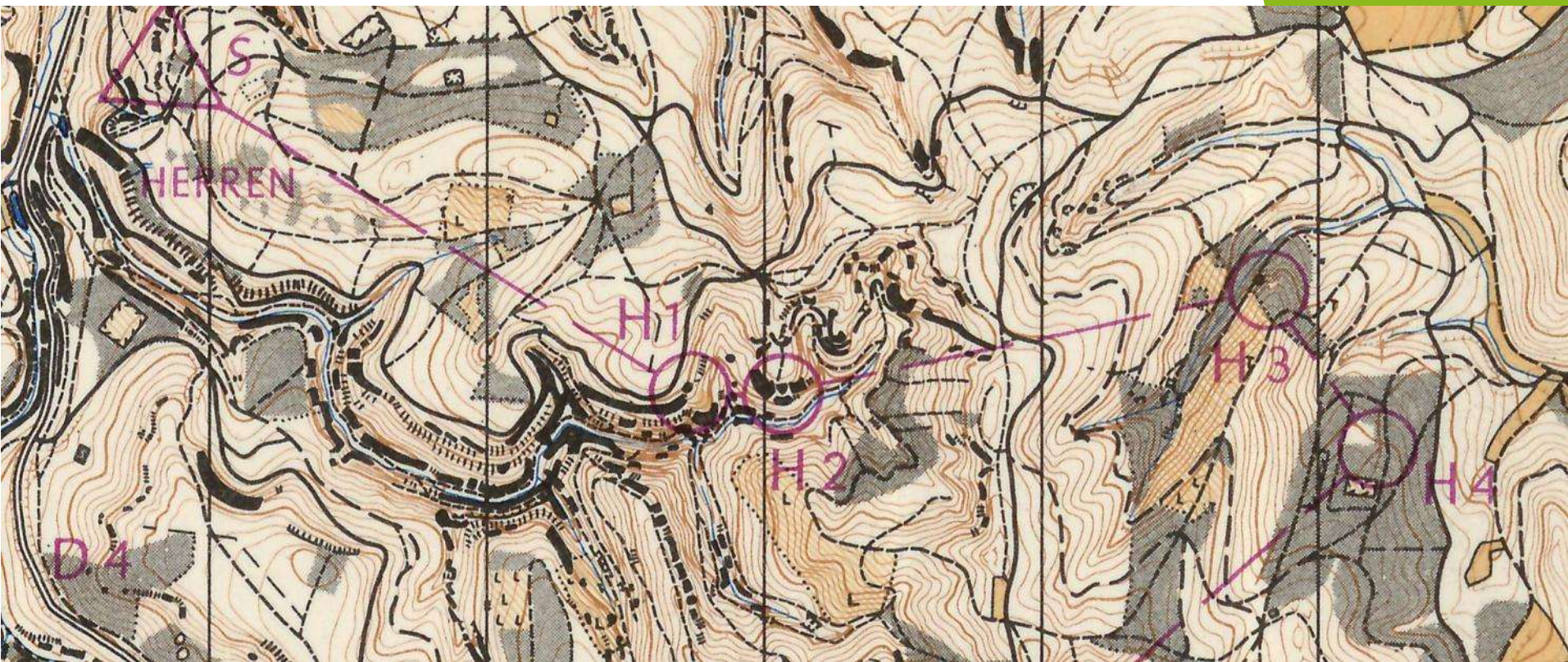


# World Orienteering Championships, Finland, 1966

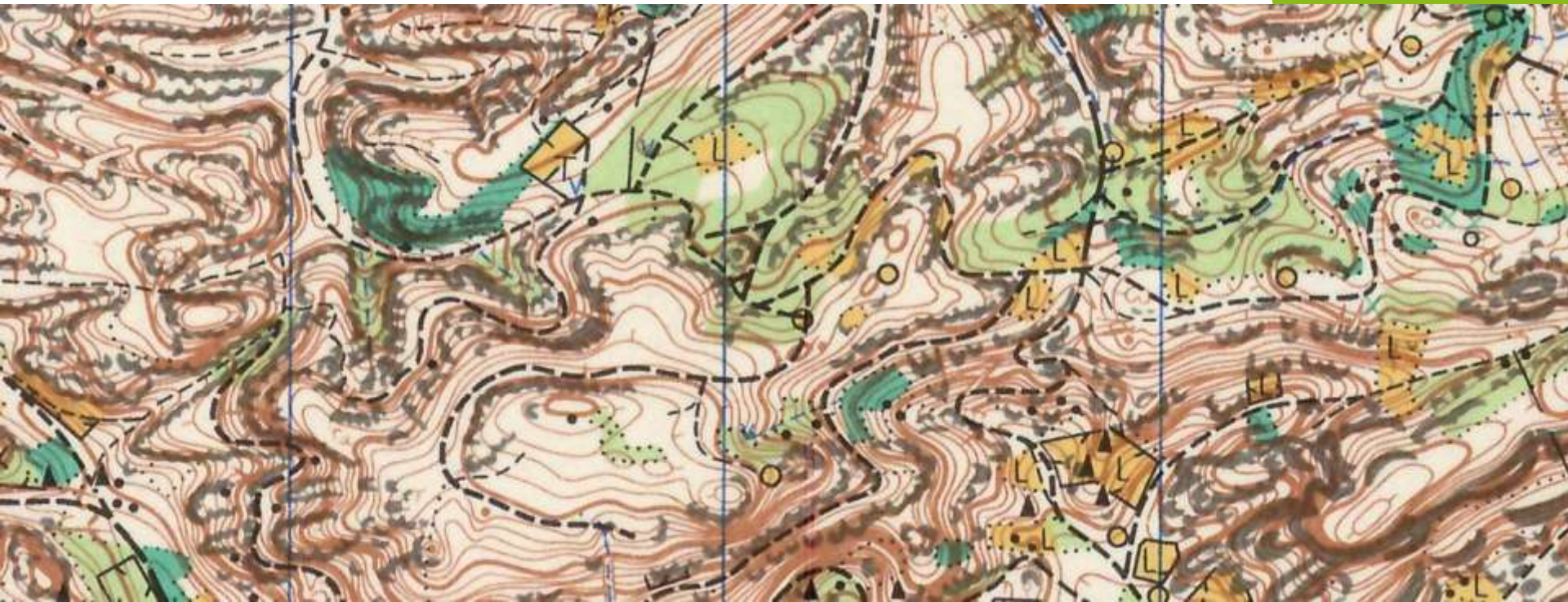




# World Orienteering Championships, East Germany, 1970



# World Orienteering Championships, Czechoslovakia, 1972



# World Orienteering Championships, Czechoslovakia, 1972

- The terrain which was selected by the national organizers was a **really extreme terrain** (sandstone area), which type had never been used previously.
- The most detailed map element of this WOC was the rock features (sandstone cliffs and boulders). The grey color was very unusual on orienteering maps and this was also the first time when different green colors were used to represent runnability. Compared to other map elements, the grey features were **over-detailed**, and the small passages of long cliffs which affected the route choices were considerably difficult to see on the maps.

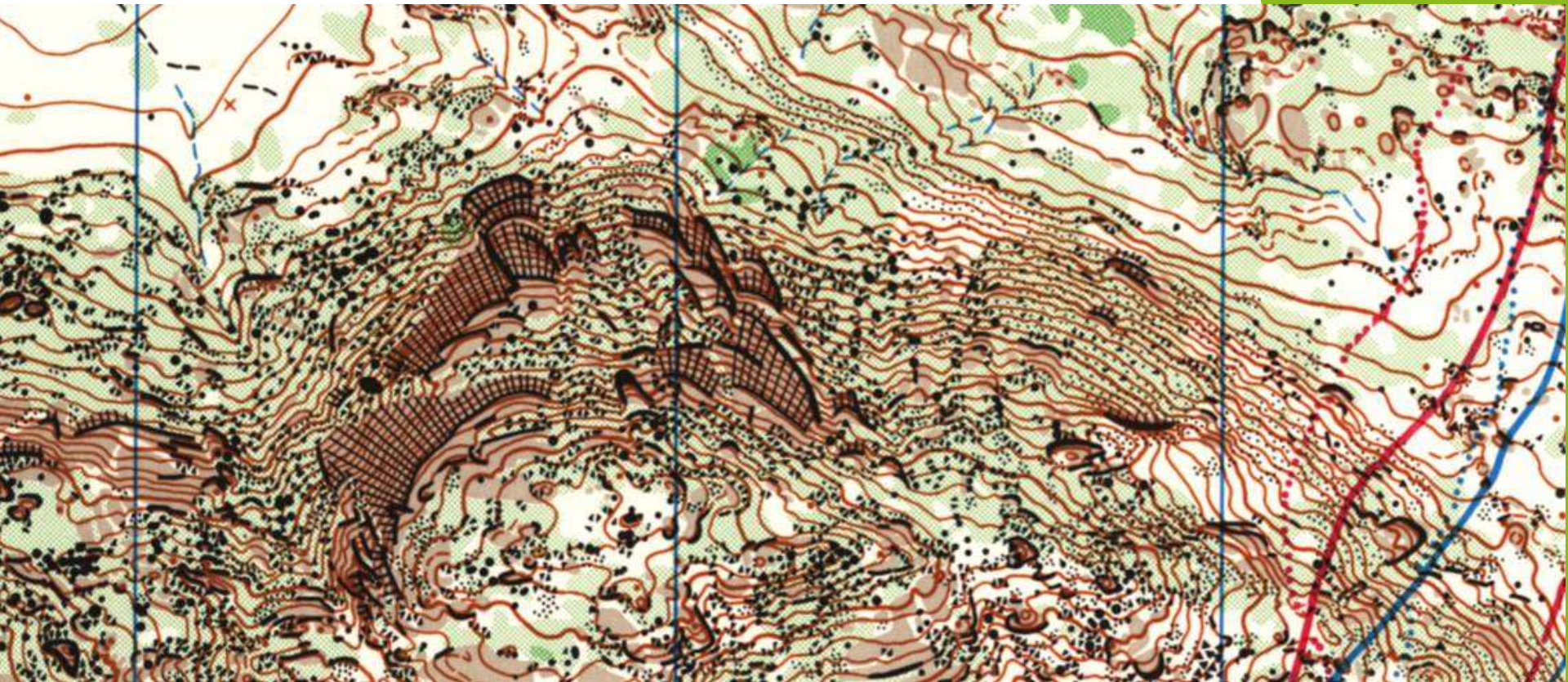
# The effect

- The larger scale (1:15,000) influenced the map-makers to fill the 'empty areas' of maps.
- The easiest way was to add more point symbols, which was easily manageable in Nordic countries, where the terrain is full of features. In continental areas, due to the less number of point features on the terrain, the map-makers tried to add vegetation features which were difficult to identify on the terrain.
- The WOC 1972 also had a relatively long-term effect to select extreme terrains for WOC. Every country which organized WOC tried to select its most difficult, most detailed terrains.
- The WOC 1989 changed this attitude; Sweden was ready to select less typical Scandinavian terrain to organize fairer championships than previously.

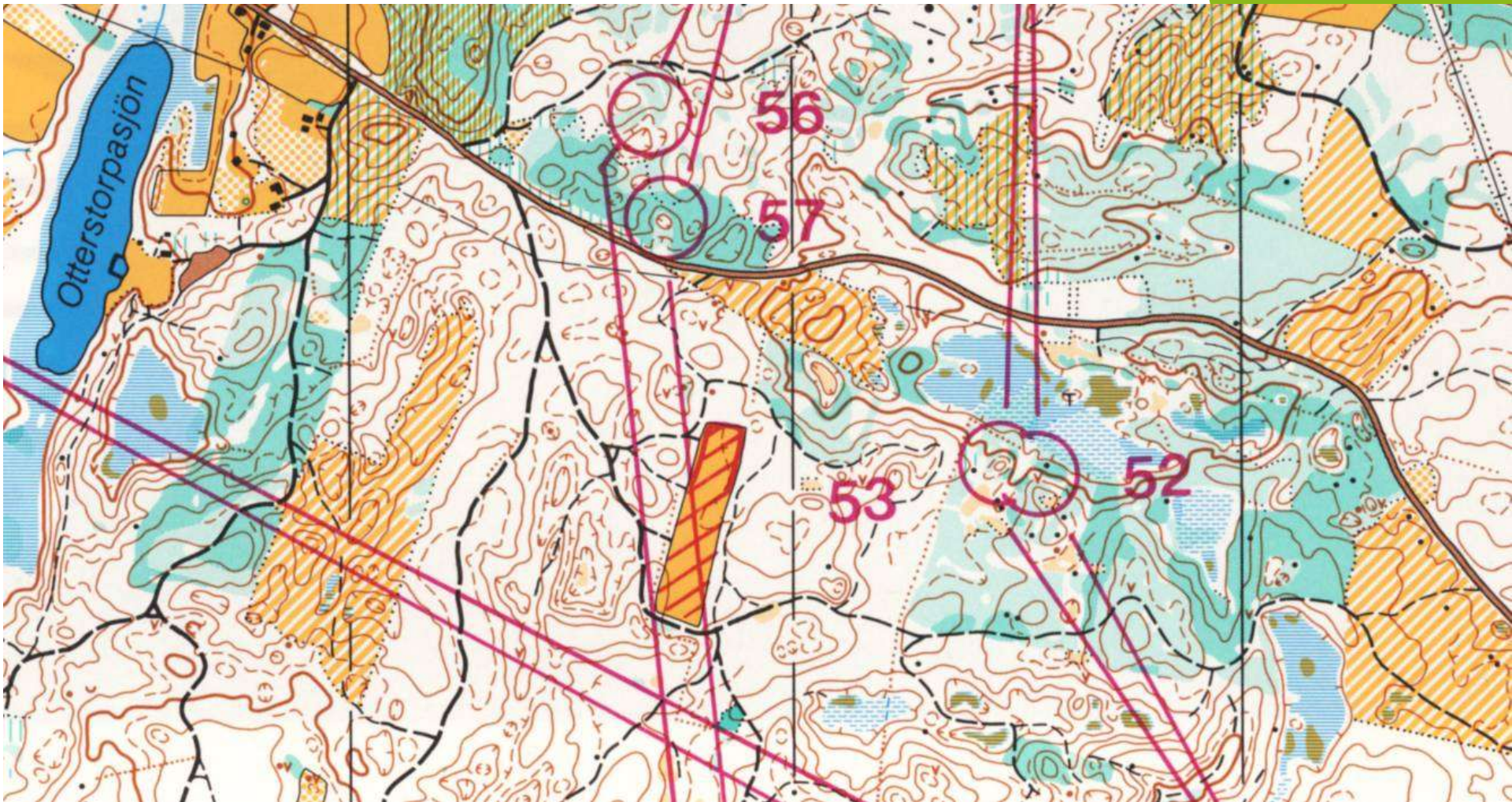
# The ISOM

- The ISOM 1975 defined several **minimum values** of orienteering map symbols based on cartographic traditions. The minimum line width was 0.1 mm in darker colors (black, blue and brown), 0.25 mm in green and 0.4 mm in yellow. The minimum area was 1 mm<sup>2</sup> for screens and 0.5 mm<sup>2</sup> for full colors.

# World Orienteering Championships, Australia, 1985



# World Orienteering Championships, Sweden, 1989



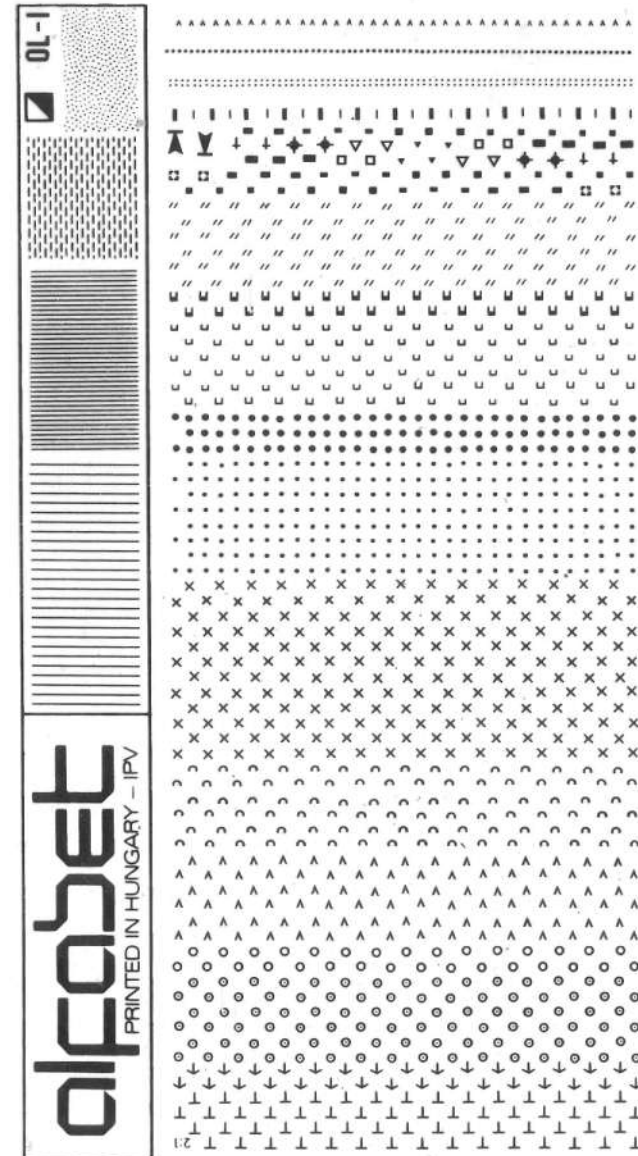
# Short distance events, 1991

- Short is a new form of event that was developed to give more opportunity for the competitors.
- The media attractiveness became an important factor and the classic distance event took too much time for television coverage.
- The larger speed in short distance event also required a **larger scale map** (1:10,000). It had the same specification and the larger scale was just a simple enlargement. The organizers wanted to express the different characteristics of the new form, so to **map smaller details** was a logical step forward, although it was not encouraged by the specifications.



# „Analogue” map drawing

- In the analogue age only very experienced orienteers drew their maps themselves.
- This job required not only special skills, but also drawing pens and some special tools, like dry transferrable lettering and map symbols.
- This technique was widespread for lettering and other elements before the advent of the computer techniques of word processing and desktop publishing. Although this was always a tedious job, the alternative, to draw the symbols by hand, was also **tedious** and **required graphic artist skills**.
- From the point of view of **legibility** of orienteering maps, the **dry transferrable orienteering symbol set** was an important step forward to ensure the standardized symbol sizes.



# Computer drawing

- Adobe Illustrator and Aldus Freehand were the first commercial software around 1988 which made o-map drawing possible.
- The Swiss **OCAD** software was also launched around **1989** and very soon this software became the dominant programme for drawing orienteering maps. The most important reason that made this software very popular in some months/years is that OCAD was **very user-friendly** and the hardware requirements were moderate.
- It was also important that **the specification of orienteering maps was uniform all over the world**, so the same product could be used in every country.
- As there is **no text inside the orienteering maps**, it was no problem that the very first versions of OCAD did not support text functions.

# Digital era: pros and cons

- The digital era has not just created opportunities for computer drawing, but also gave more chance for stereo photogrammetry. Digital elevation models and orthophotos provided more detailed base maps for orienteering maps.
- The main problem of the very detailed base maps is that the details of the photogrammetric plots are not simplified by the map-makers, because **the generalisation process requires cartographic knowledge**.
- There is another factor that considerably affects the legibility of the orienteering maps in the digital era: it is the reproduction method: spot color offset printing is the suggested method, digital printing is still not good enough: brown contour lines are very sensitive.

# Digital era: pros and cons



# A new discipline: sprint (2001)

- The sprint format required a new, separate specification.
- The sprint events are regularly organized in urban environment (historical downtowns, parks) or in a mixture of different areas.
- The number of features is much higher in urban environment than in forest areas, but the minimum dimensions of mapped features are about the same: **the running speed** of competitors is regularly **larger** in sprint format, so they do not want to waste their time on looking for features which are not **prominent** on the terrain at full running speed.

# A new discipline: sprint



ORIENTİRING FEDERASYONU  
2002 TÜRKİYE

## Cappad-O-cia Cup 2011

Uluslararası & 3. Kademe Oryantiring Yarışları  
Mustafapaşa (Middle - WRE)/26 March 2011

G S G M

M21 E	6,1 km	125 m
1	99	△ △
2	38	⊗
3	37	+
4	36	↑ ▲
5	35	
6	34	⊗
7	33	V
8	32	▲ ▲
9	39	D
10	59	↑
11	42	↑
12	43	
13	44	>
14	45	↑
15	46	↑
16	47	▲
17	48	↑
18	51	■
19	67	↑
20	53	⊗

140 m

M21 E

Scale 1:10 000  
Contours 5m  
Mapped 2010

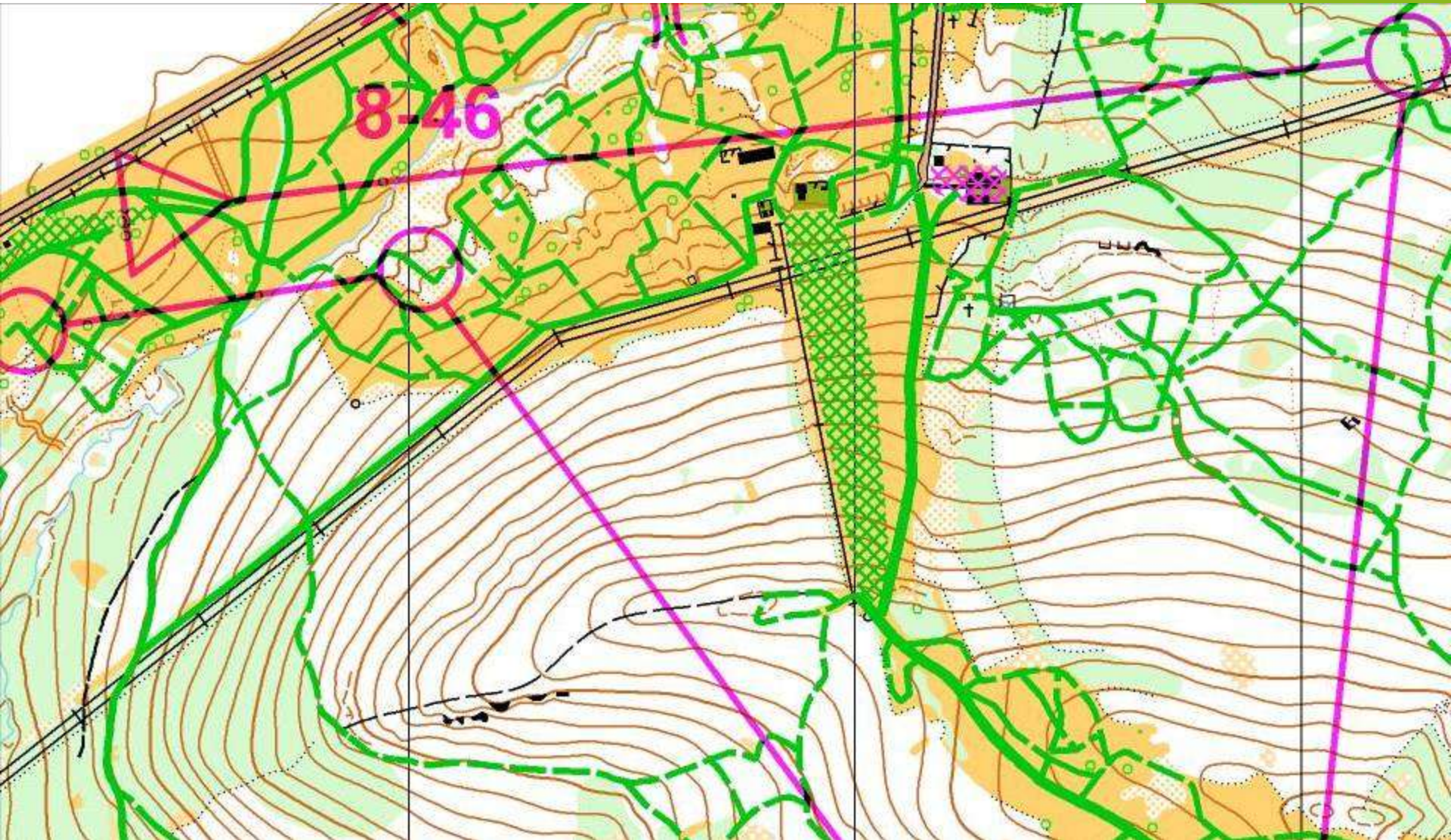
Subarea and Outlines:  
Aliş İnceol, Seri Özkul, Jor Güneş (Others)

Course Planner:  
Ömer FURKAN, Elvan ERDOĞA

# Legibility of other orienteering disciplines

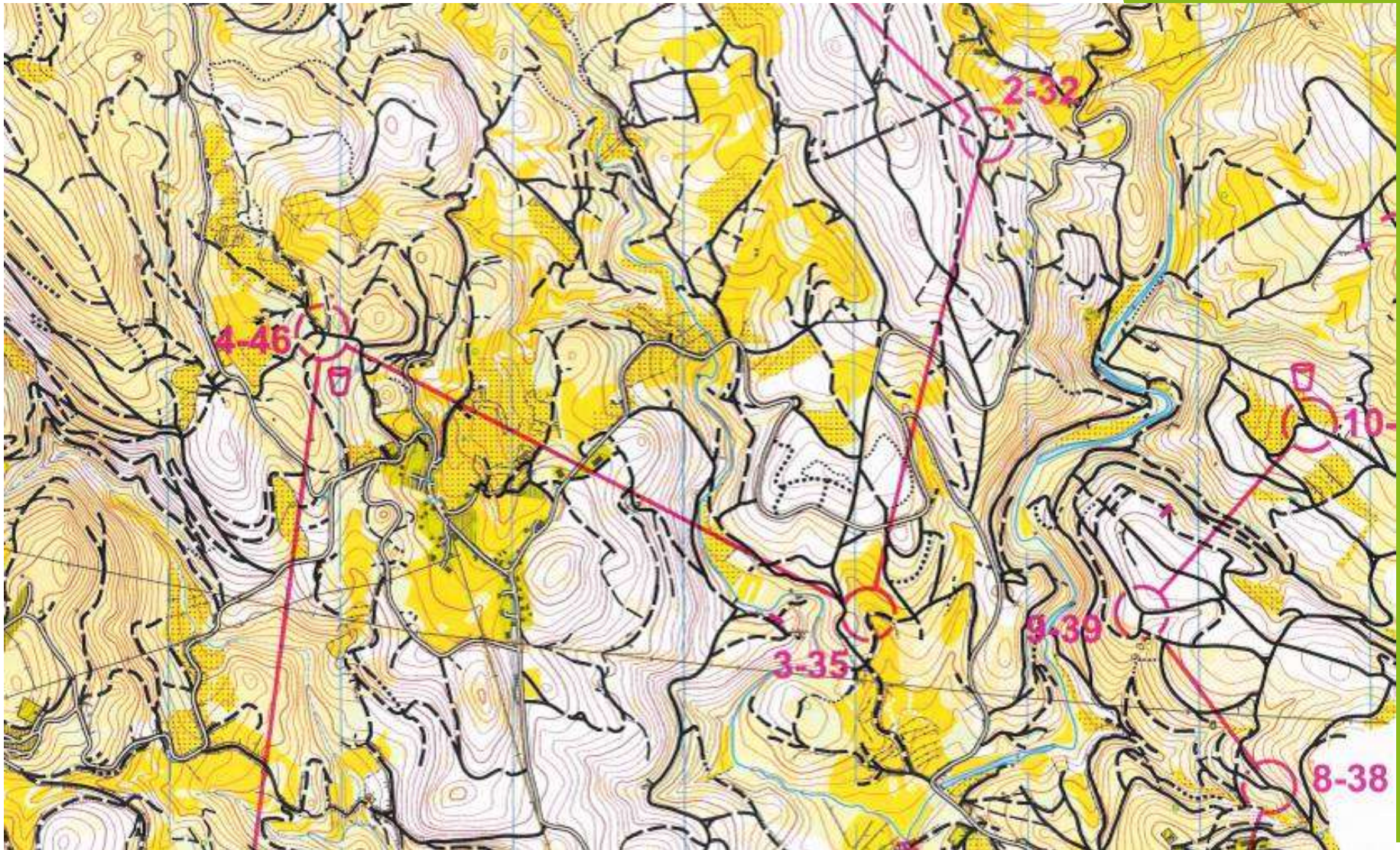
- Owing to the larger speed of the competitors, the scales are smaller (1:15,000, 1:20,000 or even 1:25,000), but the main difference is that the specifications emphasize the most important elements: **the road network**.
- Any other elements which are not relevant, which are not visible at a higher speed or are hidden in the middle of the forest, are omitted.
- **The track network is over-emphasized**: the line widths are thicker and the quality difference is shown by continuous, dashed and dotted lines in both disciplines referring to the width (speed) of the path/road. **As a result, the legibility of these maps is very good.**
- The competitors of these disciplines do not insist on adding more and more details on the maps.

# Legibility of other orienteering disciplines





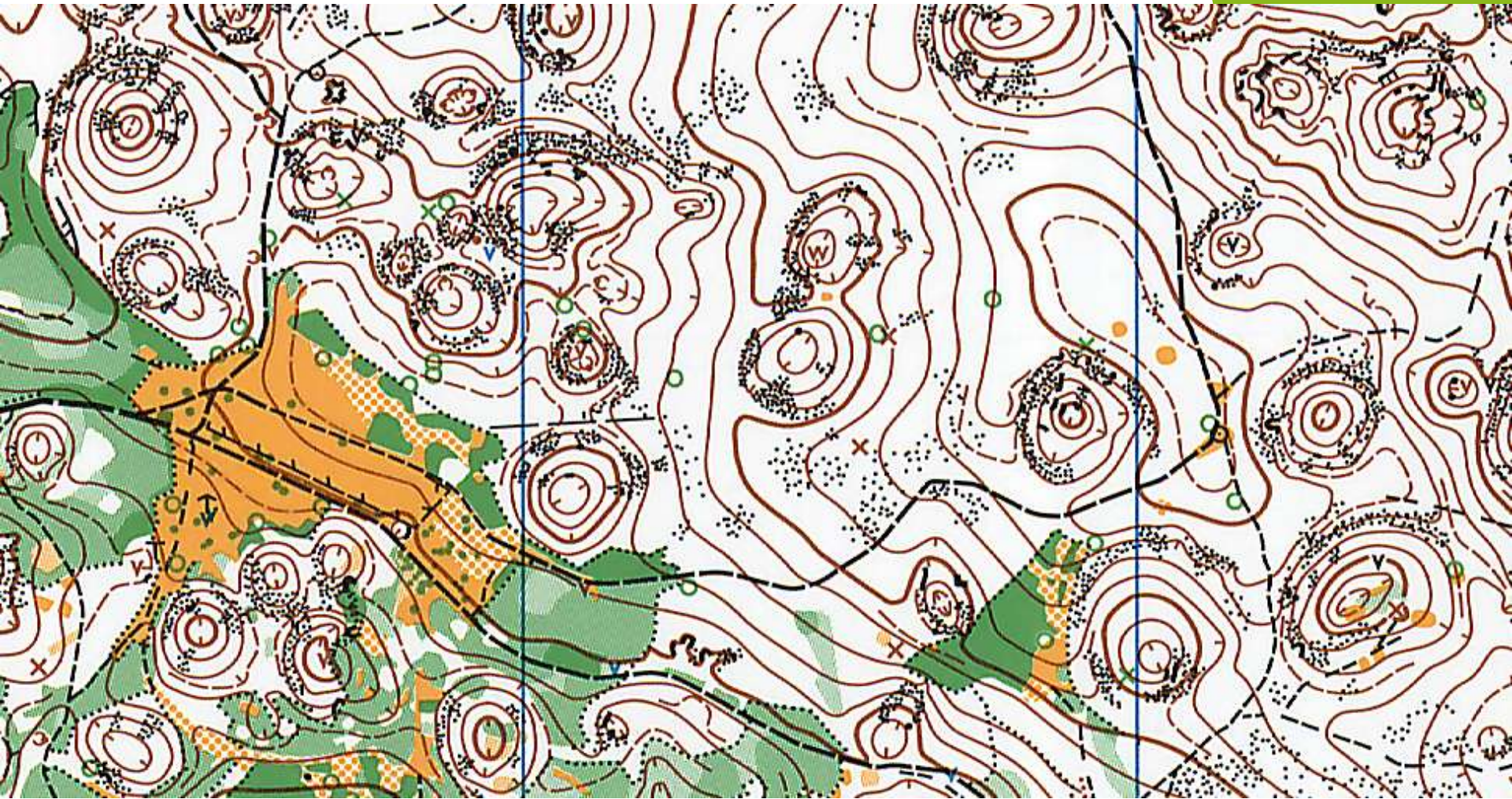
# Legibility of other orienteering disciplines



# Conclusions

- The legibility issue of orienteering maps is an interesting sample of how users' demands influence the map itself.
- The first specification used the **traditions of cartography** when the minimum dimensions were defined.
- As the sport developed, established new formats and disciplines then traditions were adjusted to the changing needs: like the higher speed of competitors in ski-orienteering and in MTBO.
- The most important changes occurred in the last 10–15 years: digital printing methods and laser scanning considerably affect the orienteering maps.
- New technologies give more support for the mapping (mostly for the fieldwork) and the main result of this is that mappers tend to add more details on the maps and finally **the legibility is decreasing**.
- The IOF and its responsible commissions are continuously working on keeping the characteristics of the different formats and the legibility is the most important factor on that.

Mapmakers should understand that without the proper level of generalisation, the legibility of orienteering maps will not be suitable for the organisation of fair events.



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