

# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Methodology</b>	<b>3</b>
2.1	Principles of Drought Analysis and Assessment	3
2.1.1	Drought Definitions and Types	3
2.1.2	Drought Risks and Impacts	5
2.1.3	Methods of Drought Assessment	6
2.2	Theoretical Basis of the Water Quality Assessment	32
2.2.1	Water Quality: Definition and Evaluation Methods	32
2.2.2	Water Quality Indicators	42
	References	48
<b>3</b>	<b>Software Tools Used at Work</b>	<b>55</b>
3.1	HydroOffice	55
3.2	Hydrogeochemical Tools	59
	References	60
<b>4</b>	<b>Area of Interest and its Natural Conditions</b>	<b>61</b>
4.1	Geological and Pedological Conditions	61
4.2	Climatic Conditions	64
4.3	Hydrological Conditions	68
4.4	Hydrogeological Conditions and Currently Processed Research	69
4.5	Land Use of Assessed Area	72
	References	73
<b>5</b>	<b>Analysis of Hydrological Drought</b>	<b>77</b>
5.1	Foreword	77
5.2	Analysis of Hydrological Drought on River Profiles of Slovakia	78

5.2.1	Methods of Data Processing . . . . .	78
5.2.2	Intensity Analysis of Hydrological Drought in Slovakia . . . . .	79
5.2.3	Spatial Extent of Hydrological Drought . . . . .	81
5.2.4	The Length of Drought Periods . . . . .	84
5.2.5	Seasonality and Frequency of the Drought Periods in Slovakia . . . . .	86
5.2.6	Classification and Drought Assessment . . . . .	89
5.3	Meteorological Drought in the Upper Part of the Nitra River Catchment . . . . .	90
5.4	Surface Water Drought in the Upper Part of the Nitra River Catchment . . . . .	105
5.5	Groundwater Drought in the Upper Part of the Nitra River Catchment . . . . .	111
5.6	Comparison of Drought Characteristics in the Evaluated Components of Runoff in the Upper Part of the Nitra River Catchment . . . . .	128
	References . . . . .	139
<b>6</b>	<b>Water Quality Assessments in Dry Seasons . . . . .</b>	<b>141</b>
6.1	Introduction . . . . .	141
6.2	Input Data and Used Methods . . . . .	141
6.3	The General Assessment of Water Quality . . . . .	143
6.4	Spatial Assessment of Water Quality . . . . .	150
6.5	Temporal Assessment of Water Quality . . . . .	152
6.6	Water Quality in the Periods of Hydrological Drought . . . . .	153
6.7	Water Quality Assessment in Dry Seasons . . . . .	155
6.7.1	Sodium . . . . .	155
6.7.2	Potassium . . . . .	156
6.7.3	Ammonia Nitrogen . . . . .	157
6.7.4	Calcium . . . . .	159
6.7.5	Magnesium . . . . .	161
6.7.6	Manganese . . . . .	162
6.7.7	Iron . . . . .	163
6.7.8	Chloride . . . . .	165
6.7.9	Nitrites . . . . .	167
6.7.10	Nitrates . . . . .	167
6.7.11	Bicarbonates . . . . .	169
6.7.12	Sulphates . . . . .	170
6.7.13	Phosphates . . . . .	172
6.7.14	Silicates . . . . .	173
6.7.15	Water Alkalinity . . . . .	174
6.7.16	Water Acidity . . . . .	174
6.7.17	Chemical Oxygen Demand . . . . .	175

6.7.18	Oxygen . . . . .	175
6.7.19	Oxygen Saturation . . . . .	177
6.7.20	Electrolytic Conductivity . . . . .	179
6.7.21	Total Dissolved Solids . . . . .	180
6.7.22	Water pH . . . . .	182
6.7.23	Water Temperature . . . . .	183
6.7.24	Summary of Results . . . . .	187
	References . . . . .	190
<b>7</b>	<b>Summary of Thesis Results . . . . .</b>	<b>191</b>
7.1	Development of New Hydrological and Hydro-Geochemical Software Tools . . . . .	191
7.2	Assessment of Hydrological Drought in a Regional Scale . . . . .	192
7.3	Evaluation of Meteorological Drought . . . . .	193
7.4	Assessment of Hydrological Drought in Surface Waters . . . . .	195
7.5	Assessment of Hydrological Drought in the Groundwater . . . . .	196
7.6	Comparison of the Incidence and Nature of Drought in Individual Parts of the Catchment Hydrological Cycle . . . . .	198
7.7	Assessment of Water Quality Changes During Hydrological Drought . . . . .	199
	References . . . . .	202
<b>8</b>	<b>Recommendation for Further Research . . . . .</b>	<b>203</b>
<b>9</b>	<b>Conclusions . . . . .</b>	<b>207</b>
	<b>Appendix A: Assessed Profiles of Rivers in Slovakia . . . . .</b>	<b>209</b>
	<b>Appendix B: Analysis of the Achieved Deficits in the Individual Catchments of Slovakia . . . . .</b>	<b>213</b>
	<b>Appendix C: Analysis of the Relative Occurrence of Maximum Annual Deficits in Individual Months of Year for Selected Catchments (in %) . . . . .</b>	<b>217</b>
	<b>Appendix D: Statistic Overview of Annual Precipitation Totals in Evaluated Meteorological Stations (in mm) . . . . .</b>	<b>221</b>
	<b>Appendix E: Statistic Overview of Annual Effective Precipitation Totals in Evaluated Meteorological Stations (in mm) . . . . .</b>	<b>223</b>

<b>Appendix F: Statistic Overview of Annual Effective Precipitation Totals in Evaluated Meteorological Stations with Consideration of Water Volume Time Shift in Snow Cover. . . . .</b>	<b>225</b>
<b>Appendix G: List of Selected Gauging Profiles on Surface Streams. . .</b>	<b>227</b>
<b>Appendix H: List of Selected Groundwater Monitoring Objects . . . . .</b>	<b>229</b>

Surface- and Groundwater Quality Changes in Periods  
of Water Scarcity

Gregor, M.

2013, XVIII, 230 p., Hardcover

ISBN: 978-3-642-32243-3