Upper Grande Ronde: Summary of CHaMP Metrics and Modeled Products

- CHaMP metrics are directly measured at each CHaMP site according to probabilistic sampling design. Metric included in this summary are:
  - Sinuosity
  - Substrate < 2 mm
  - Substrate < 6 mm
- Modeled products are built from CHaMP data and additional mechanistic or empirical knowledge, assessed at each CHaMP Site
  - Habitat Suitability Index (HSI)
  - Net Rate of Energy Investment (NREI)

Background: CHaMP Metrics and Modeled Products

Upper Grande Ronde: Summary of CHaMP Metrics and Modeled Products

CHaMP Metrics

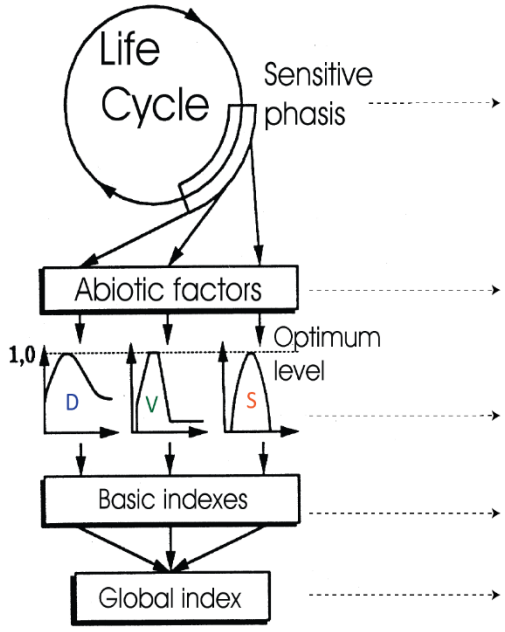
- **Sinuosity (Sin)**
  - Ratio of the thalweg length to the straight line distance between the start and end points of the thalweg.

- **Substrate < 2 mm and Substrate < 6 mm**
  - Average percentage of pool tail substrates comprised of fine sediment <2 mm and < 6 mm, respectively.
  - **Details**
    - Substrates metrics are directly measured by CHaMP crews as the percentage of 50 substrate observations less than 2mm or 6mm, respectively, measured at each of three grid locations (150 total observations per site), at the pool tail of each channel unit.
    - Additional details available at: https://www.monitoringmethods.org/Method/Details/868

CHaMP Modeled Products: Habitat Suitability Index

- **Habitat Suitability Index Metrics:**
  - Suitable habitat area (m^2) per meter of stream length for:
    - Steelhead Juvenile Weighted Usable Area per Meter
    - Steelhead Spawner Weighted Usable Area per Meter
    - Chinook Juvenile Weighted Usable Area per Meter
    - Chinook Spawner Weighted Usable Area per Meter
- Details
  - Modeled from CHaMP Data
  - Inputs to HSI Models
    - Site level hydraulic models which yield detailed field estimates of velocity and depth.
    - Substrate (D50)
    - Habitat Suitability Index Curves
      - Based on expert judgement
      - See Appendix

HSI Model Structure:



CHaMP Implementation Example:

CHaMP Modeled Products: NREI Capacity

- **Net rate of energy intake (NREI) :**
  - Juvenile salmonid capacity per meter
    - The carrying capacity of juvenile salmonid per meter of stream
- **Details**
  - NREI carrying capacity is a modeled metric. Carrying capacity is estimated based on an energy balance model, where the energy required to occupy a stream location (swimming sots, SC) is compared to the energy available from prey drift at that same location (gross rate of energy intake, GREI)
  - Inputs to NREI Model
    - Site level hydraulic models which yield detailed field estimates of velocity and depth.
      - Based on detailed CHaMP surveyed of bathymetry, as discharge (Q) and surface roughness (D84).
    - Temperature
    - Drift
    - Fish Characteristics
- References:
  - Hayes, J. W., N. F. Hughes, and L. H. Kelly. 2007. Process-based modelling of invertebrate drift transport, net energy intake and reach carrying capacity for drift-feeding salmonids. Ecological Modelling **207**:171-188.
  - See appendix for additional references

CHaMP Metrics and Modeled Products: Summaries by Assessment Unit

- Estimated Population Distributions of CHaMP Metrics and Modeled Products, by Assessment Unit
  - Aka “GRTS Rollups”
  - Metrics from CHaMP sites were used to estimate the mean and standard deviations for the entire Assessment Unit
  - Design based statistical estimations are used to estimate population level responses and corresponding standard errors at spatial scales larger than individual CHaMP site
    - Using R-package spsurvey
    - Estimates are robust and unbiased
    - No distributional assumptions required
  - References:

    - Stevens Jr DL, and Olsen AR (2004). Spatially balanced sampling of natural resources. J Am Stat Assoc, 99:465, 262-278, DOI: 0.1198/016214504000000250.
    - Kincaid TM, Olsen AR (2013). Spsurvey: spatial survey design and analysis. R package version 2.6. URL: http://www.epa.gov/nheerl/arm/.

CHaMP Metrics and Modeled Products: Continuous Estimates

- Model assisted regression models were generated to make spatially continuous estimates at all points along continuous stream networks
  - Required for continuous response map generation
  - Metrics and products are “extrapolated” beyond measured points
  - CHaMP metrics and modeled products are empirically fit to globally available attributes (GAA).
  - Model assisted regression used to account for non-uniform sample inclusion probabilities
    - R-package “survey”

- Model details in appendix.

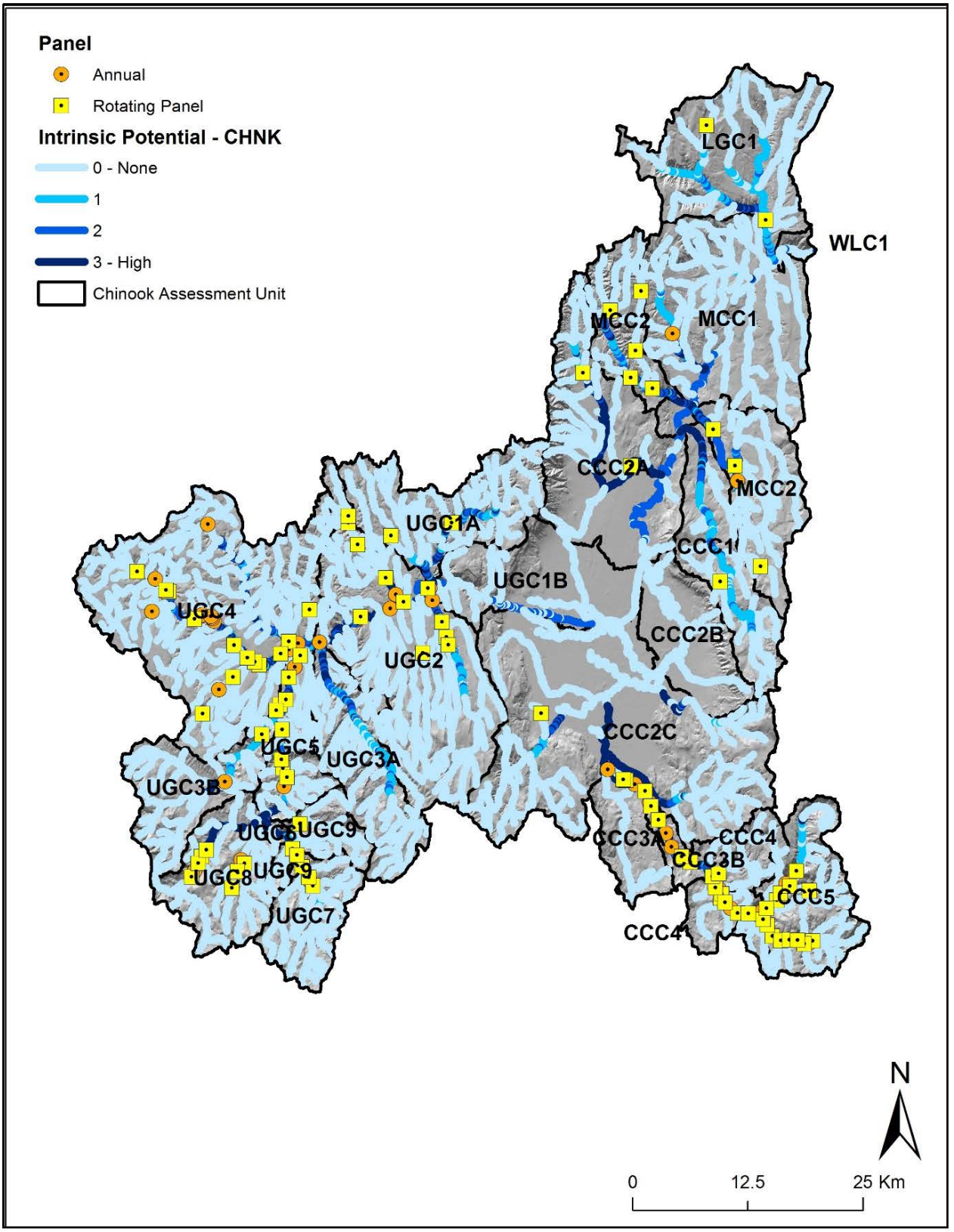
- References

  - Lumley T (2004). Analysis of complex survey samples. J Stat Software 9(1): 1-19.
  - Lumley T (2012). Survey: analysis of complex survey samples. R package version 3.28-2.
  - Nahorniak M, Larsen DP, Volk C, Jordan CE (2015) Using Inverse Probability Bootstrap Sampling to Eliminate Sample Induced Bias in Model Based Analysis of Unequal Probability Samples. PLoS ONE 10(6): e0131765. doi:10.1371/journal.pone.0131765

Summary by Chinook Assessment Unit

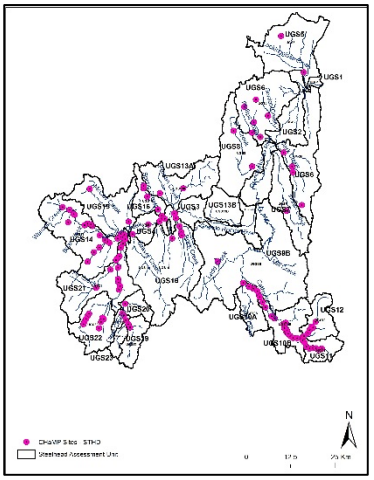
Upper Grande Ronde: Summary of CHaMP Metrics and Modeled Products

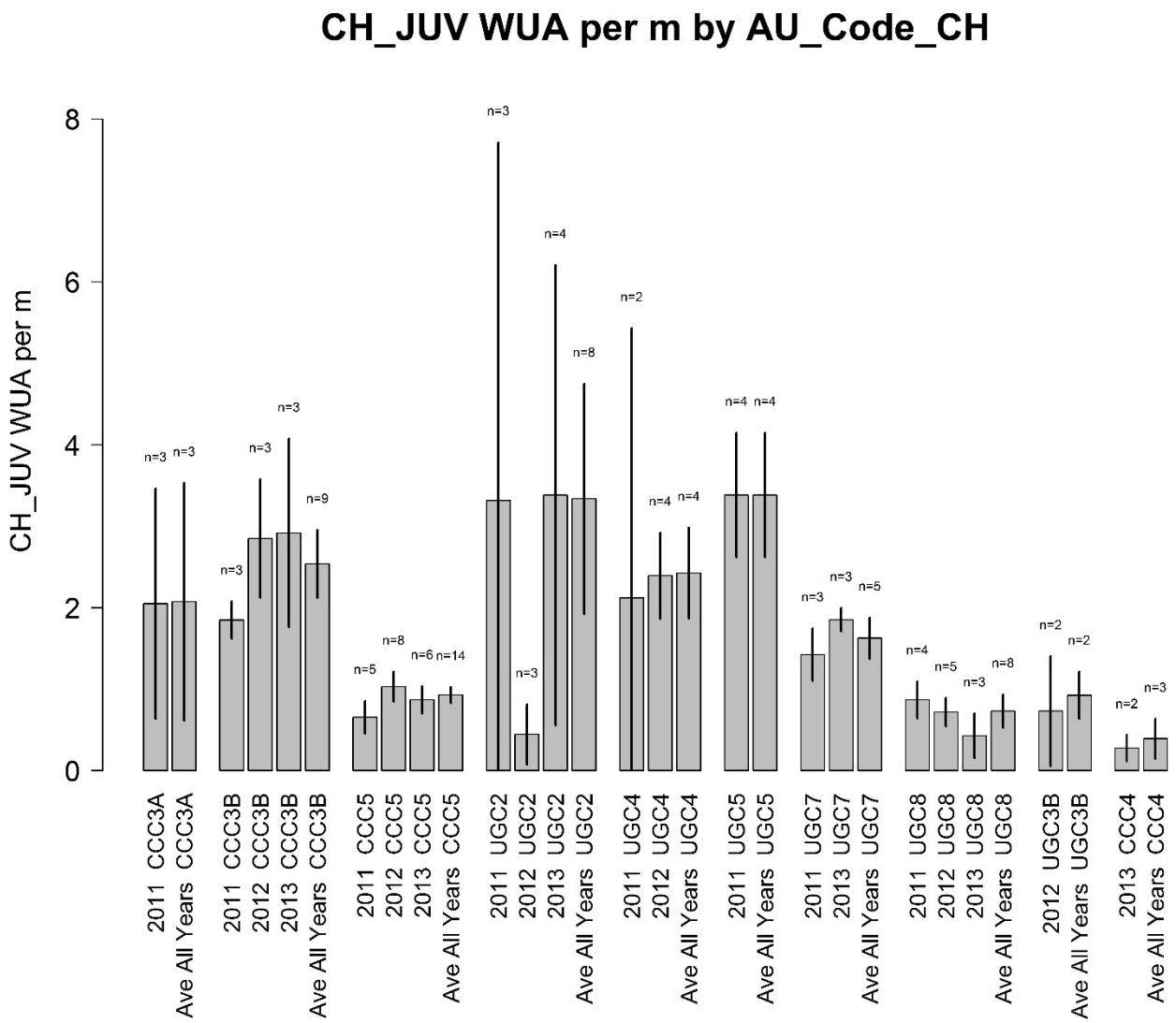
Chinook Intrinsic Potential



Chinook Juvenile Weighted Usable Area

- Source: Habitat Suitability Index (HSI) Model
- Definition: Suitable habitat area (m^2) per meter of stream length for Juvenile Chinook





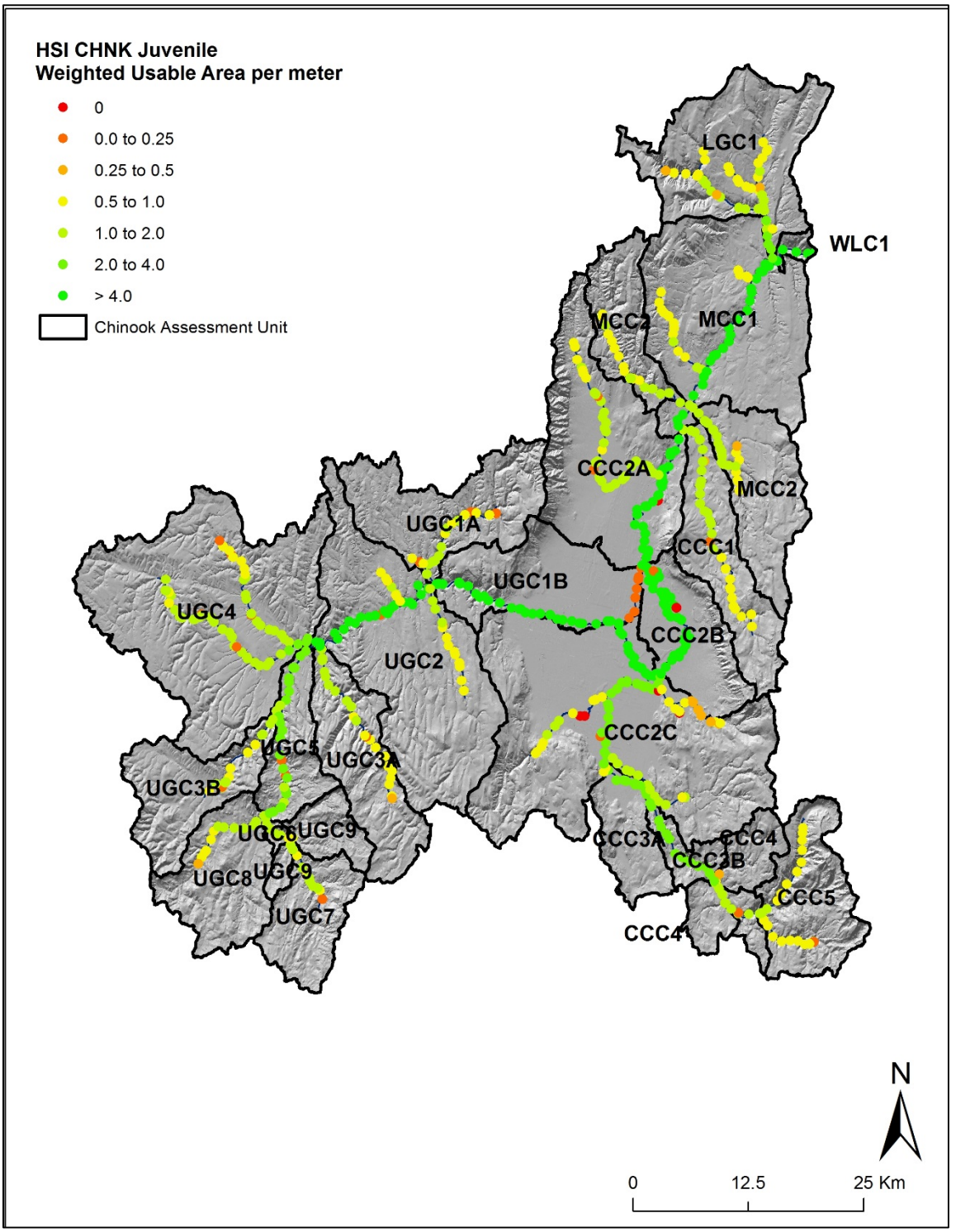
Chinook Juvenile Weighted Usable Area

- Source: Habitat Suitability Index (HSI) Model
- Definition: Suitable habitat area (m^2) per meter of stream length for Juvenile Chinook

Sub Population	Visit Year	N	Mean	St. Dev.
	2011	32	1.716	1.75
	2012	27	1.329	0.912
	2013	24	1.747	1.706
All.Sites	Average of All Years	61	1.894	1.713
	2011	3	2.05	1.021
CCC3A	Average of All Years	3	2.074	1.053
	2011	3	1.849	0.166
	2012	3	2.851	0.526
	2013	3	2.919	0.835
CCC3B	Average of All Years	9	2.54	0.757
	2011	5	0.656	0.242
	2012	8	1.033	0.3
	2013	6	0.871	0.228
CCC5	Average of All Years	14	0.93	0.222
	2011	3	3.318	2.944
	2012	3	0.446	0.266
	2013	4	3.385	3.003
UGC2	Average of All Years	8	3.338	3.064
	2011	2	2.122	1.693
	2012	4	2.394	0.549
UGC4	Average of All Years	4	2.426	0.581
	2011	4	3.385	0.791
UGC5	Average of All Years	4	3.385	0.791
	2011	3	1.426	0.232
	2013	3	1.853	0.105
UGC7	Average of All Years	5	1.627	0.304
	2011	4	0.869	0.237
	2012	5	0.719	0.214
	2013	3	0.429	0.209
UGC8	Average of All Years	8	0.733	0.381
	2012	2	0.732	0.343
UGC3B	Average of All Years	2	0.927	0.148
	2013	2	0.278	0.082
CCC4	Average of All Years	3	0.394	0.177

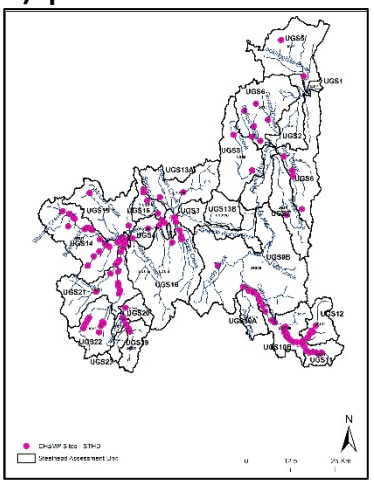
Chinook Juvenile Weighted Usable Area

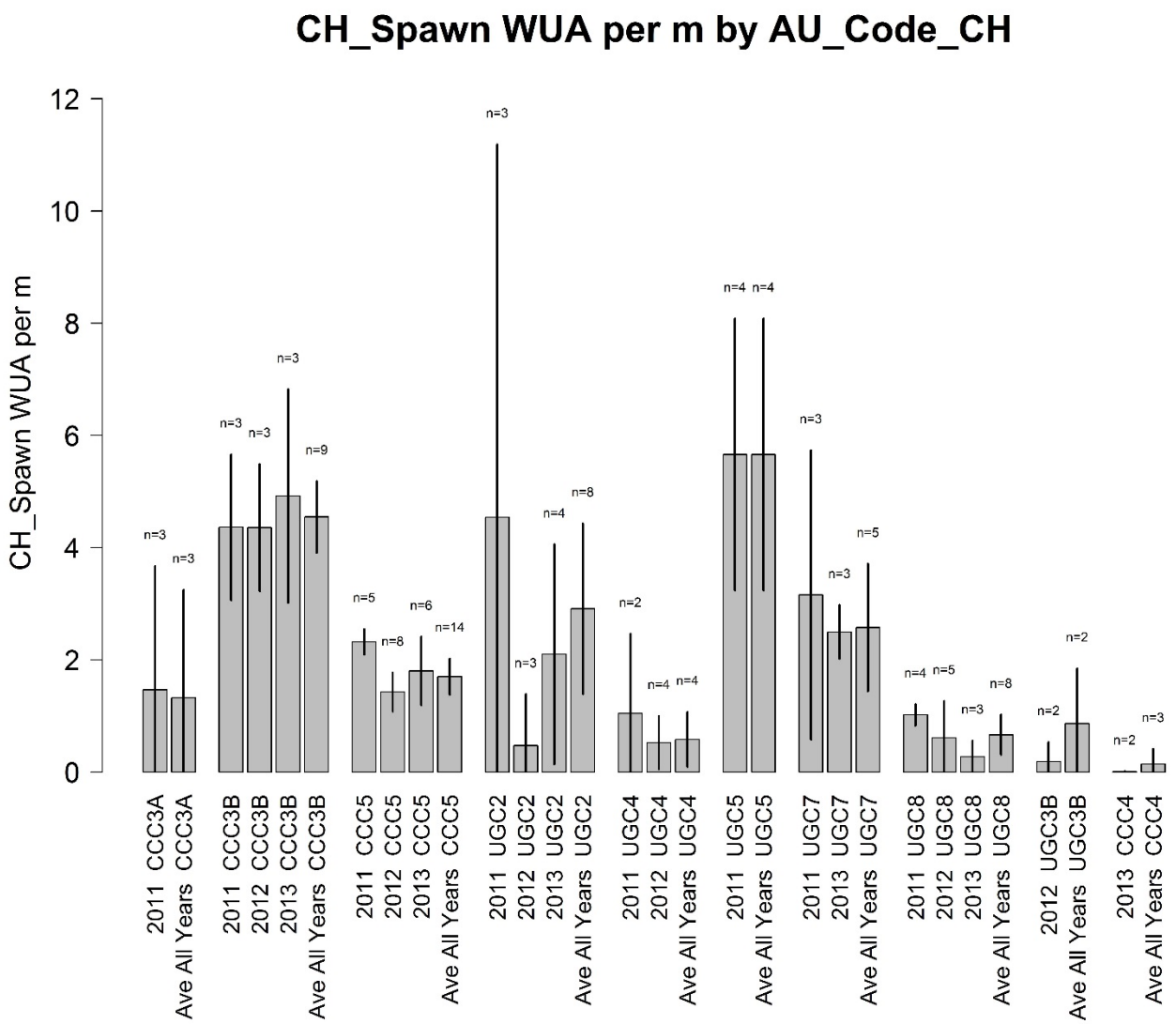
- Source: Habitat Suitability Index (HSI) Model
- Definition: Suitable habitat area (m^2) per meter of stream length for Juvenile Chinook



Chinook Spawner Weighted Usable Area

- Source: Habitat Suitability Index (HSI) Model
- Definition: Suitable Spawning habitat area (m^2) per meter of stream length for Chinook





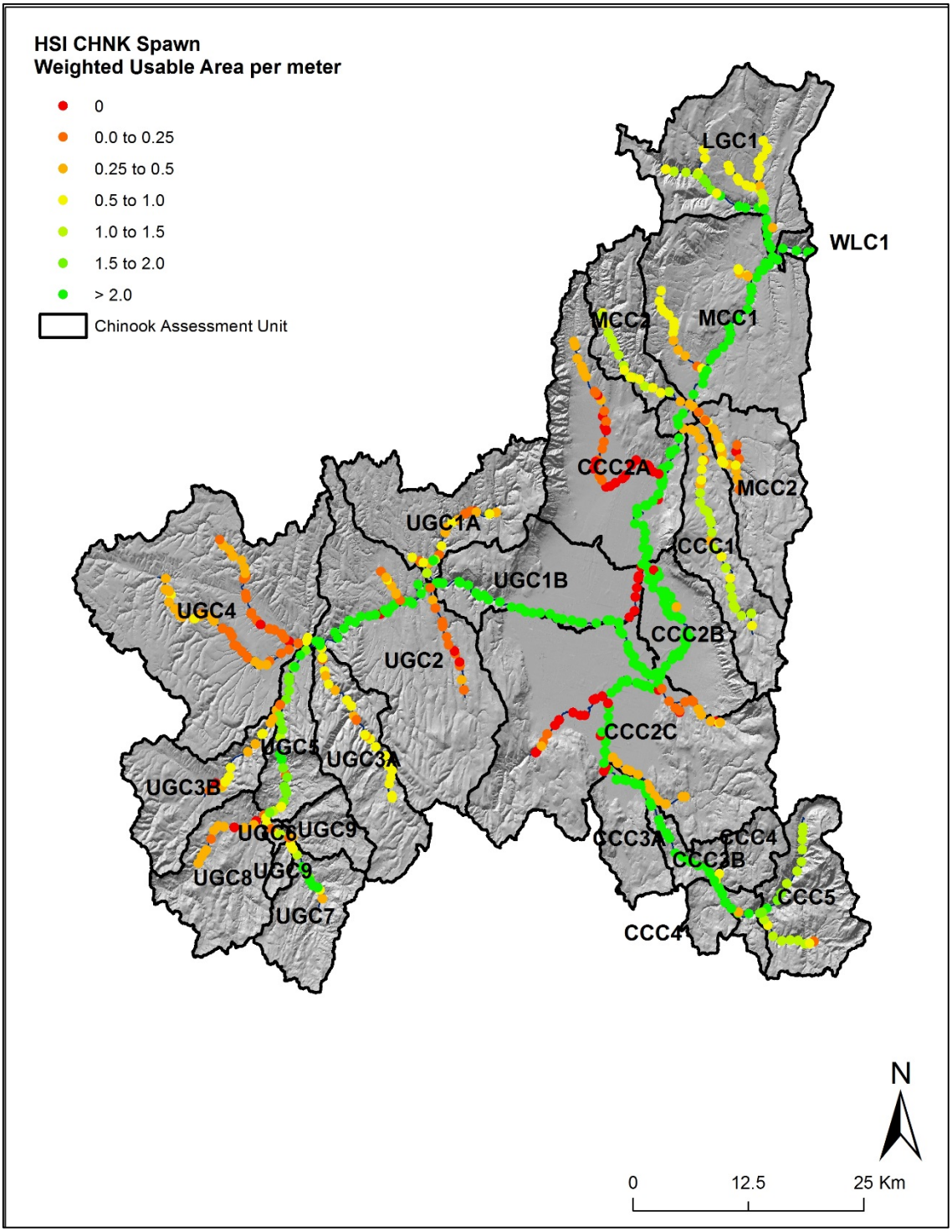
Chinook Spawner Weighted Usable Area

- Source: Habitat Suitability Index (HSI) Model
- Definition: Suitable Spawning habitat area (m^2) per meter of stream length for Chinook

Sub Population	Visit Year	N	Mean	St. Dev.
	2011	32	2.274	2.499
	2012	27	1.255	1.3
	2013	24	1.824	1.683
All.Sites	Average of All Years	61	2.241	2.317
	2011	3	1.467	1.589
CCC3A	Average of All Years	3	1.324	1.39
	2011	3	4.363	0.938
	2012	3	4.358	0.817
	2013	3	4.92	1.373
CCC3B	Average of All Years	9	4.547	1.102
	2011	5	2.323	0.321
	2012	8	1.428	0.603
	2013	6	1.802	0.795
CCC5	Average of All Years	14	1.701	0.733
	2011	3	4.543	4.159
	2012	3	0.475	0.658
	2013	4	2.101	2.118
UGC2	Average of All Years	8	2.911	3.191
	2011	2	1.045	0.727
	2012	4	0.527	0.488
UGC4	Average of All Years	4	0.583	0.503
	2011	4	5.661	2.557
UGC5	Average of All Years	4	5.661	2.557
	2011	3	3.159	1.859
	2013	3	2.5	0.346
UGC7	Average of All Years	5	2.578	1.343
	2011	4	1.02	0.254
	2012	5	0.616	0.693
	2013	3	0.274	0.198
UGC8	Average of All Years	8	0.665	0.568
	2012	2	0.185	0.18
UGC3B	Average of All Years	2	0.866	0.501
	2013	2	0.005	0.005
CCC4	Average of All Years	3	0.144	0.196

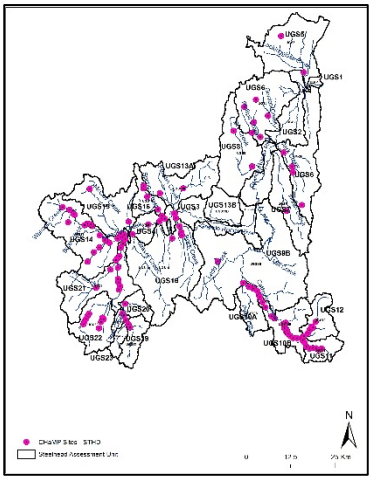
Chinook Spawner Weighted Usable Area

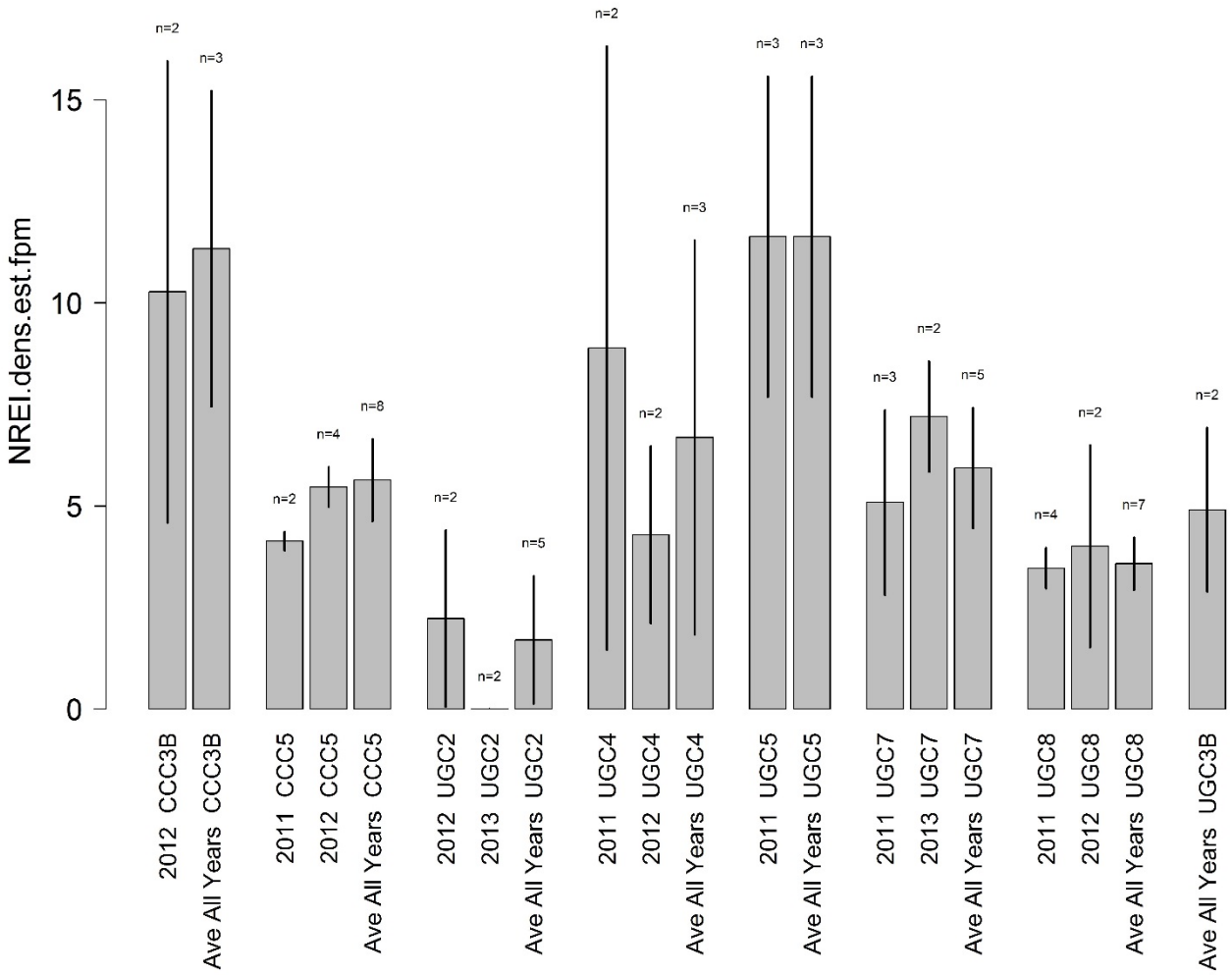
- Source: Habitat Suitability Index (HSI) Model
- Definition: Suitable Spawning habitat area (m^2) per meter of stream length for Chinook



Juvenile Salmonid Capacity

- Source: Net Rate of Energy Intake (NREI) Model
- Definition: Carrying capacity (fish) per meter of stream length





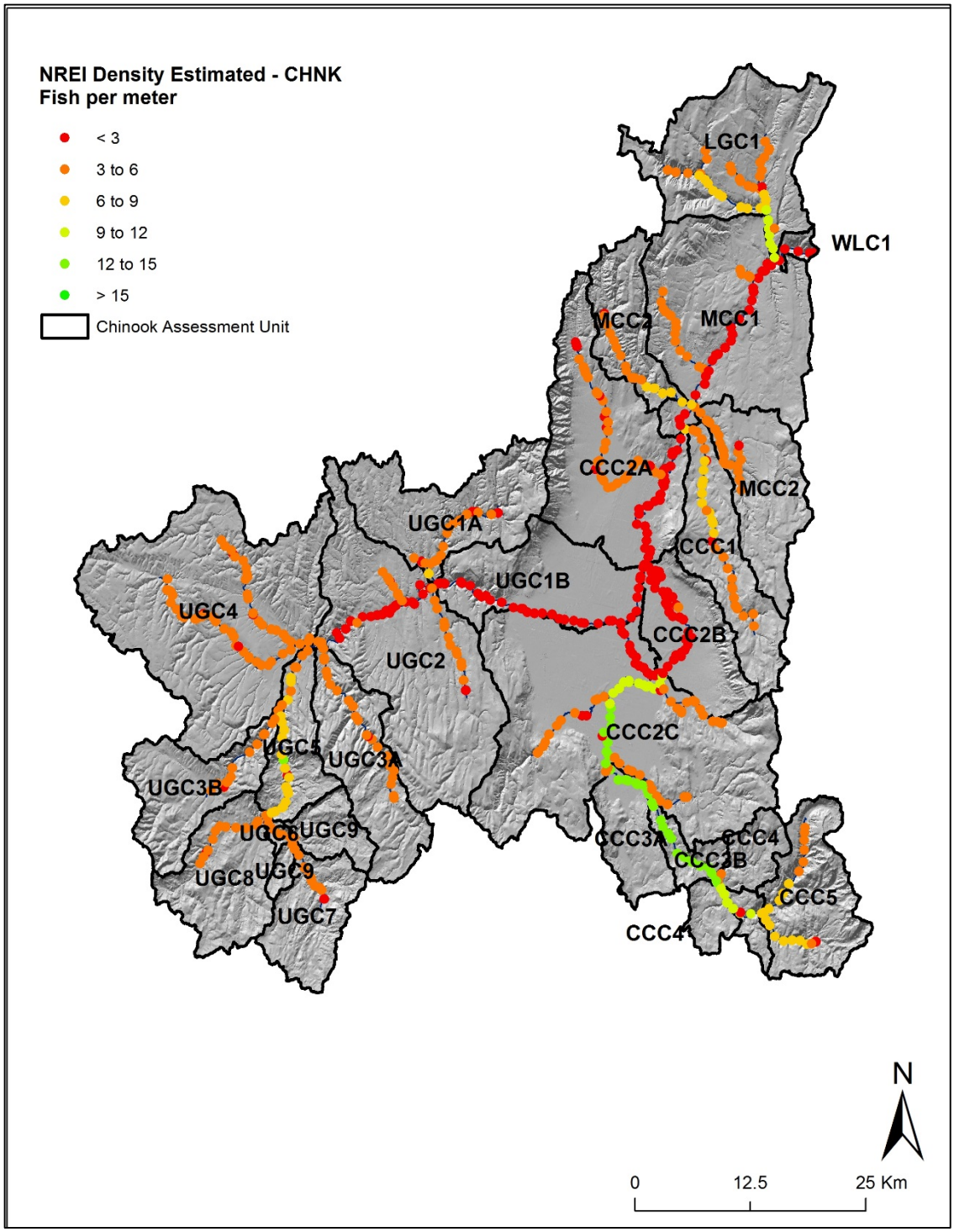
Juvenile Salmonid Capacity

- Source: Net Rate of Energy Intake (NREI) Model
- Definition: Carrying capacity (fish) per meter of stream length

Sub Population	Visit Year	N	Mean	St. Dev.
	2011	16	6.471	3.935
	2012	13	4.783	2.529
	2013	7	5.824	4.479
All.Sites	Average of All Years	37	5.654	3.539
	2012	2	10.272	2.899
CCC3B	Average of All Years	3	11.335	2.804
	2011	2	4.135	0.12
	2012	4	5.466	0.527
CCC5	Average of All Years	8	5.637	1.522
	2012	2	2.231	1.11
	2013	2	0	0
UGC2	Average of All Years	5	1.704	1.888
	2011	2	8.892	4.292
	2012	2	4.295	1.112
UGC4	Average of All Years	3	6.687	3.502
	2011	3	11.631	2.845
UGC5	Average of All Years	3	11.631	2.845
	2011	3	5.09	1.642
	2013	2	7.203	0.694
UGC7	Average of All Years	5	5.935	1.698
	2011	4	3.47	0.557
	2012	2	4.01	1.269
UGC8	Average of All Years	7	3.58	1.003
UGC3B	Average of All Years	2	4.909	1.03

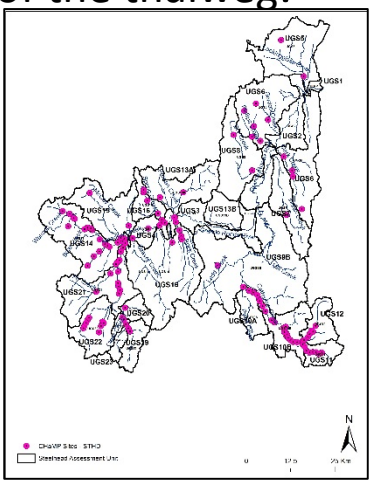
Juvenile Salmonid Capacity

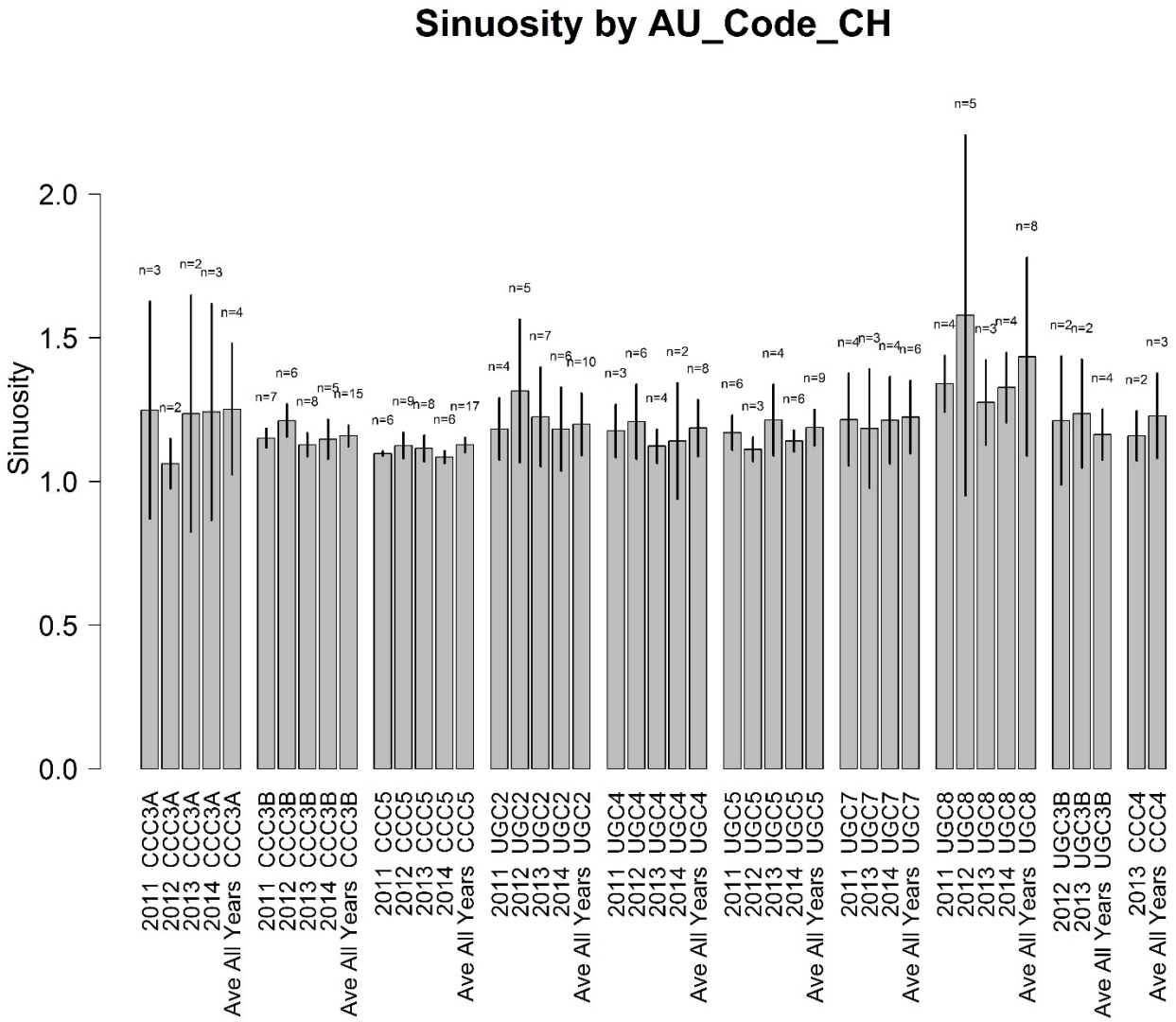
- Source: Net Rate of Energy Intake (NREI) Model
- Definition: Carrying capacity (fish) per meter of stream length



Sinuosity

- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Ratio of the thalweg length to the straight line distance between the start and end points of the thalweg.





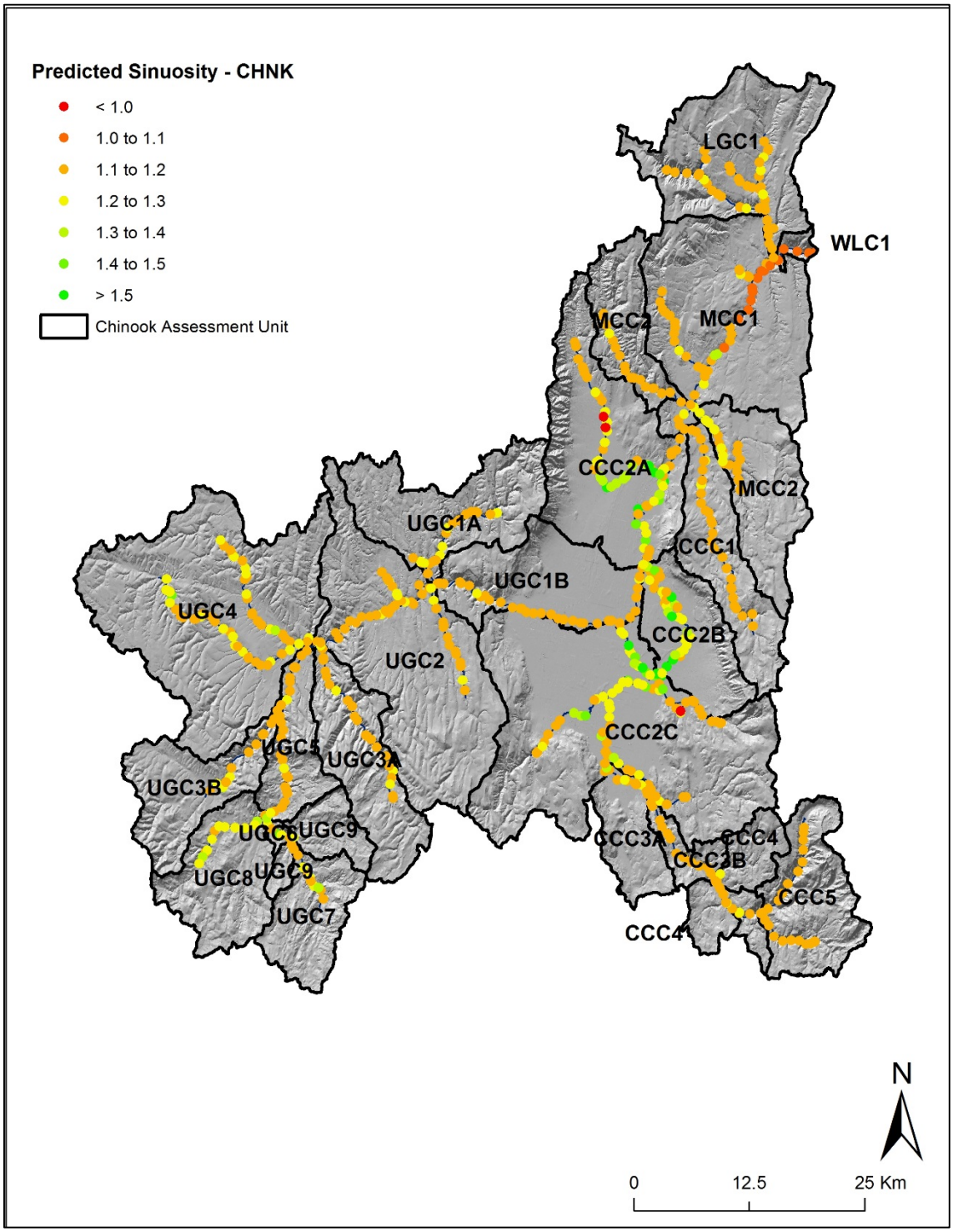
Sinuosity

- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Ratio of the thalweg length to the straight line distance between the start and end points of the thalweg.

Sub Population	Visit Year	N	Mean	St. Dev.
	2011	43	1.165	0.133
	2012	39	1.251	0.35
	2013	43	1.183	0.152
	2014	39	1.194	0.171
All.Sites	Average of All Years	85	1.214	0.237
	2011	3	1.248	0.273
	2012	2	1.062	0.044
	2013	2	1.236	0.21
	2014	3	1.242	0.271
CCC3A	Average of All Years	4	1.252	0.237
	2011	7	1.151	0.062
	2012	6	1.212	0.076
	2013	8	1.128	0.061
	2014	5	1.147	0.083
CCC3B	Average of All Years	15	1.159	0.084
	2011	6	1.097	0.015
	2012	9	1.125	0.072
	2013	8	1.115	0.069
	2014	6	1.085	0.027
CCC5	Average of All Years	17	1.127	0.068
	2011	4	1.183	0.175
	2012	5	1.315	0.279
	2013	7	1.225	0.25
	2014	6	1.182	0.224
UGC2	Average of All Years	10	1.199	0.2
	2011	3	1.176	0.067
	2012	6	1.208	0.169
	2013	4	1.123	0.061
	2014	2	1.141	0.103
UGC4	Average of All Years	8	1.186	0.153
	2011	6	1.17	0.082
	2012	3	1.112	0.03
	2013	4	1.214	0.127
	2014	6	1.141	0.056
UGC5	Average of All Years	9	1.188	0.098
	2011	4	1.215	0.173
	2013	3	1.184	0.149
	2014	4	1.213	0.163
UGC7	Average of All Years	6	1.224	0.162
	2011	4	1.34	0.103
	2012	5	1.578	0.675
	2013	3	1.275	0.107
	2014	4	1.327	0.13
UGC8	Average of All Years	8	1.434	0.522
	2012	2	1.212	0.114
	2013	2	1.236	0.096
UGC3B	Average of All Years	4	1.163	0.096
	2013	2	1.159	0.044
CCC4	Average of All Years	3	1.229	0.106

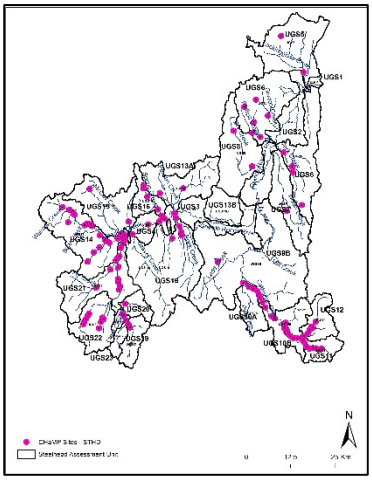
Sinuosity

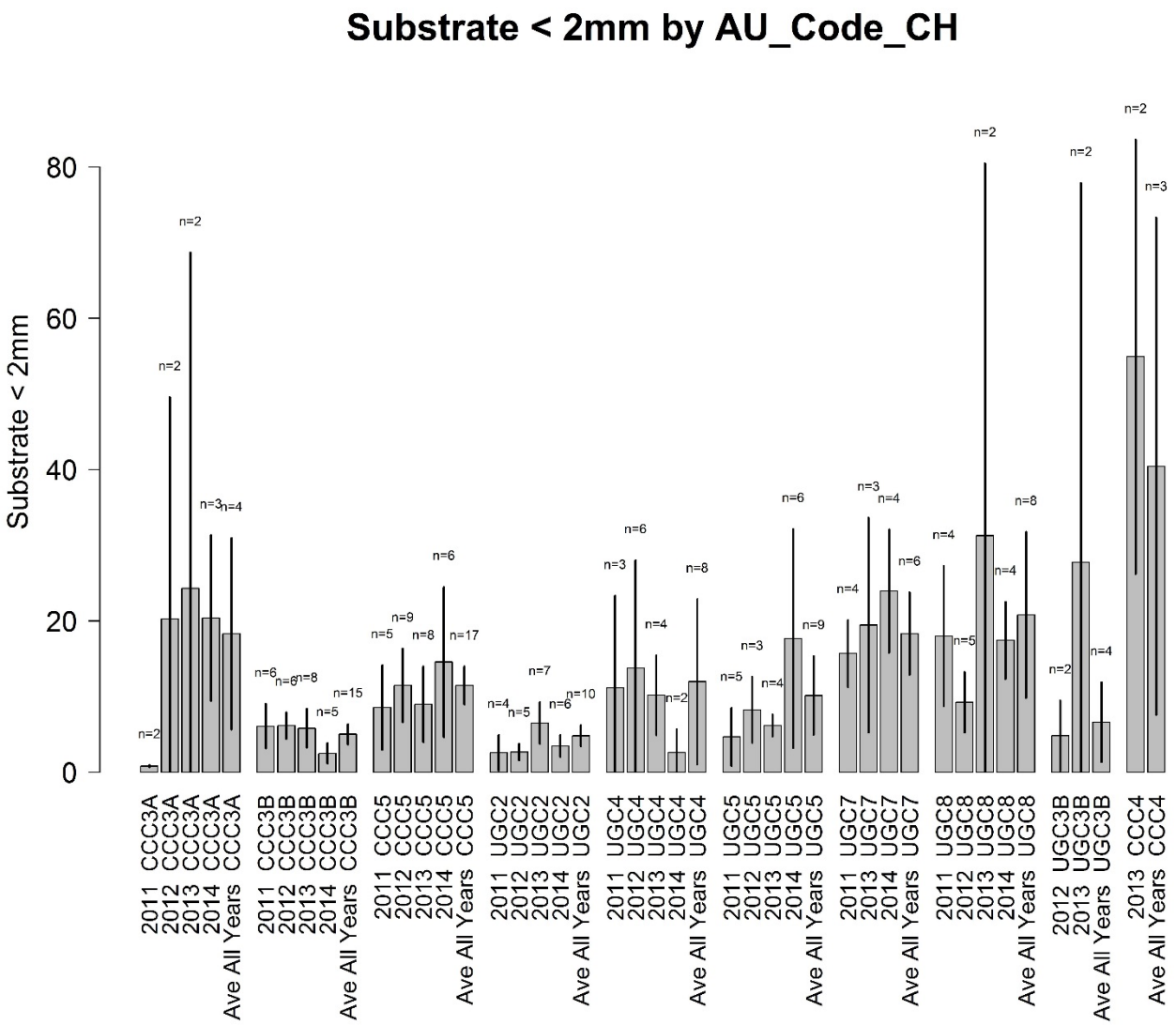
- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Ratio of the thalweg length to the straight line distance between the start and end points of the thalweg.



Substrate < 2 mm

- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Average percentage of pool tail substrates comprised of fine sediment <2 mm





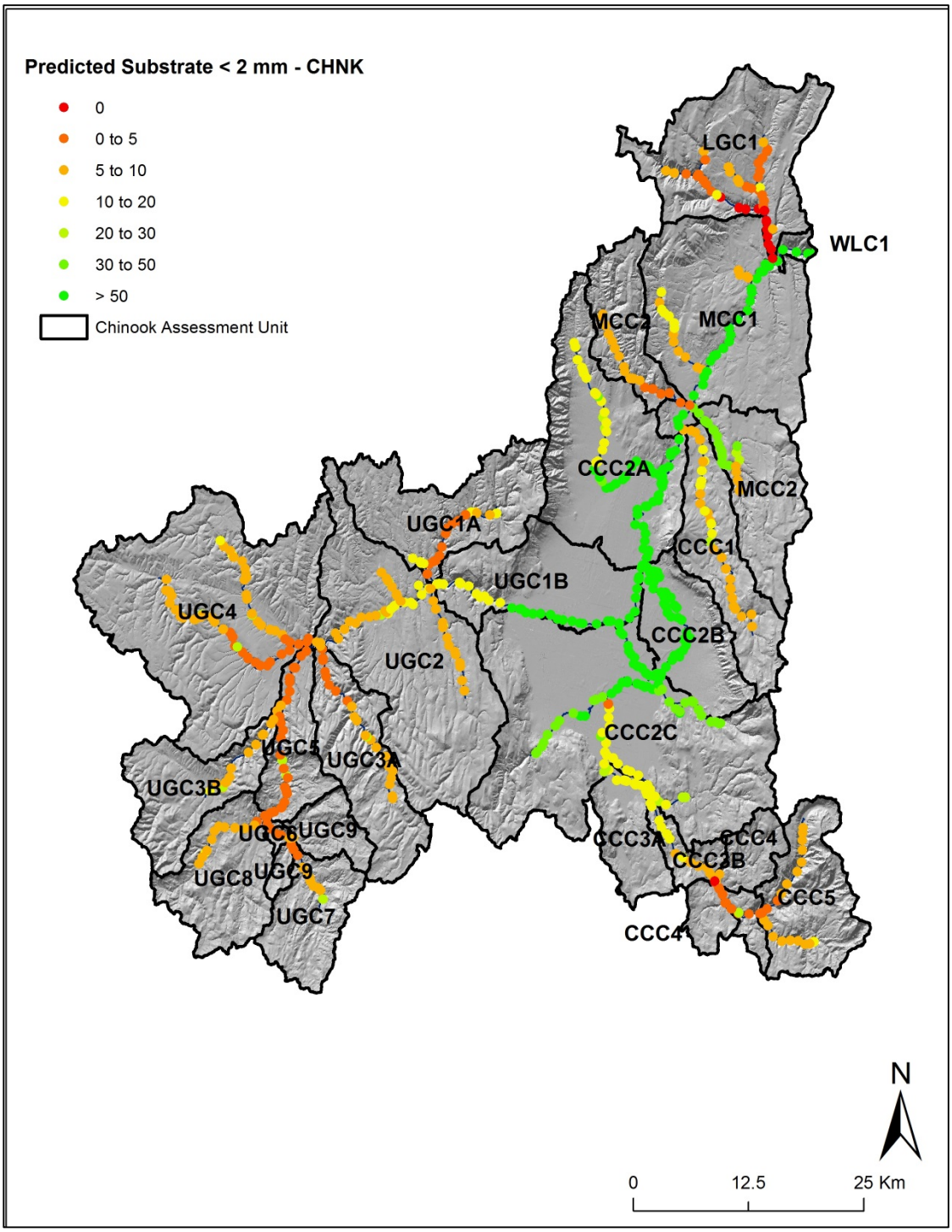
Substrate < 2 mm

- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Average percentage of pool tail substrates comprised of fine sediment <2 mm

Sub Population	Visit Year	N	Mean	St. Dev.
	2011	38	8.609	8.484
	2012	39	10.226	11.637
	2013	42	13.363	15.955
	2014	40	11.833	12.42
All.Sites	Average of All Years	85	11.961	13.044
	2011	2	0.819	0.069
	2012	2	20.278	14.944
	2013	2	24.31	22.643
	2014	3	20.393	7.89
CCC3A	Average of All Years	4	18.309	13.554
	2011	6	6.093	3.691
	2012	6	6.168	2.479
	2013	8	5.815	3.741
	2014	5	2.512	1.661
CCC3B	Average of All Years	15	5.032	2.826
	2011	5	8.554	7.789
	2012	9	11.487	8.319
	2013	8	8.987	8.64
	2014	6	14.583	14.808
CCC5	Average of All Years	17	11.46	8.14
	2011	4	2.577	4.015
	2012	5	2.686	1.322
	2013	7	6.504	3.822
	2014	6	3.463	1.897
UGC2	Average of All Years	10	4.815	2.358
	2011	3	11.142	8.896
	2012	6	13.765	20.208
	2013	4	10.164	5.562
	2014	2	2.633	1.567
UGC4	Average of All Years	8	11.979	17.674
	2011	5	4.681	4.398
	2012	3	8.265	3.137
	2013	4	6.183	1.579
	2014	6	17.68	18.478
UGC5	Average of All Years	9	10.149	8.742
	2011	4	15.702	4.54
	2013	3	19.463	10.237
	2014	4	23.942	8.557
UGC7	Average of All Years	6	18.334	7.515
	2011	4	18.007	12.731
	2012	5	9.246	5.261
	2013	2	31.292	25.3
	2014	4	17.429	5.392
UGC8	Average of All Years	8	20.804	17.346
	2012	2	4.832	2.368
	2013	2	27.778	25.556
UGC3B	Average of All Years	4	6.628	5.593
	2013	2	54.921	14.635
CCC4	Average of All Years	3	40.447	23.701

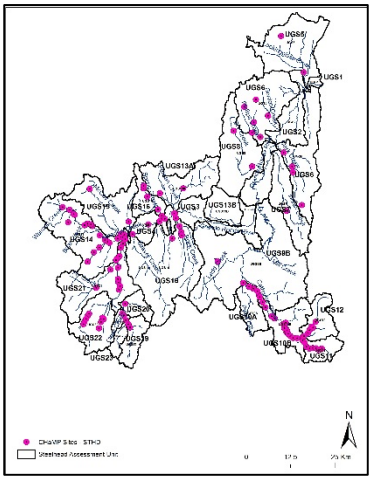
Substrate < 2 mm

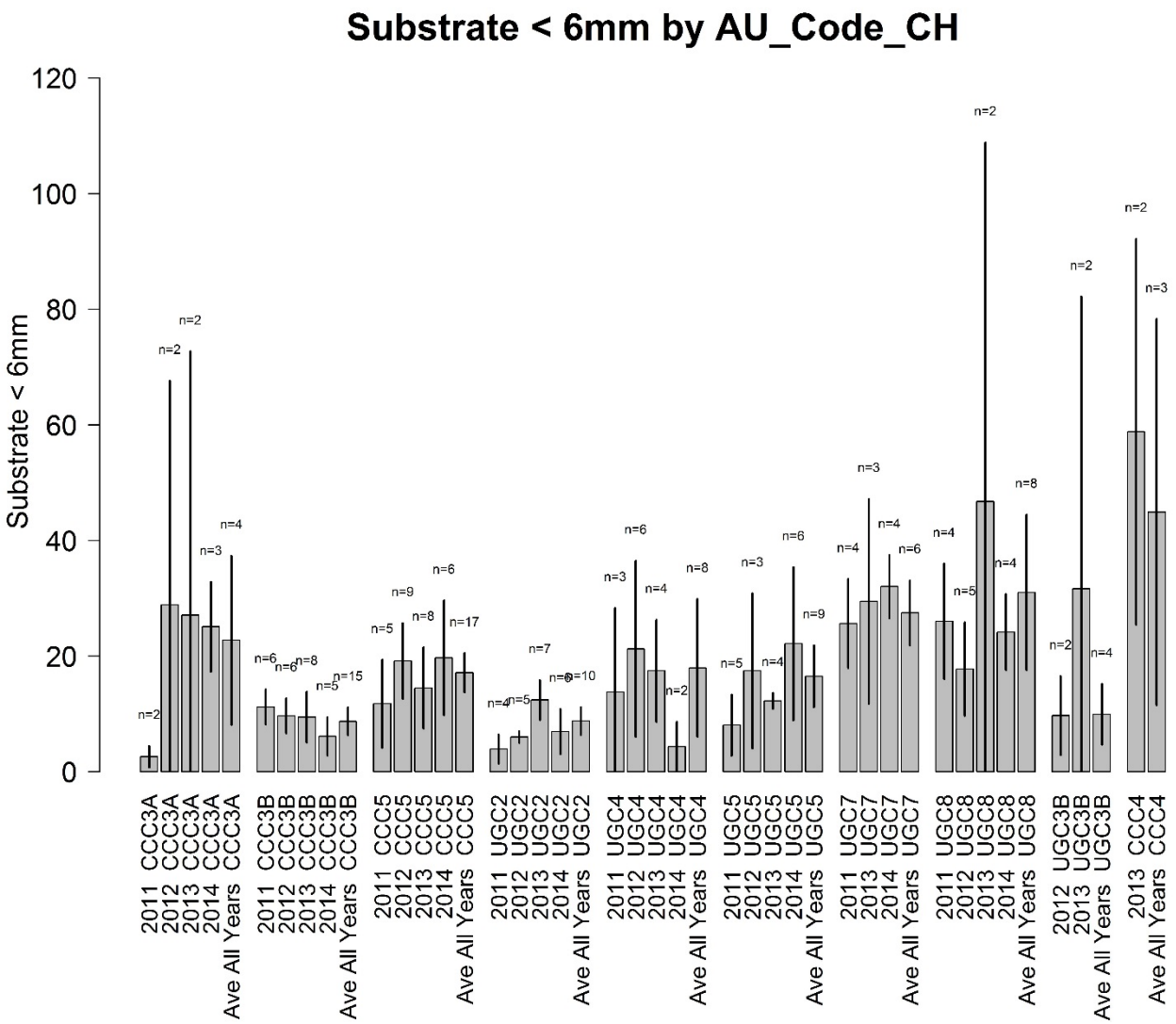
- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Average percentage of pool tail substrates comprised of fine sediment <2 mm



Substrate < 6 mm

- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Average percentage of pool tail substrates comprised of fine sediment <6 mm





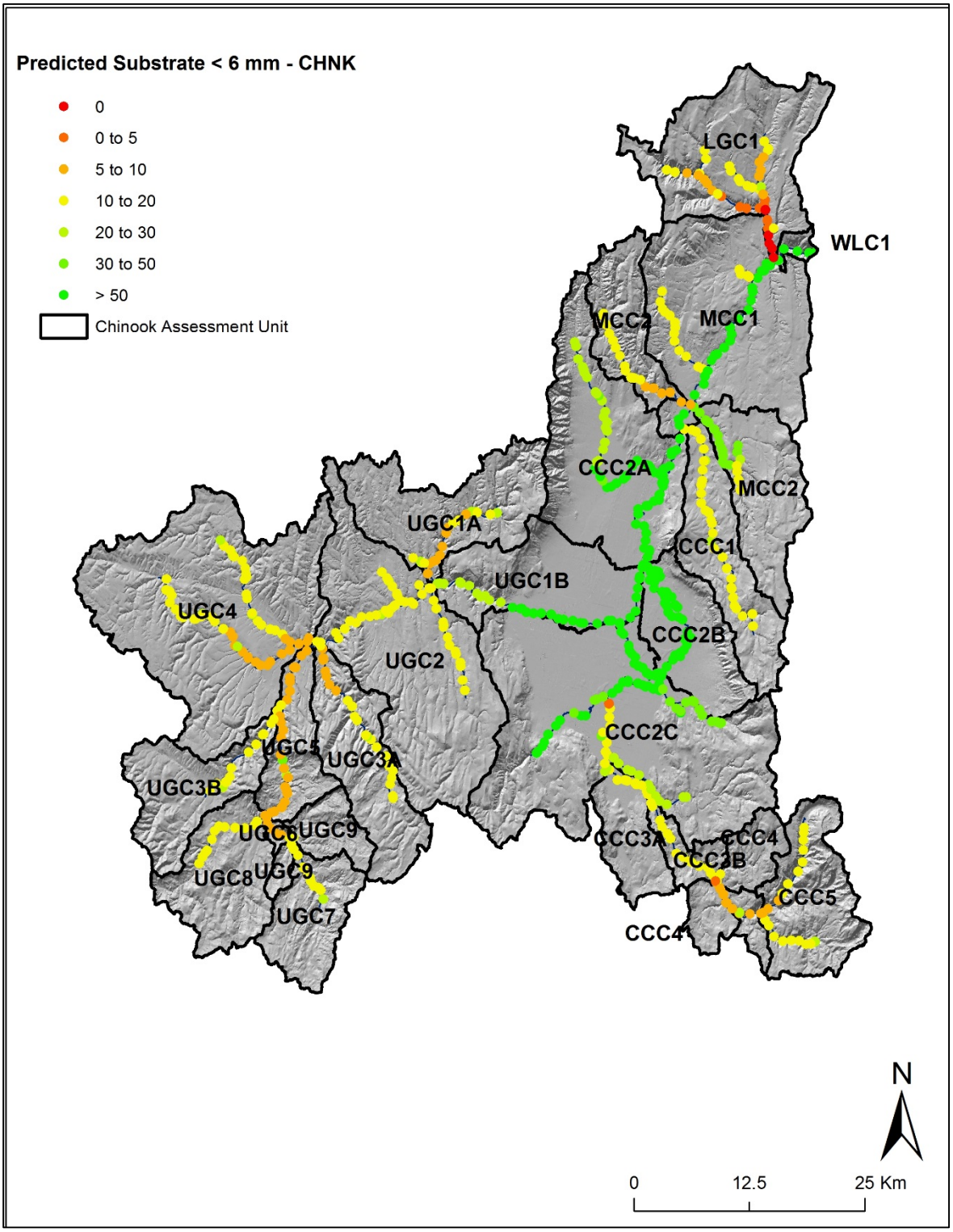
Substrate < 6 mm

- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Average percentage of pool tail substrates comprised of fine sediment <6 mm

Sub Population	Visit Year	N	Mean	St. Dev.
	2011	38	12.431	10.843
	2012	39	17.072	14.474
	2013	42	19.793	18.301
	2014	40	16.466	13.122
All.Sites	Average of All Years	85	17.884	15.504
	2011	2	2.611	0.944
	2012	2	28.917	19.75
	2013	2	27.107	23.274
	2014	3	25.088	5.594
CCC3A	Average of All Years	4	22.738	15.631
	2011	6	11.189	3.824
	2012	6	9.7	4.402
	2013	8	9.459	6.428
	2014	5	6.14	3.885
CCC3B	Average of All Years	15	8.703	5.073
	2011	5	11.757	10.43
	2012	9	19.174	11.168
	2013	8	14.503	11.508
	2014	6	19.713	14.625
CCC5	Average of All Years	17	17.147	10.453
	2011	4	3.919	4.013
	2012	5	6.015	1.229
	2013	7	12.416	4.853
	2014	6	6.944	5.13
UGC2	Average of All Years	10	8.787	3.973
	2011	3	13.753	10.656
	2012	6	21.255	21.61
	2013	4	17.464	9.397
	2014	2	4.333	2.2
UGC4	Average of All Years	8	17.97	18.884
	2011	5	8.08	6.123
	2012	3	17.459	9.669
	2013	4	12.273	1.497
	2014	6	22.157	17.149
UGC5	Average of All Years	9	16.518	10.049
	2011	4	25.644	7.907
	2013	3	29.489	12.771
	2014	4	32.05	5.753
UGC7	Average of All Years	6	27.488	7.65
	2011	4	26.029	13.85
	2012	5	17.768	10.831
	2013	2	46.738	31.975
	2014	4	24.155	6.913
UGC8	Average of All Years	8	31.032	22.704
	2012	2	9.719	3.481
	2013	2	31.667	25.778
UGC3B	Average of All Years	4	9.947	5.594
	2013	2	58.831	17.021
CCC4	Average of All Years	3	44.92	24.086

Substrate < 6 mm

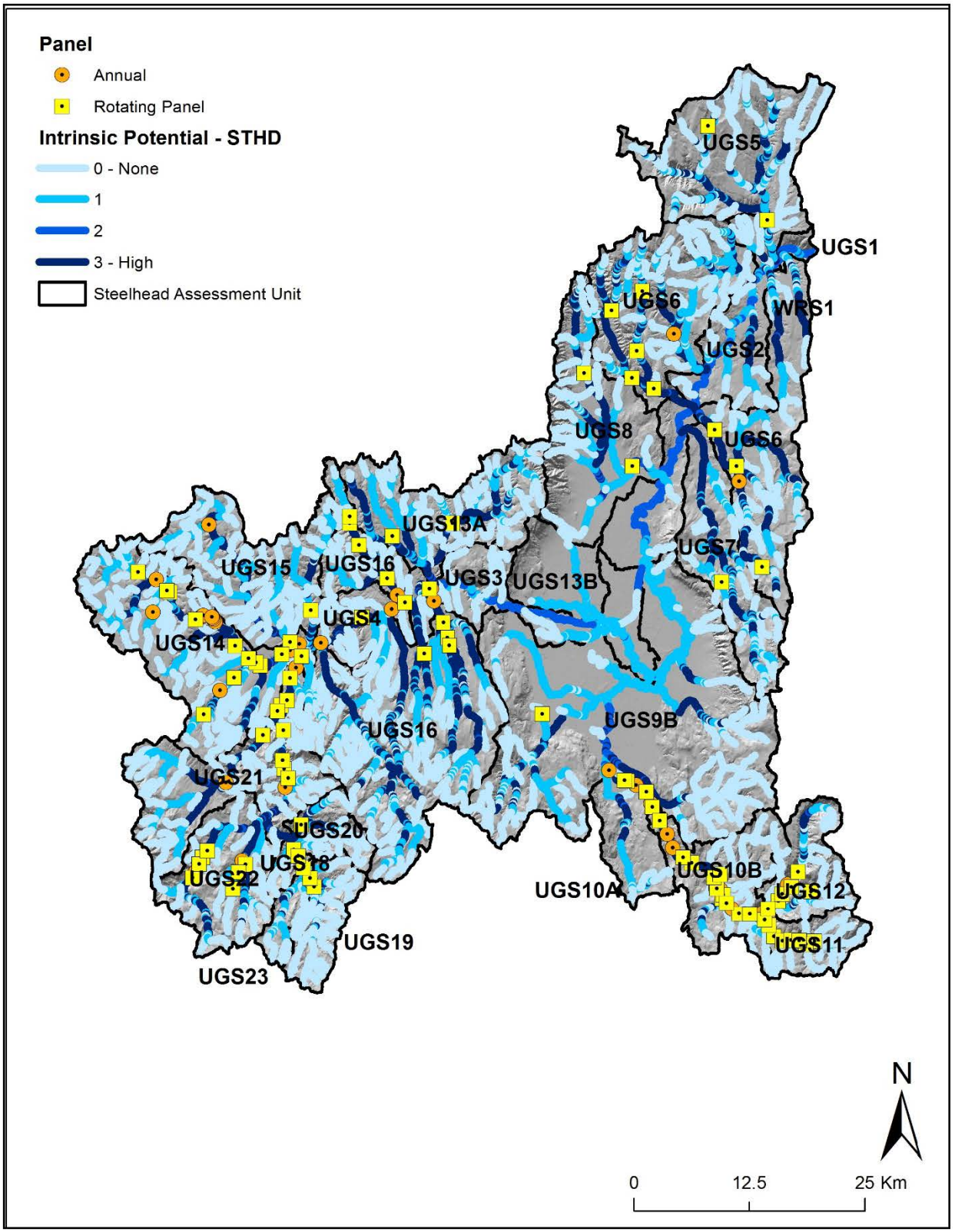
- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Average percentage of pool tail substrates comprised of fine sediment <6 mm



Summary by Steelhead Assessment Unit

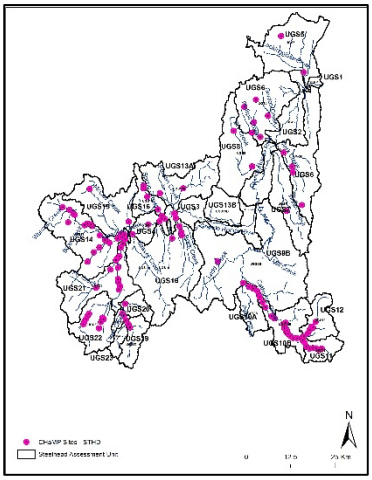
Upper Grande Ronde: Summary of CHaMP Metrics and Modeled Products

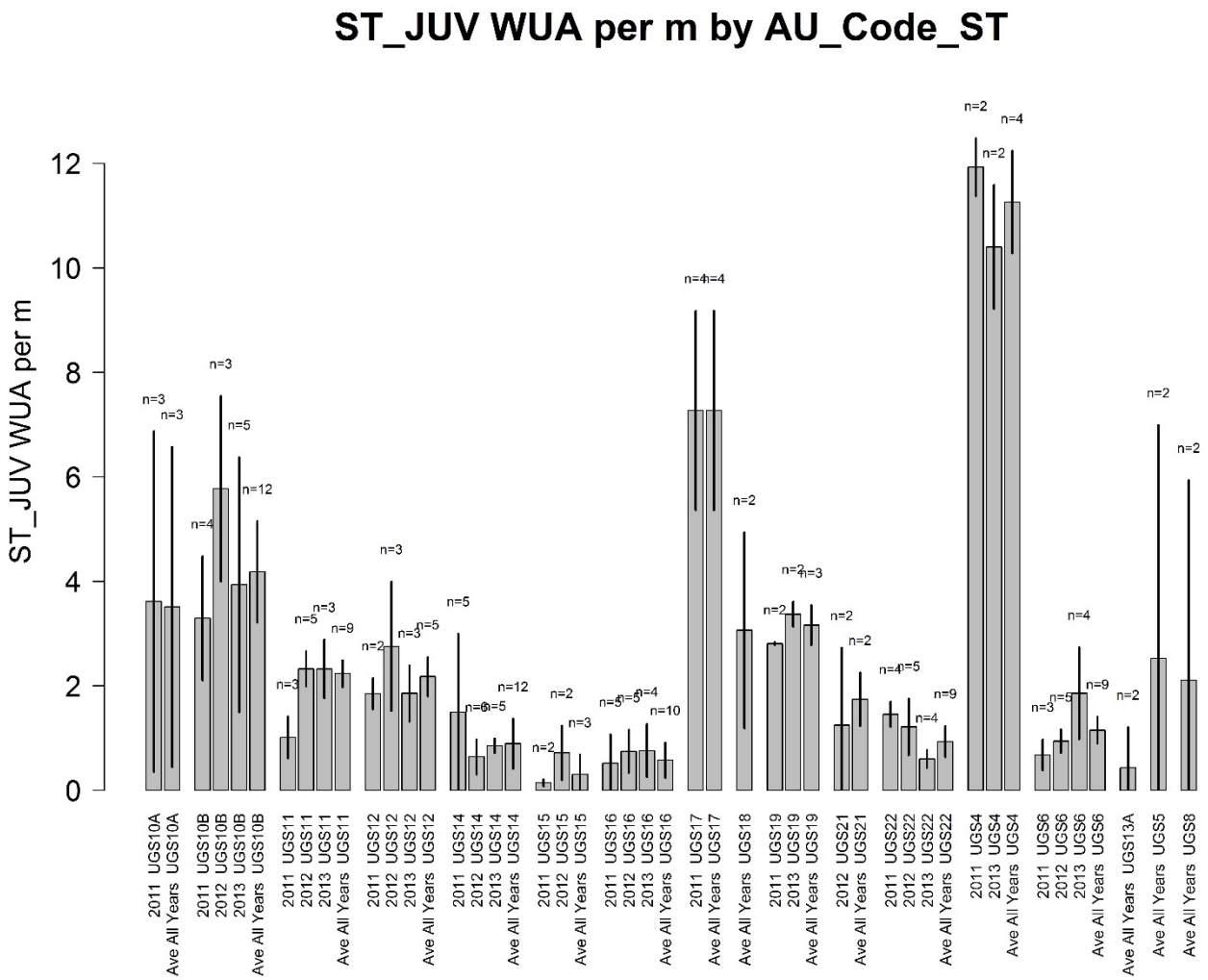
Steelhead Intrinsic Potential



Steelhead Juvenile Weighted Usable Area

- Source: Habitat Suitability Index (HSI) Model
- Definition: Suitable habitat area (m^2) per meter of stream length for Juvenile Steelhead





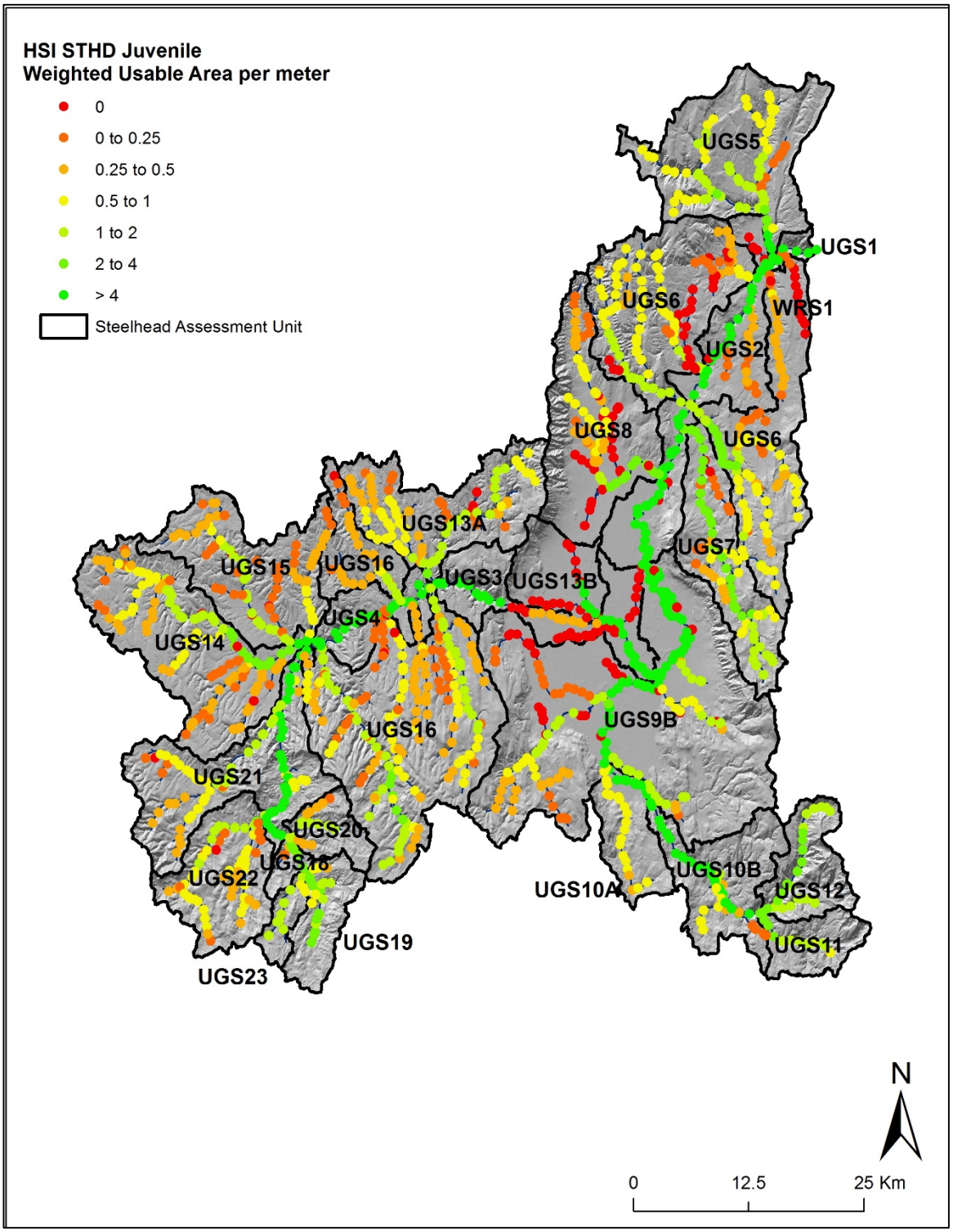
Steelhead Juvenile Weighted Usable Area

- Source: Habitat Suitability Index (HSI) Model
- Definition: Suitable habitat area (m^2) per meter of stream length for Juvenile Steelhead

Sub Population	Visit Year	N	Mean	St. Dev.
All.Sites	2011	45	1.676	2.519
	2012	40	1.05	1.072
	2013	38	1.664	1.951
	Average of All Years	96	1.508	2.122
UGS10A	2011	3	3.614	2.351
	Average of All Years	3	3.512	2.209
UGS10B	2011	4	3.294	1.229
	2012	3	5.773	1.28
	2013	5	3.935	2.833
	Average of All Years	12	4.181	2.276
UGS11	2011	3	1.014	0.373
	2012	5	2.325	0.404
	2013	3	2.323	0.404
	Average of All Years	9	2.233	0.467
UGS12	2011	2	1.848	0.234
	2012	3	2.756	0.891
	2013	3	1.855	0.387
	Average of All Years	5	2.177	0.484
UGS14	2011	5	1.5	1.787
	2012	6	0.643	0.863
	2013	5	0.854	0.219
	Average of All Years	12	0.891	1.1
UGS15	2011	2	0.143	0.033
	2012	2	0.718	0.347
	Average of All Years	3	0.309	0.385
UGS16	2011	5	0.519	0.815
	2012	5	0.746	0.487
	2013	4	0.761	0.529
	Average of All Years	10	0.577	0.678
UGS17	2011	4	7.271	1.956
	Average of All Years	4	7.271	1.956
UGS18	Average of All Years	2	3.064	0.957
UGS19	2011	2	2.808	0.015
	2013	2	3.372	0.123
	Average of All Years	3	3.162	0.274
UGS21	2012	2	1.248	0.755
	Average of All Years	2	1.743	0.26
UGS22	2011	4	1.455	0.282
	2012	5	1.214	0.608
	2013	4	0.601	0.215
	Average of All Years	9	0.931	0.602
UGS4	2011	2	11.931	0.371
	2013	2	10.404	0.604
	Average of All Years	4	11.264	1.054
UGS6	2011	3	0.677	0.198
	2012	5	0.941	0.295
	2013	4	1.858	0.816
	Average of All Years	9	1.152	0.433
UGS13A	Average of All Years	2	0.431	0.461
UGS5	Average of All Years	2	2.524	2.367
UGS8	Average of All Years	2	2.105	1.962

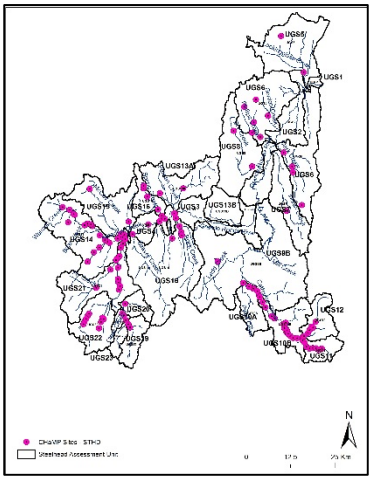
Steelhead Juvenile Weighted Usable Area

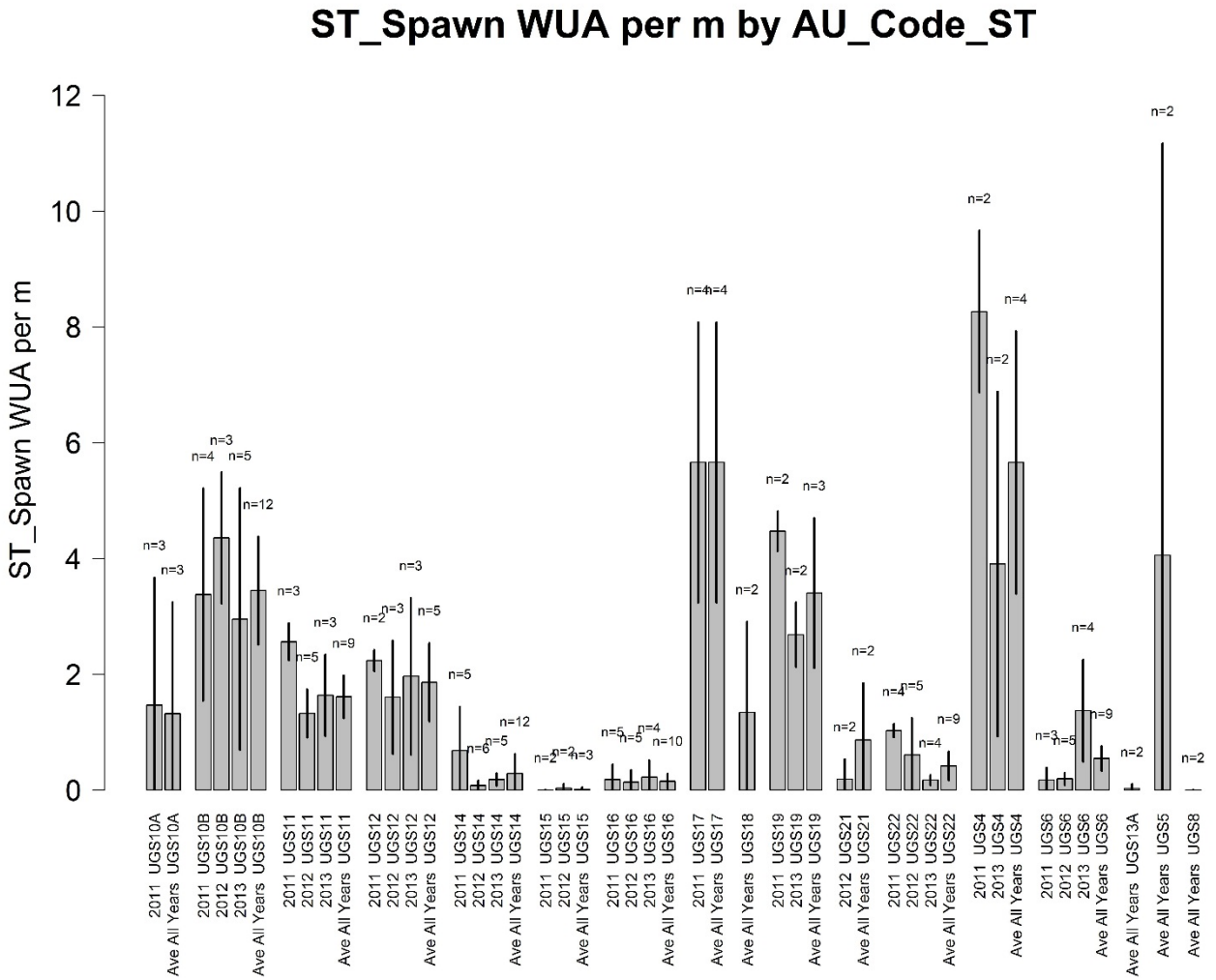
- Source: Habitat Suitability Index (HSI) Model
- Definition: Suitable habitat area (m^2) per meter of stream length for Juvenile Steelhead



Steelhead Spawner Weighted Usable Area

- Source: Habitat Suitability Index (HSI) Model
- Definition: Suitable Spawning habitat area (m^2) per meter of stream length for Steelhead





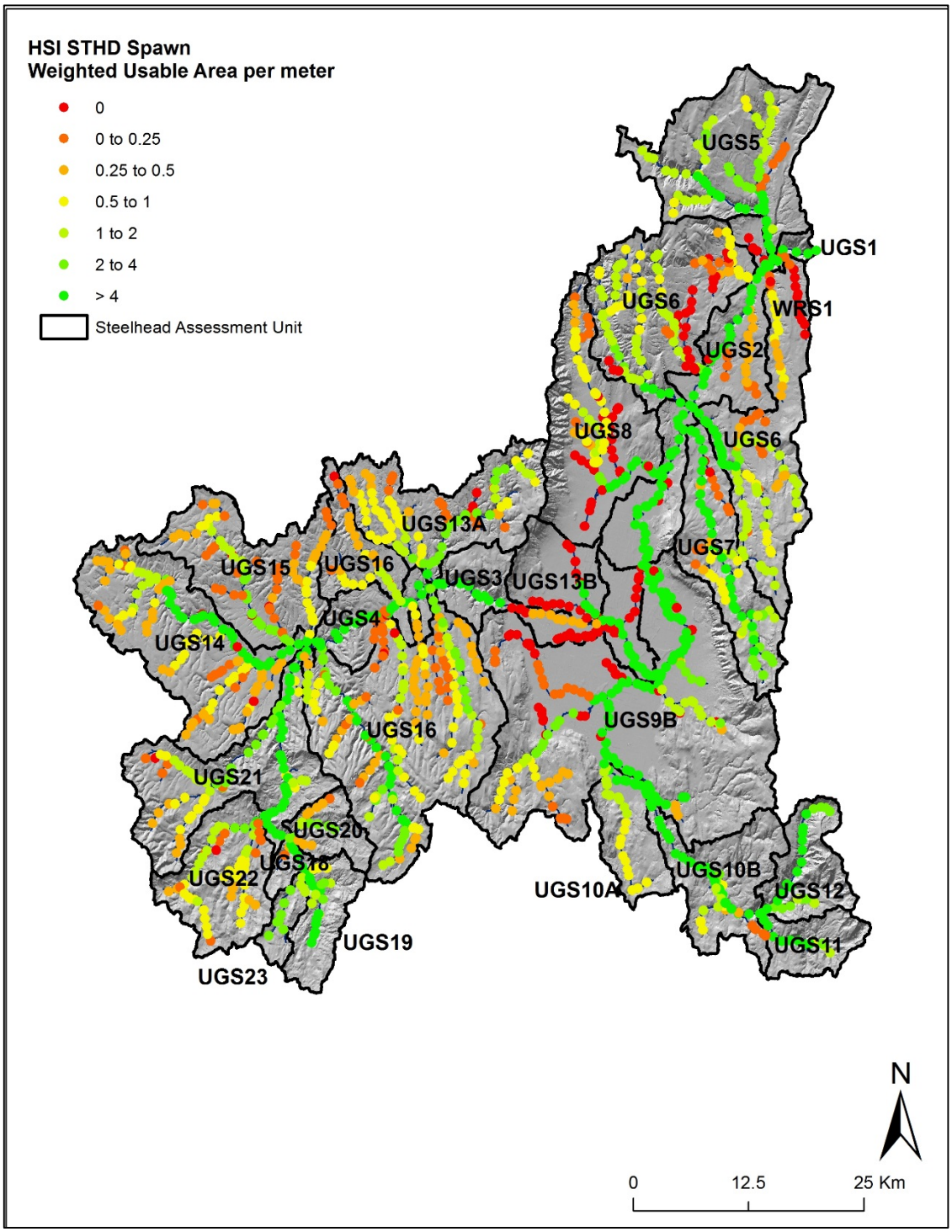
Steelhead Spawner Weighted Usable Area

- Source: Habitat Suitability Index (HSI) Model
- Definition: Suitable Spawning habitat area (m^2) per meter of stream length for Steelhead

Sub Population	Visit Year	N	Mean	St. Dev.
All.Sites	2011	45	1.186	1.95
	2012	40	0.342	0.756
	2013	38	1.12	1.922
	Average of All Years	96	0.884	1.815
UGS10A	2011	3	1.465	1.589
	Average of All Years	3	1.321	1.388
UGS10B	2011	4	3.377	1.891
	2012	3	4.356	0.816
	2013	5	2.953	2.631
	Average of All Years	12	3.445	2.134
UGS11	2011	3	2.562	0.331
	2012	5	1.322	0.505
	2013	3	1.637	0.508
	Average of All Years	9	1.61	0.589
UGS12	2011	2	2.236	0.143
	2012	3	1.603	0.704
	2013	3	1.965	0.976
	Average of All Years	5	1.861	0.917
UGS14	2011	5	0.681	1.008
	2012	6	0.078	0.229
	2013	5	0.182	0.112
	Average of All Years	12	0.286	0.742
UGS15	2011	2	0	0
	2012	2	0.031	0.05
	Average of All Years	3	0.014	0.04
UGS16	2011	5	0.182	0.389
	2012	5	0.137	0.357
	2013	4	0.223	0.303
	Average of All Years	10	0.152	0.303
UGS17	2011	4	5.66	2.557
	Average of All Years	4	5.66	2.557
UGS18	Average of All Years	2	1.338	0.8
UGS19	2011	2	4.47	0.176
	2013	2	2.68	0.285
	Average of All Years	3	3.403	0.934
UGS21	2012	2	0.184	0.179
	Average of All Years	2	0.865	0.502
UGS22	2011	4	1.026	0.198
	2012	5	0.606	0.688
	2013	4	0.171	0.116
	Average of All Years	9	0.418	0.487
UGS4	2011	2	8.262	0.939
	2013	2	3.905	1.519
	Average of All Years	4	5.657	2.299
UGS6	2011	3	0.172	0.205
	2012	5	0.194	0.134
	2013	4	1.369	0.872
	Average of All Years	9	0.546	0.388
UGS13A	Average of All Years	2	0.027	0.045
UGS5	Average of All Years	2	4.059	3.766
UGS8	Average of All Years	2	0	0

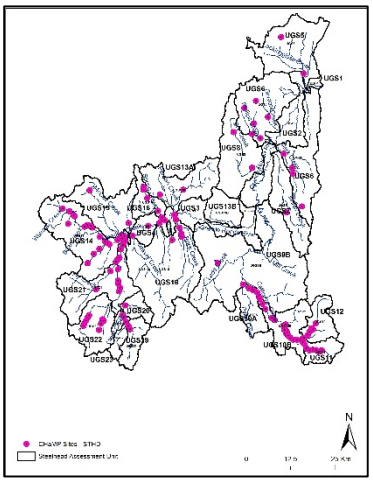
Steelhead Spawner Weighted Usable Area

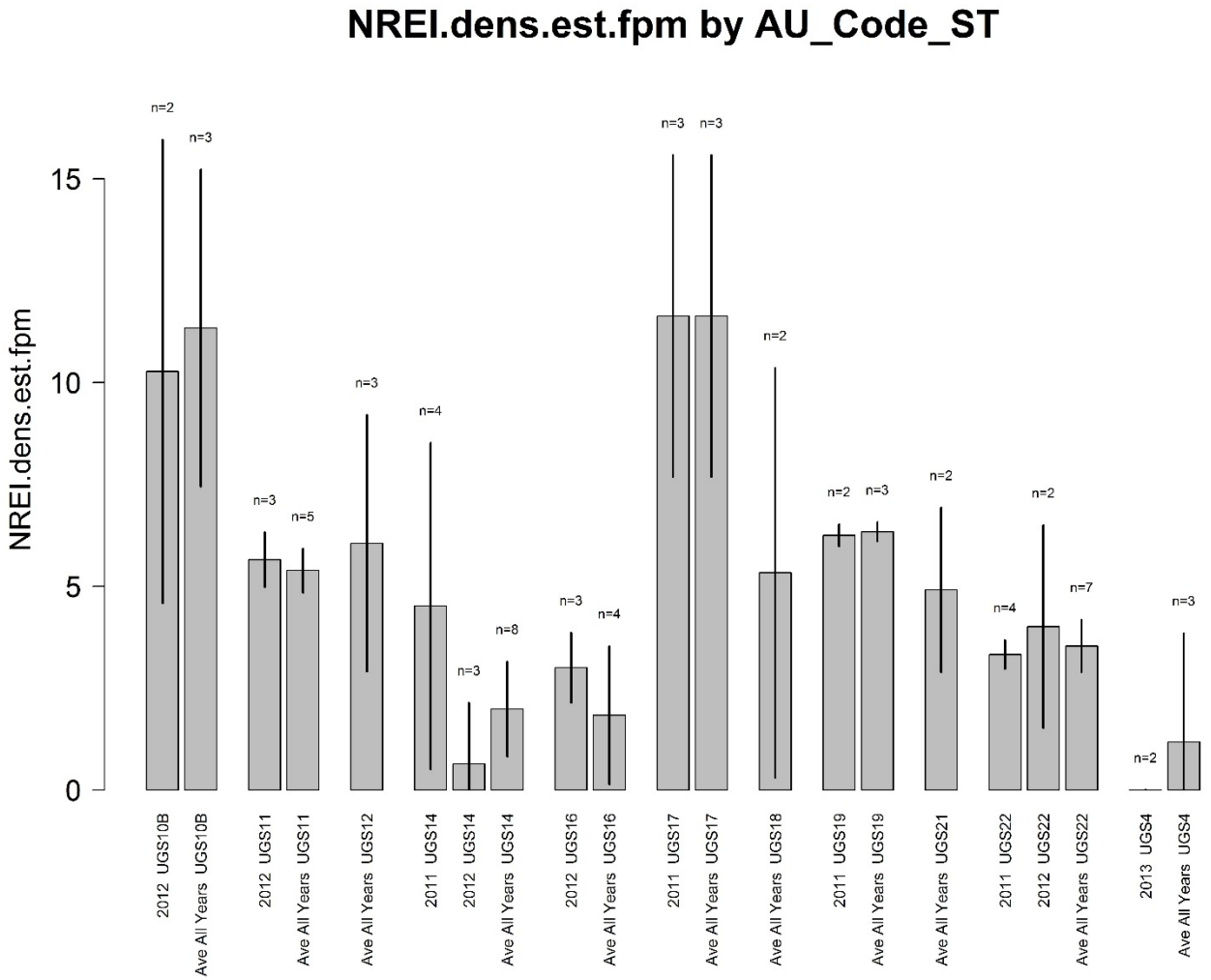
- Source: Habitat Suitability Index (HSI) Model
- Definition: Suitable Spawning habitat area (m^2) per meter of stream length for Steelhead



Juvenile Salmonid Capacity

- Source: Net Rate of Energy Intake (NREI) Model
- Definition: Carrying capacity (fish) per meter of stream length





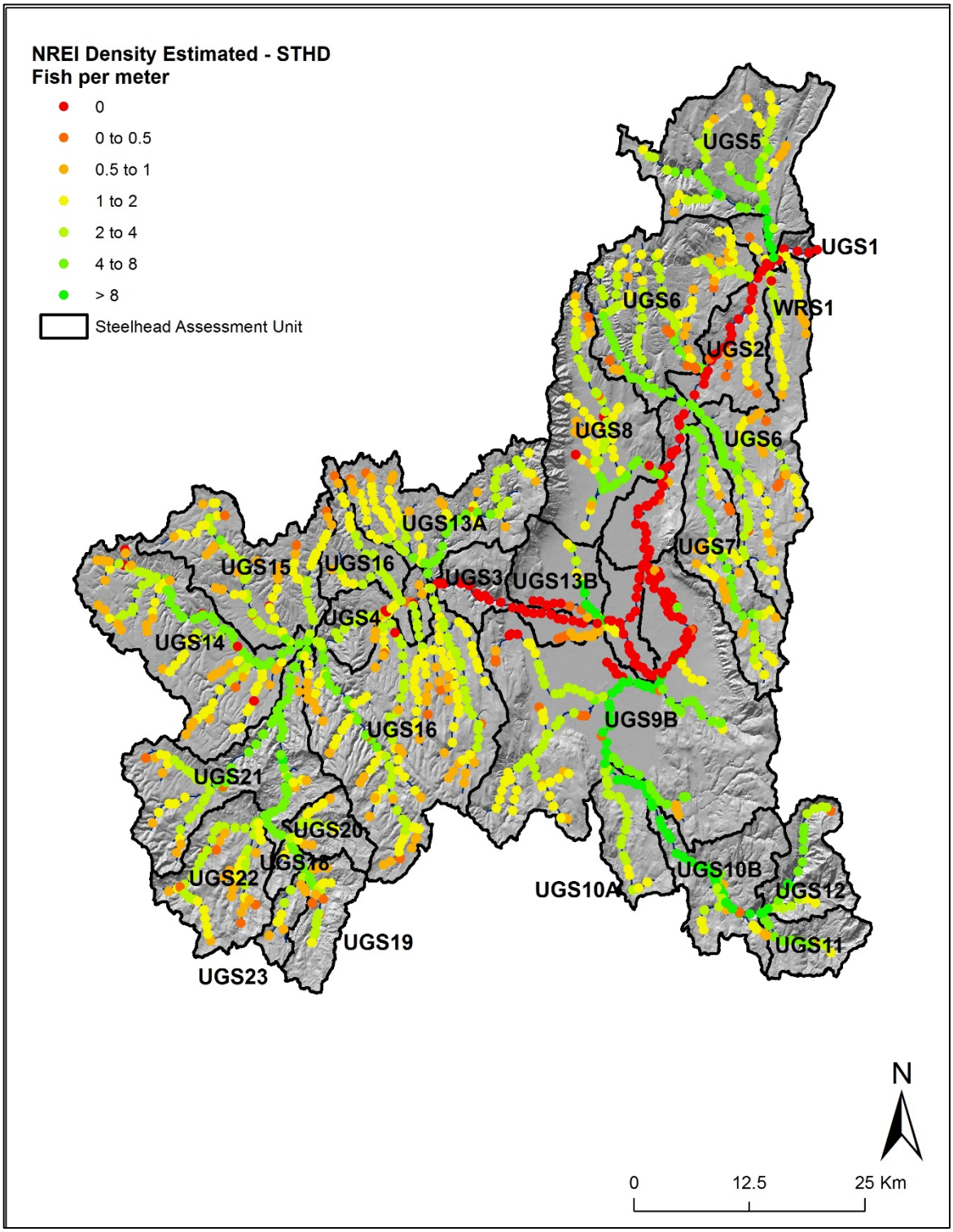
Juvenile Salmonid Capacity

- Source: Net Rate of Energy Intake (NREI) Model
- Definition: Carrying capacity (fish) per meter of stream length

Sub Population	Visit Year	N	Mean	St. Dev.
All.Sites	2011	20	4.381	3.518
	2012	17	3.075	2.355
	2013	8	5.263	3.741
	Average of All Years	46	3.216	2.804
UGS10B	2012	2	10.272	2.899
	Average of All Years	3	11.335	2.804
UGS11	2012	3	5.651	0.484
	Average of All Years	5	5.385	0.667
UGS12	Average of All Years	3	6.058	2.269
UGS14	2011	4	4.517	4.16
	2012	3	0.639	1.516
	Average of All Years	8	1.987	2.084
UGS16	2012	3	3.001	0.775
	Average of All Years	4	1.836	1.525
UGS17	2011	3	11.631	2.845
	Average of All Years	3	11.631	2.845
UGS18	Average of All Years	2	5.335	2.562
UGS19	2011	2	6.249	0.138
	Average of All Years	3	6.336	0.167
UGS21	Average of All Years	2	4.909	1.03
UGS22	2011	4	3.325	0.451
	2012	2	4.01	1.269
	Average of All Years	7	3.535	0.999
UGS4	2013	2	0	0
	Average of All Years	3	1.181	2.143

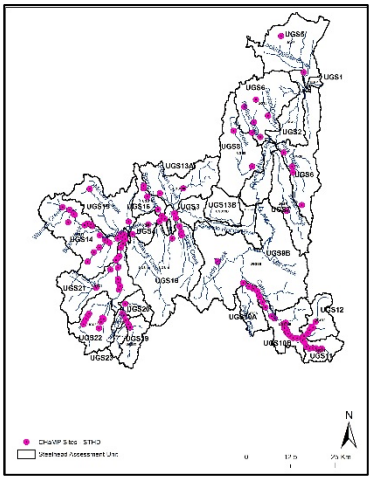
Juvenile Salmonid Capacity

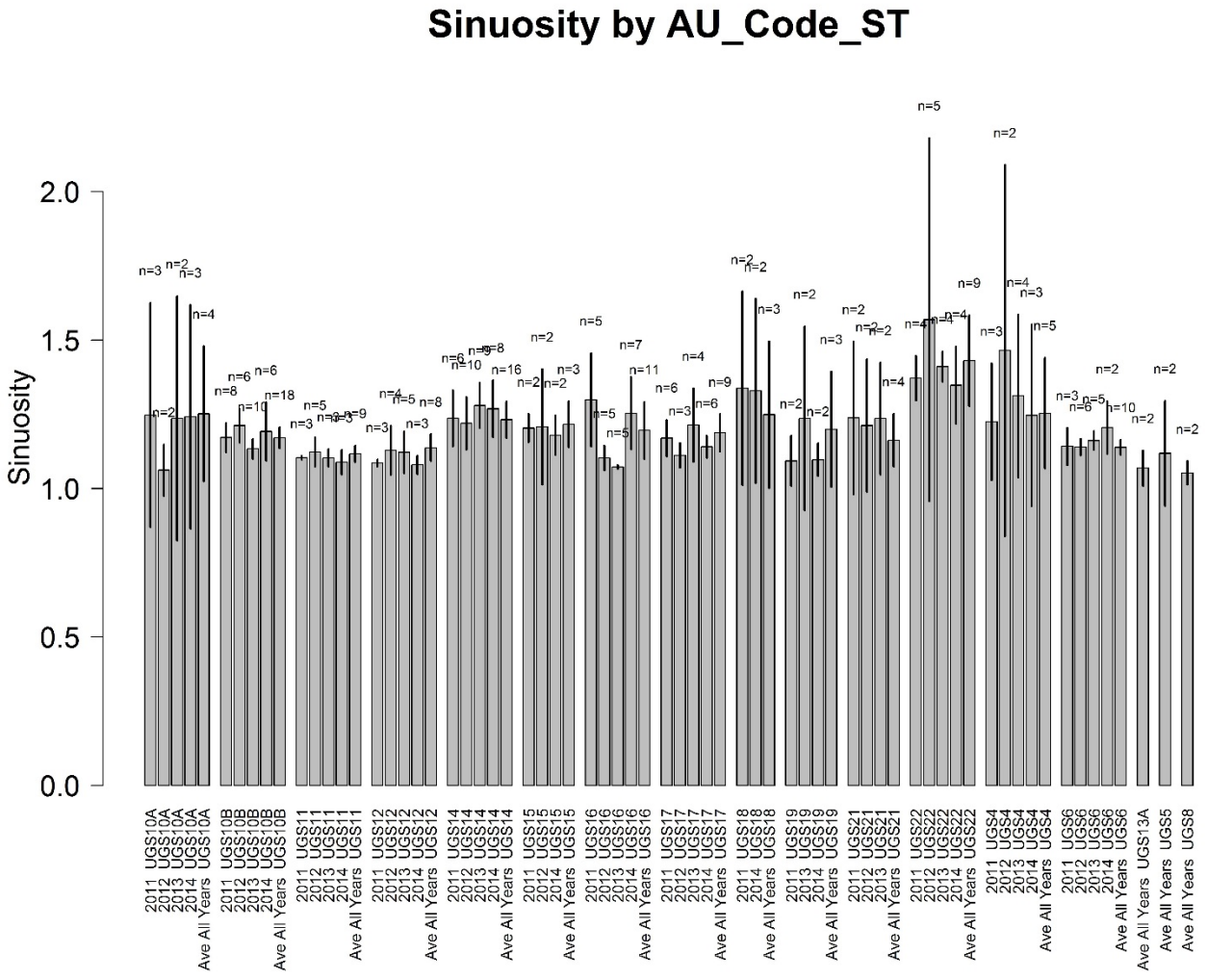
- Source: Net Rate of Energy Intake (NREI) Model
- Definition: Carrying capacity (fish) per meter of stream length



Sinuosity

- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Ratio of the thalweg length to the straight line distance between the start and end points of the thalweg.





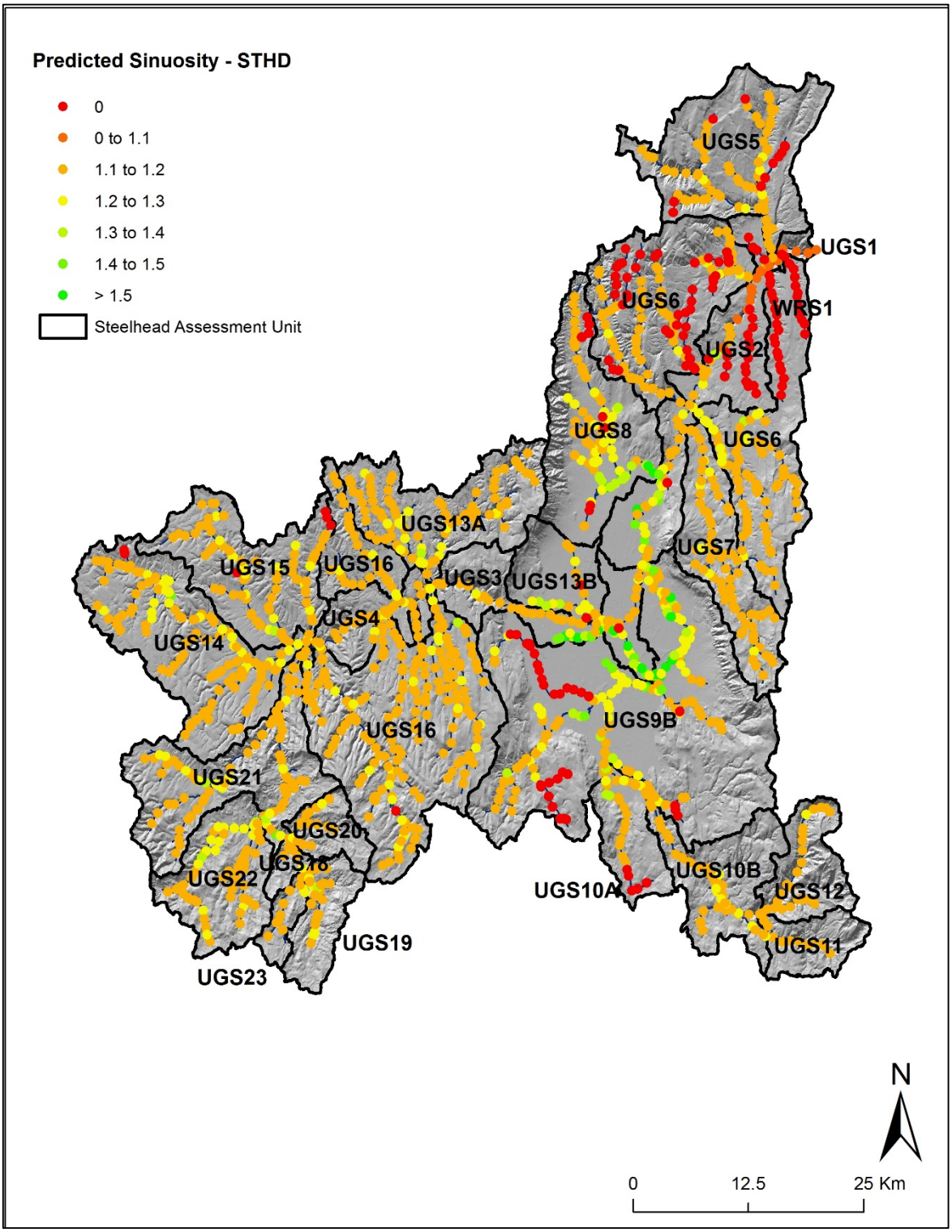
Sinuosity

- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Ratio of the thalweg length to the straight line distance between the start and end points of the thalweg.

Sub Population	Visit Year	N	Mean	St. Dev.
All.Sites	2011	56	1.206	0.14
	2012	55	1.188	0.191
	2013	59	1.231	0.141
	2014	56	1.197	0.143
	Average of All Years	121	1.191	0.156
UGS10A	2011	3	1.248	0.273
	2012	2	1.062	0.044
	2013	2	1.236	0.21
	2014	3	1.242	0.271
	Average of All Years	4	1.252	0.237
UGS10B	2011	8	1.172	0.082
	2012	6	1.212	0.076
	2013	10	1.134	0.059
	2014	6	1.192	0.126
	Average of All Years	18	1.171	0.092
UGS11	2011	3	1.104	0.008
	2012	5	1.123	0.056
	2013	3	1.103	0.021
	2014	3	1.089	0.03
	Average of All Years	9	1.117	0.044
UGS12	2011	3	1.086	0.011
	2012	4	1.129	0.088
	2013	5	1.122	0.085
	2014	3	1.08	0.023
	Average of All Years	8	1.138	0.086
UGS14	2011	6	1.237	0.116
	2012	10	1.22	0.121
	2013	9	1.28	0.138
	2014	8	1.269	0.142
	Average of All Years	16	1.232	0.123
UGS15	2011	2	1.204	0.024
	2012	2	1.208	0.142
	2014	2	1.18	0.034
	Average of All Years	3	1.217	0.094
UGS16	2011	5	1.299	0.176
	2012	5	1.103	0.064
	2013	5	1.073	0.01
	2014	7	1.254	0.157
	Average of All Years	11	1.196	0.153
UGS17	2011	6	1.17	0.082
	2012	3	1.112	0.03
	2013	4	1.214	0.127
	2014	6	1.141	0.056
	Average of All Years	9	1.188	0.098
UGS18	2011	2	1.338	0.166
	2014	2	1.329	0.158
	Average of All Years	3	1.249	0.179
UGS19	2011	2	1.093	0.043
	2013	2	1.236	0.158
	2014	2	1.097	0.028
	Average of All Years	3	1.2	0.14
UGS21	2011	2	1.238	0.132
	2012	2	1.212	0.114
	2013	2	1.236	0.096
	Average of All Years	4	1.163	0.096
UGS22	2011	4	1.372	0.087
	2012	5	1.569	0.666
	2013	4	1.411	0.071
	2014	4	1.348	0.133
	Average of All Years	9	1.431	0.347
UGS4	2011	3	1.225	0.205
	2012	2	1.465	0.325
	2013	4	1.312	0.28
	2014	3	1.247	0.258
	Average of All Years	5	1.254	0.238
UGS6	2011	3	1.142	0.048
	2012	6	1.14	0.04
	2013	5	1.162	0.036
	2014	2	1.206	0.045
	Average of All Years	10	1.139	0.044
UGS13A	Average of All Years	2	1.069	0.035
UGS5	Average of All Years	2	1.119	0.097
UGS8	Average of All Years	2	1.053	0.021

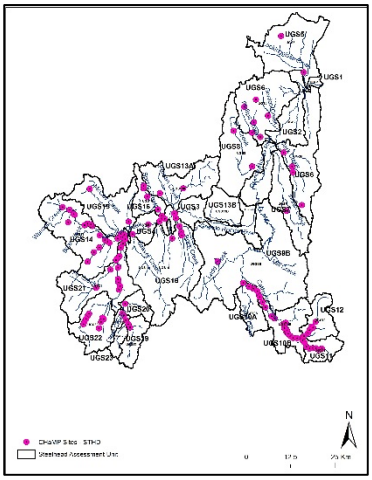
Sinuosity

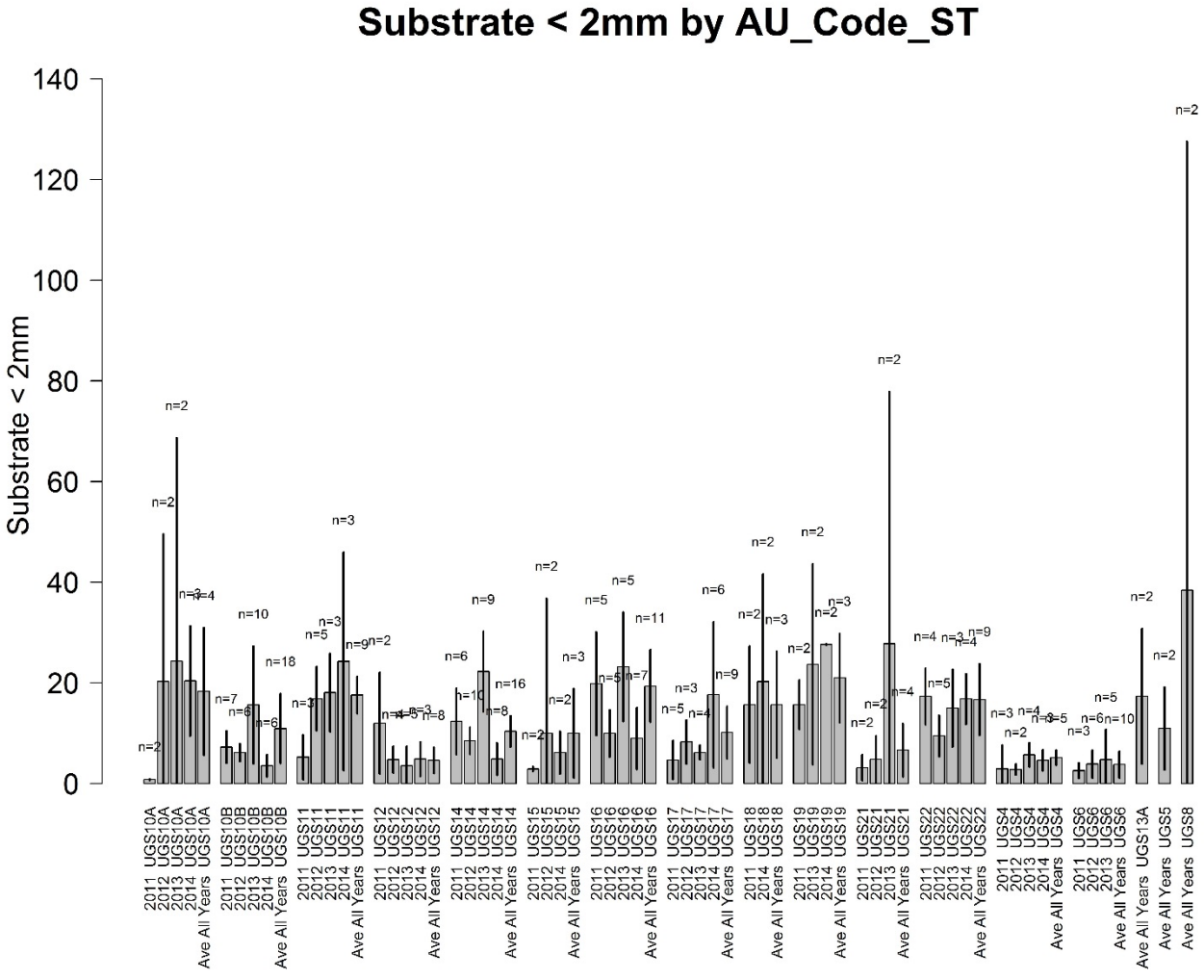
- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Ratio of the thalweg length to the straight line distance between the start and end points of the thalweg.



Substrate < 2mm

- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Average percentage of pool tail substrates comprised of fine sediment <2 mm





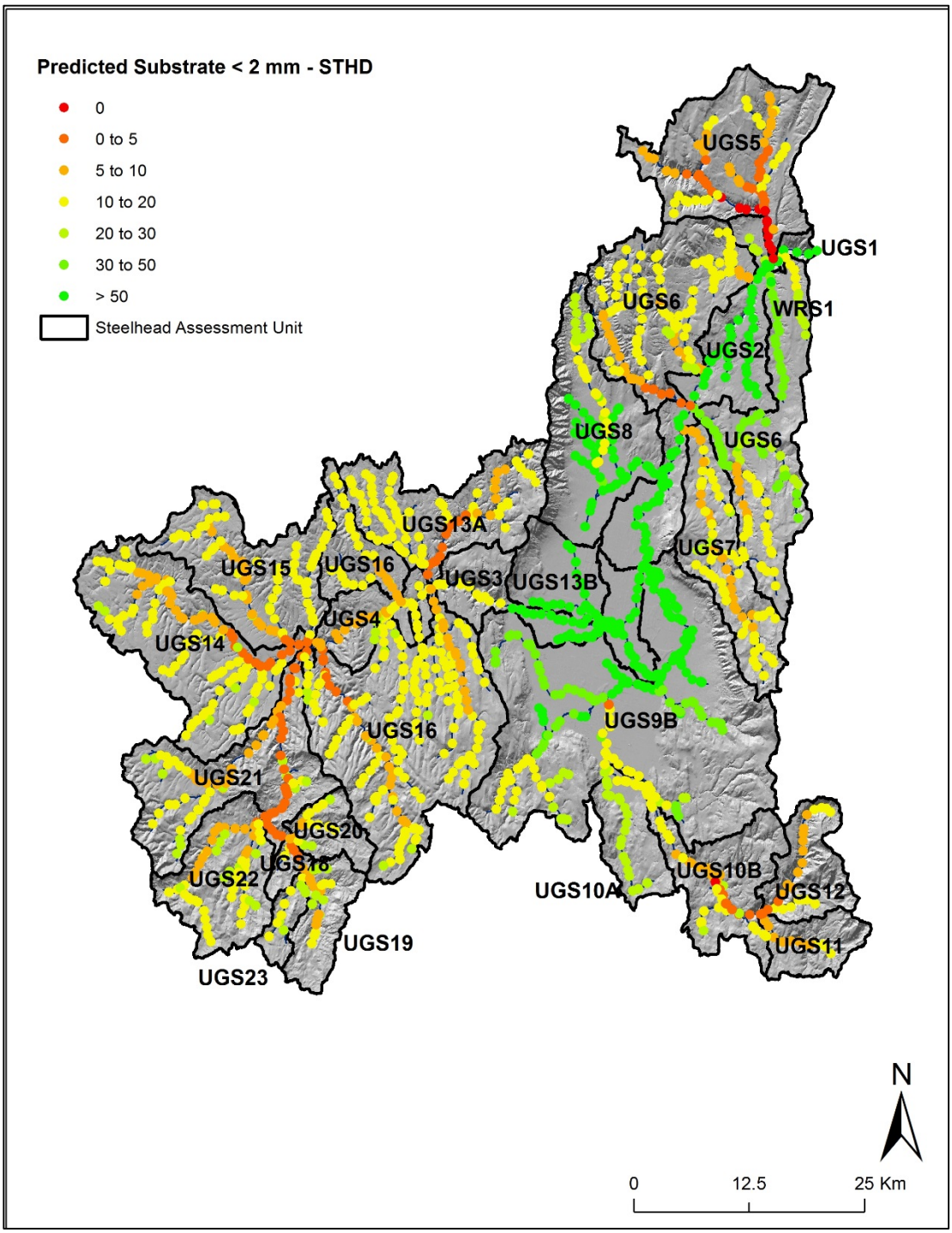
Substrate < 2mm

- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Average percentage of pool tail substrates comprised of fine sediment <2 mm

Sub Population	Visit Year	N	Mean	St. Dev.
All.Sites	2011	51	9.834	9.687
	2012	55	7.264	7.113
	2013	57	15.002	13.799
	2014	56	15.765	24.924
	Average of All Years	120	11.858	14.568
UGS10A	2011	2	0.819	0.069
	2012	2	20.278	14.944
	2013	2	24.31	22.643
	2014	3	20.393	7.89
	Average of All Years	4	18.309	13.554
UGS10B	2011	7	7.26	4.456
	2012	6	6.168	2.479
	2013	10	15.636	20.973
	2014	6	3.549	2.77
	Average of All Years	18	10.934	16.568
UGS11	2011	3	5.252	5.747
	2012	5	16.862	7.312
	2013	3	18.09	5.604
	2014	3	24.278	15.638
	Average of All Years	9	17.561	5.657
UGS12	2011	2	12.029	5.878
	2012	4	4.769	2.765
	2013	5	3.525	4.588
	2014	3	4.889	2.455
	Average of All Years	8	4.597	3.978
UGS14	2011	6	12.357	7.607
	2012	10	8.511	3.838
	2013	9	22.269	13.918
	2014	8	4.878	3.869
	Average of All Years	16	10.384	6.344
UGS15	2011	2	2.894	0.222
	2012	2	9.983	19.499
	2014	2	6.143	2.168
	Average of All Years	3	9.995	12.169
UGS16	2011	5	19.833	12.687
	2012	5	9.967	5.465
	2013	5	23.191	12.472
	2014	7	8.958	6.265
	Average of All Years	11	19.38	10.999
UGS17	2011	5	4.681	4.398
	2012	3	8.265	3.137
	2013	4	6.183	1.579
	2014	6	17.68	18.478
	Average of All Years	9	10.149	8.742
UGS18	2011	2	15.705	5.927
	2014	2	20.25	10.917
	Average of All Years	3	15.652	7.623
UGS19	2011	2	15.699	2.468
	2013	2	23.695	10.171
	2014	2	27.633	0.033
	Average of All Years	3	21.016	6.361
UGS21	2011	2	3.163	1.322
	2012	2	4.832	2.368
	2013	2	27.778	25.556
	Average of All Years	4	6.628	5.593
UGS22	2011	4	17.298	9.818
	2012	5	9.454	5.357
	2013	3	14.986	10.789
	2014	4	16.794	5.327
	Average of All Years	9	16.696	12.805
UGS4	2011	3	2.927	4.994
	2012	2	2.787	0.543
	2013	4	5.72	2.461
	2014	3	4.618	1.386
	Average of All Years	5	5.165	1.761
UGS6	2011	3	2.576	1.556
	2012	6	3.871	3.802
	2013	5	4.744	6.697
	Average of All Years	10	3.792	4.078
UGS13A	Average of All Years	2	17.34	7.972
UGS5	Average of All Years	2	10.947	4.504
UGS8	Average of All Years	2	38.439	47.102

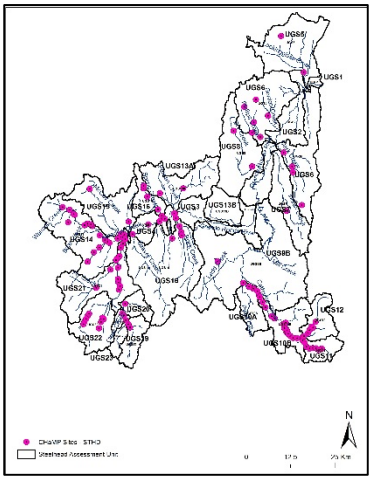
Substrate < 2mm

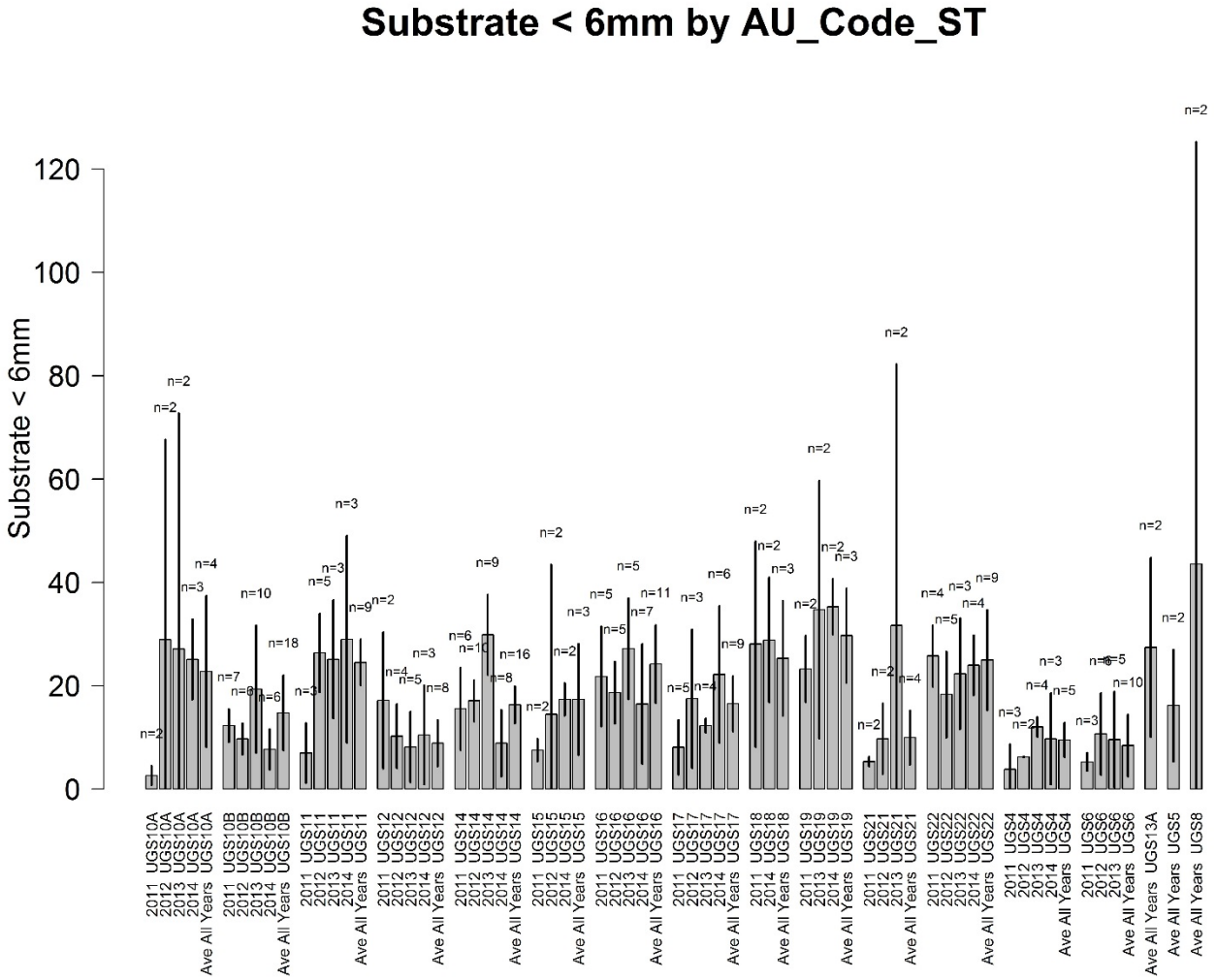
- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Average percentage of pool tail substrates comprised of fine sediment <2 mm



Substrate < 6 mm

- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Average percentage of pool tail substrates comprised of fine sediment <6 mm





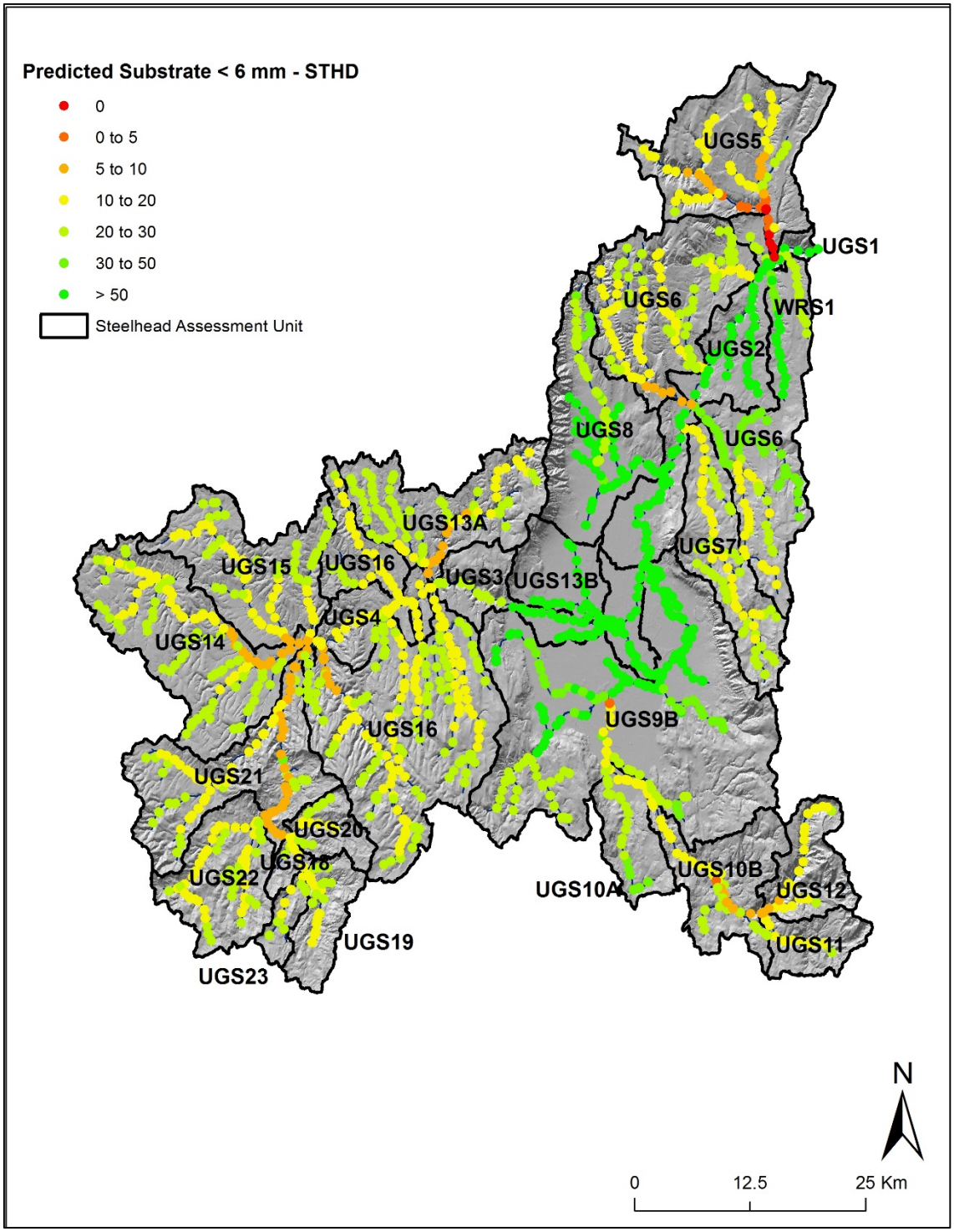
Substrate < 6 mm

- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Average percentage of pool tail substrates comprised of fine sediment <6 mm

Sub Population	Visit Year	N	Mean	St. Dev.
All.Sites	2011	51	13.387	10.542
	2012	55	14.836	10.34
	2013	57	21.466	15.57
	2014	56	22.048	24.224
	Average of All Years	120	17.546	15.44
UGS10A	2011	2	2.611	0.944
	2012	2	28.917	19.75
	2013	2	27.107	23.274
	2014	3	25.088	5.594
	Average of All Years	4	22.738	15.631
UGS10B	2011	7	12.276	4.43
	2012	6	9.7	4.402
	2013	10	19.333	21.932
	2014	6	7.683	4.948
	Average of All Years	18	14.739	17.33
UGS11	2011	3	6.961	7.515
	2012	5	26.336	8.661
	2013	3	25.104	8.236
	2014	3	28.967	14.443
	Average of All Years	9	24.501	7.033
UGS12	2011	2	17.158	7.712
	2012	4	10.223	6.527
	2013	5	8.142	7.957
	2014	3	10.459	6.922
	Average of All Years	8	8.874	6.873
UGS14	2011	6	15.508	9.189
	2012	10	17.105	6.279
	2013	9	29.862	13.419
	2014	8	8.877	7.691
	Average of All Years	16	16.289	6.875
UGS15	2011	2	7.529	1.111
	2012	2	14.459	21.069
	2014	2	17.339	1.608
	Average of All Years	3	17.333	12.857
UGS16	2011	5	21.792	12.267
	2012	5	18.643	7.755
	2013	5	27.154	11.471
	2014	7	16.449	11.816
	Average of All Years	11	24.178	11.344
UGS17	2011	5	8.08	6.123
	2012	3	17.459	9.669
	2013	4	12.273	1.497
	2014	6	22.157	17.149
	Average of All Years	9	16.518	10.049
UGS18	2011	2	28.039	10.15
	2014	2	28.833	6.167
	Average of All Years	3	25.291	8.01
UGS19	2011	2	23.25	3.25
	2013	2	34.733	12.733
	2014	2	35.267	2.733
	Average of All Years	3	29.686	6.574
UGS21	2011	2	5.301	0.468
	2012	2	9.719	3.481
	2013	2	31.667	25.778
	Average of All Years	4	9.947	5.594
UGS22	2011	4	25.754	10.646
	2012	5	18.281	11.035
	2013	3	22.328	14.496
	2014	4	23.976	6.492
	Average of All Years	9	24.957	17.07
UGS4	2011	3	3.804	5.03
	2012	2	6.222	0.037
	2013	4	12.012	2.062
	2014	3	9.702	5.995
	Average of All Years	5	9.507	3.769
UGS6	2011	3	5.25	1.645
	2012	6	10.66	10.159
	2013	5	9.557	10.22
	Average of All Years	10	8.429	9.143
UGS13A	Average of All Years	2	27.415	10.291
UGS5	Average of All Years	2	16.138	5.943
UGS8	Average of All Years	2	43.569	43.177

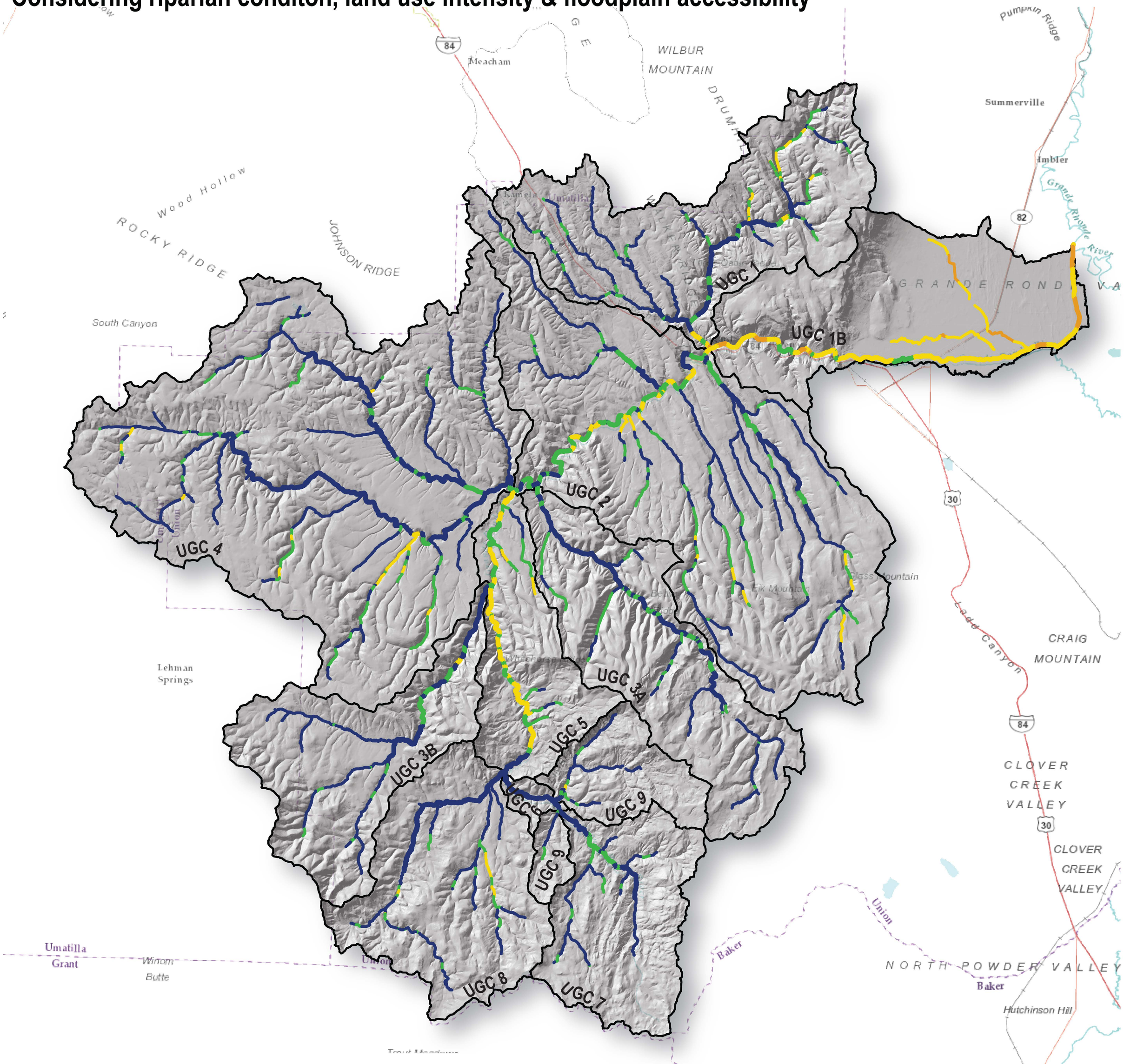
Substrate < 6 mm

- Source: CHaMP Metrics (www.champmonitoring.org)
- Definition: Average percentage of pool tail substrates comprised of fine sediment <6 mm



FLOODPLAIN CONDITION ASSESSMENT

Considering riparian conditon, land use intensity & floodplain accessibility



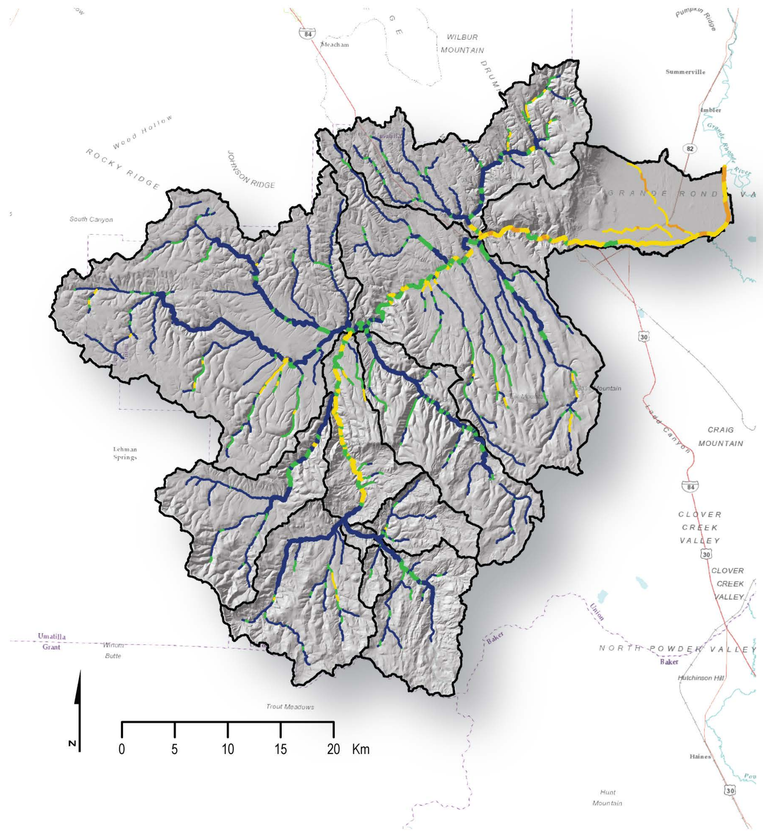
Floodplain Condition

Status

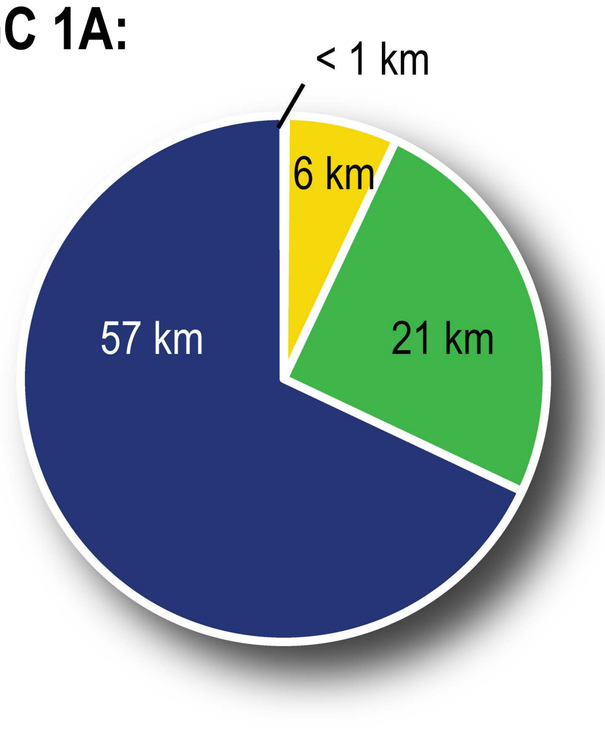
- Poor
- Moderate
- Good
- Intact
- Chinook and Steelhead bearing perennial streams
- Steelhead bearing perennial streams

FLOODPLAIN CONDITION ASSESSMENT

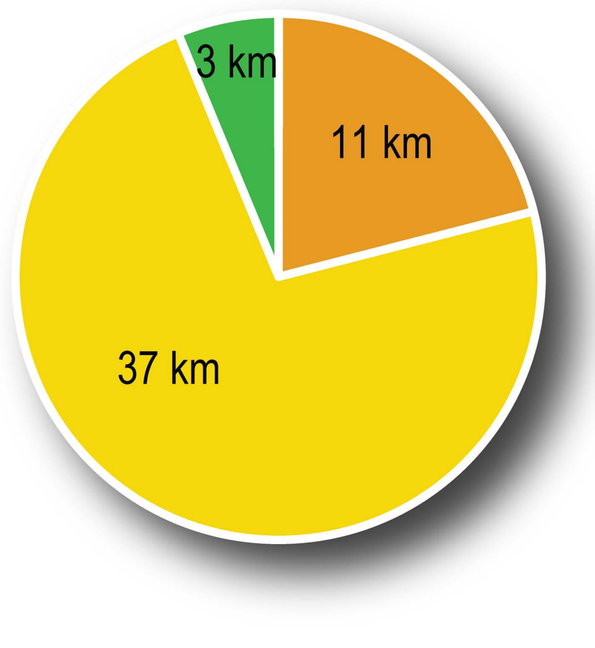
Considering riparian conditon, land use intensity & floodplain accessibility



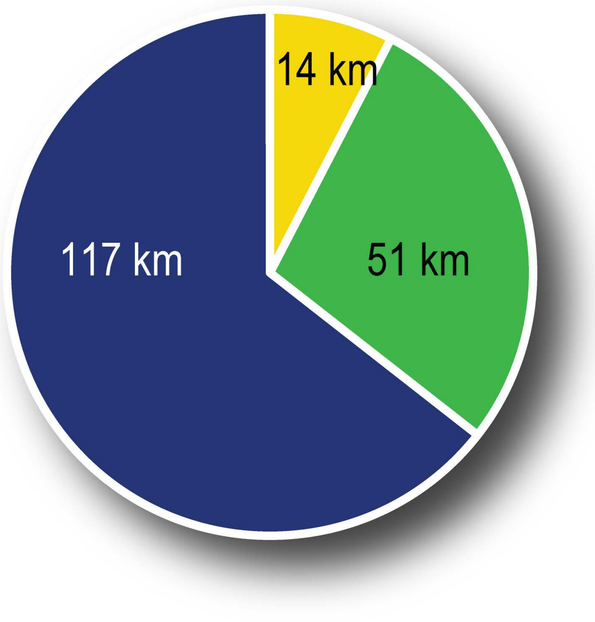
UGC 1A:



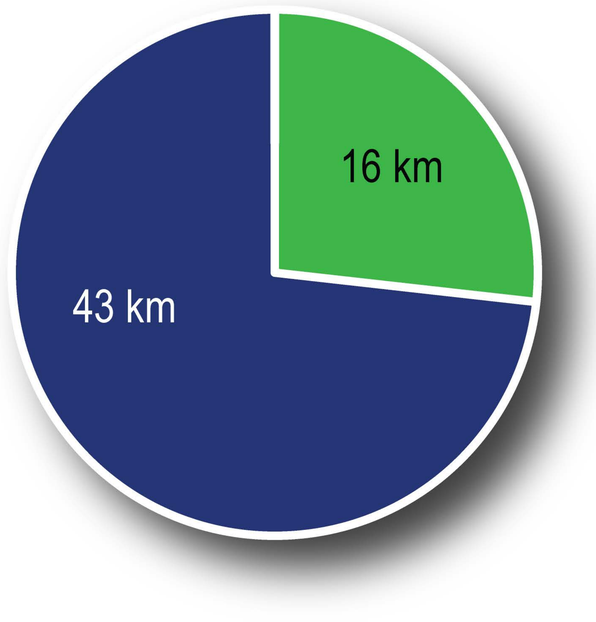
UGC 1B:



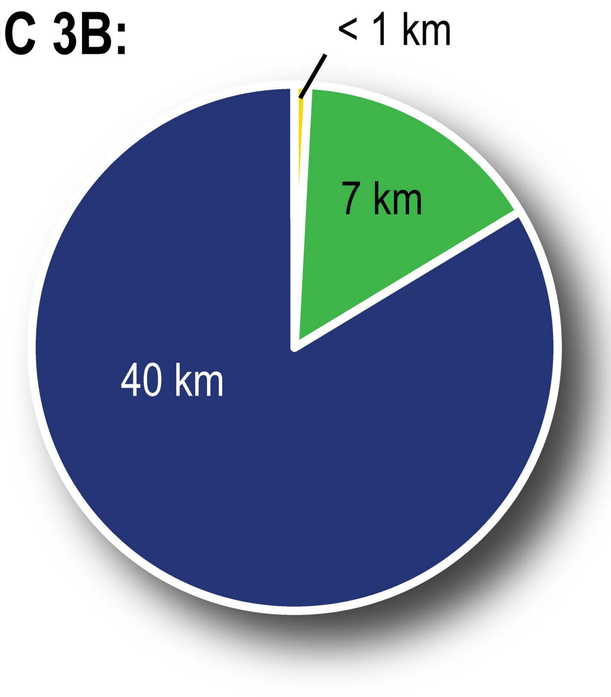
UGC 2:



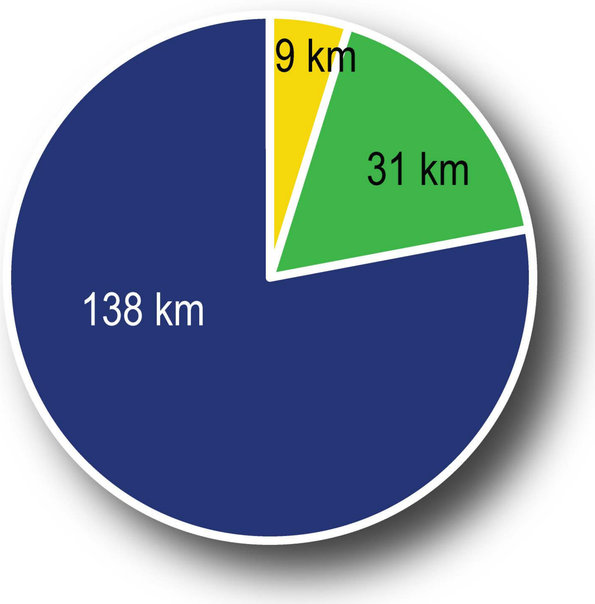
UGC 3A:



UGC 3B:



UGC 4:



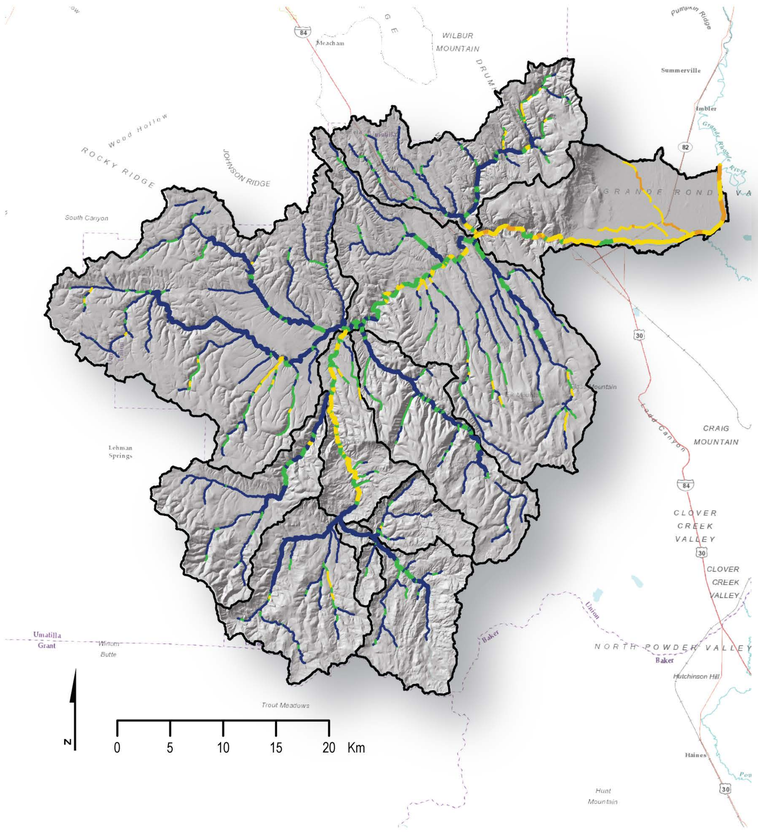
Floodplain Condition

Status

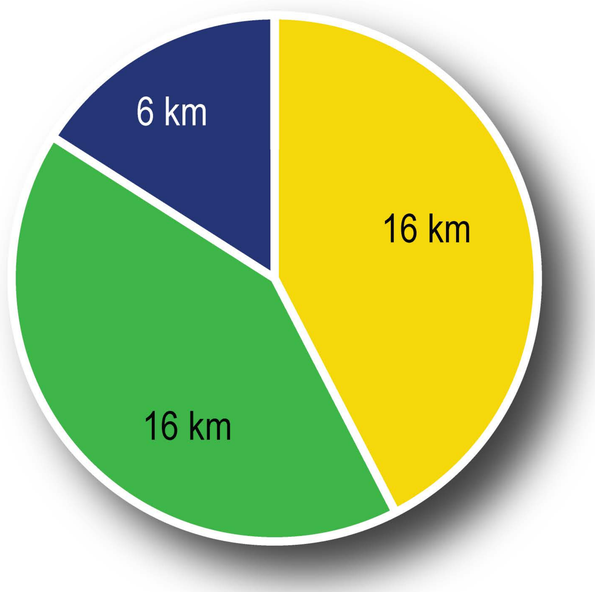
- Poor
- Moderate
- Good
- Intact

FLOODPLAIN CONDITION ASSESSMENT

Considering riparian conditon, land use intensity & floodplain accessibility



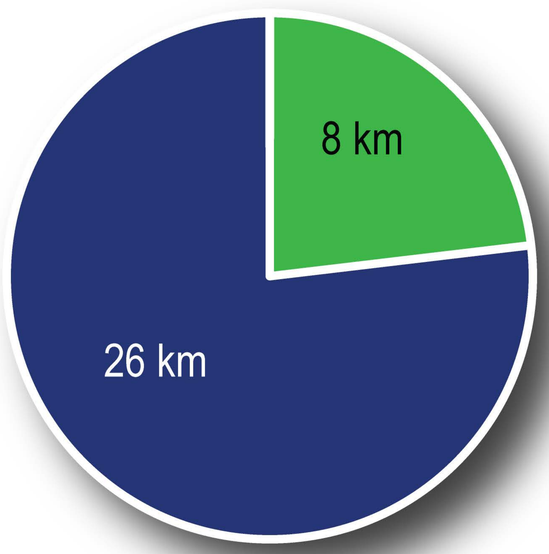
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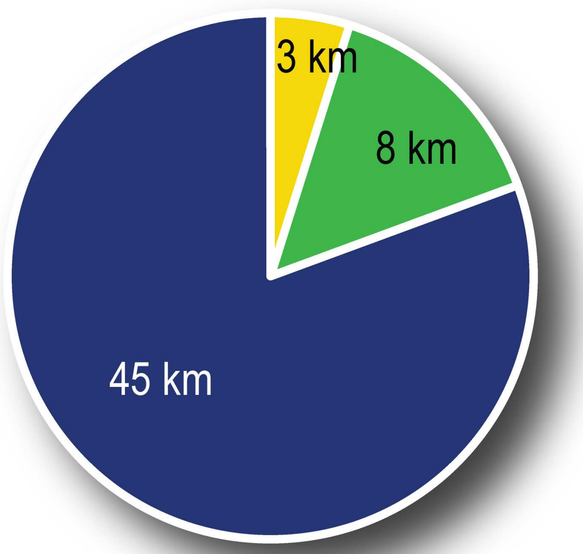
UGC 6:



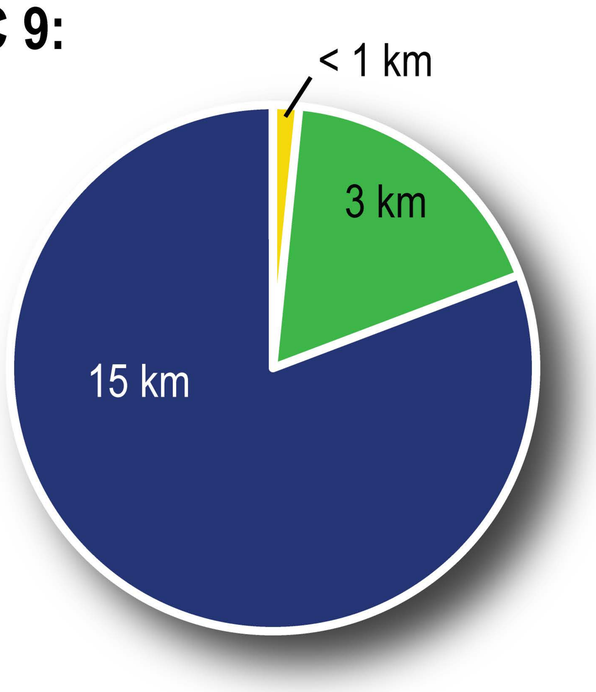
UGC 7:



UGC 8:



UGC 9:

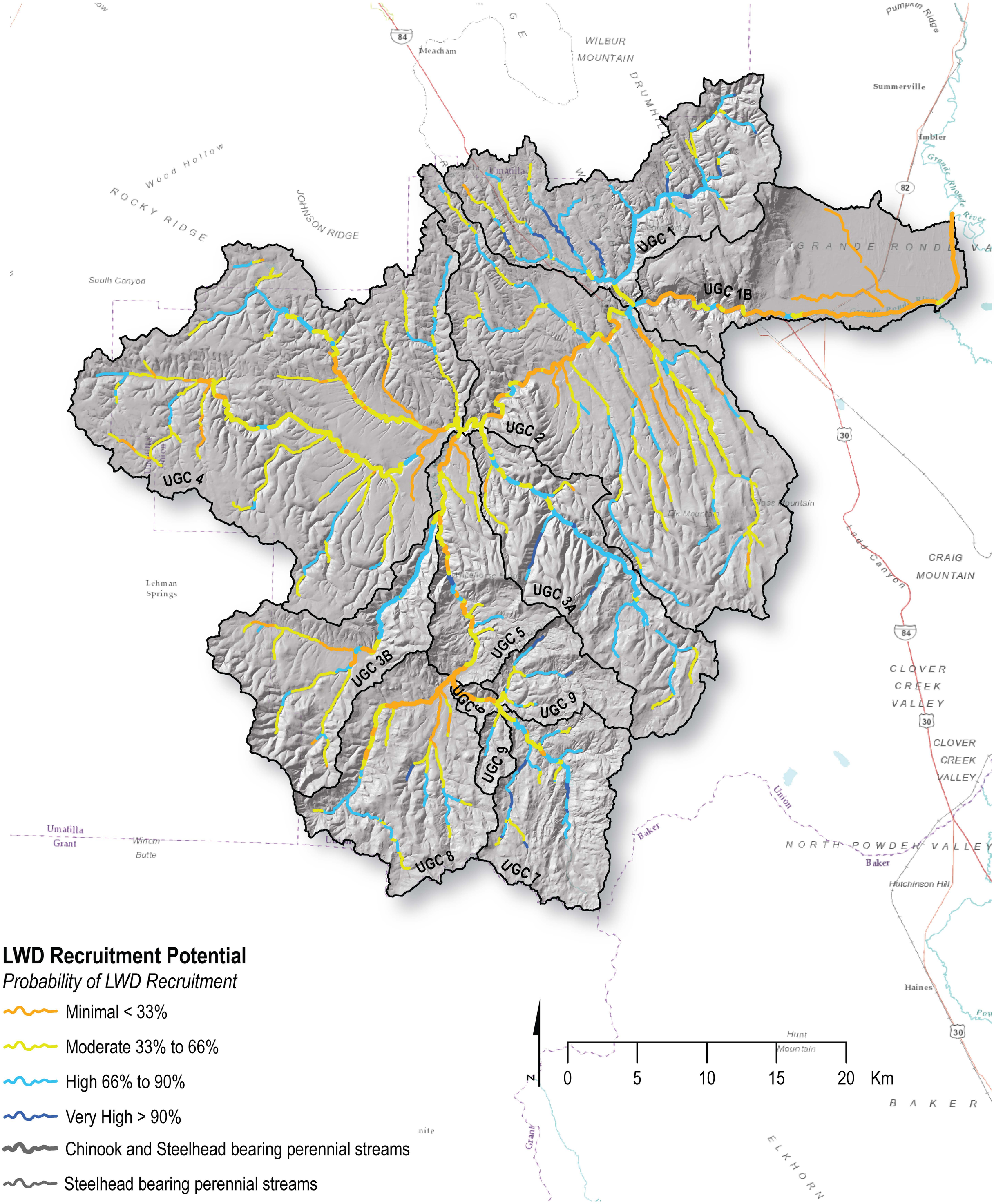


Floodplain Condition

Status

- Poor
- Moderate
- Good
- Intact

LARGE WOODY DEBRIS RECRUITMENT POTENTIAL

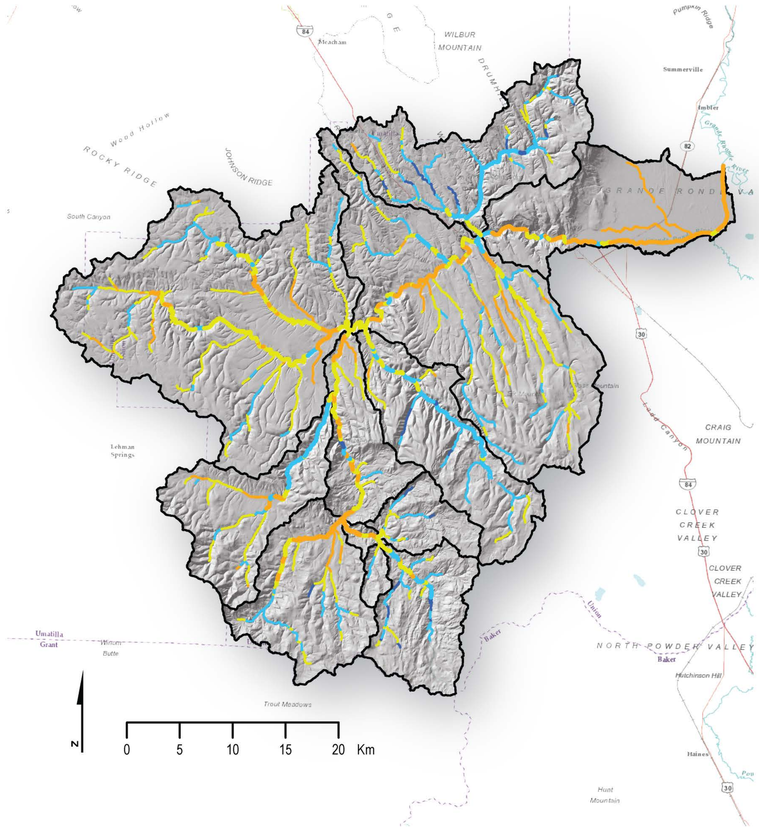


LWD Recruitment Potential

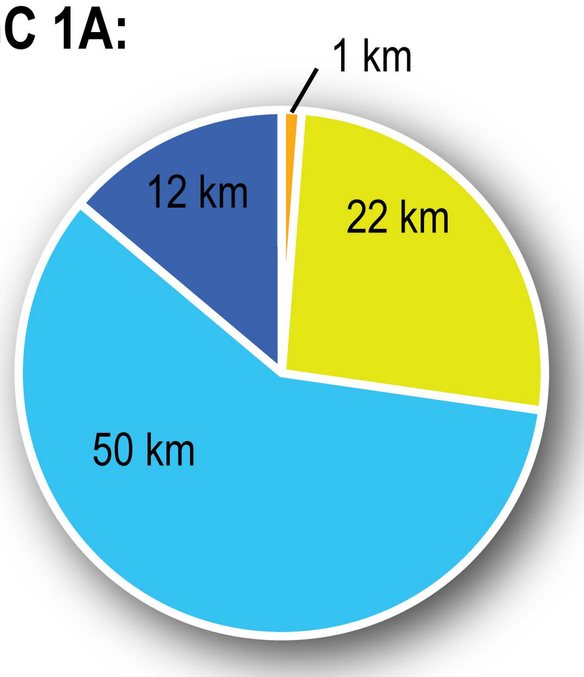
Probability of LWD Recruitment

- Minimal < 33%
- Moderate 33% to 66%
- High 66% to 90%
- Very High > 90%
- Chinook and Steelhead bearing perennial streams
- Steelhead bearing perennial streams

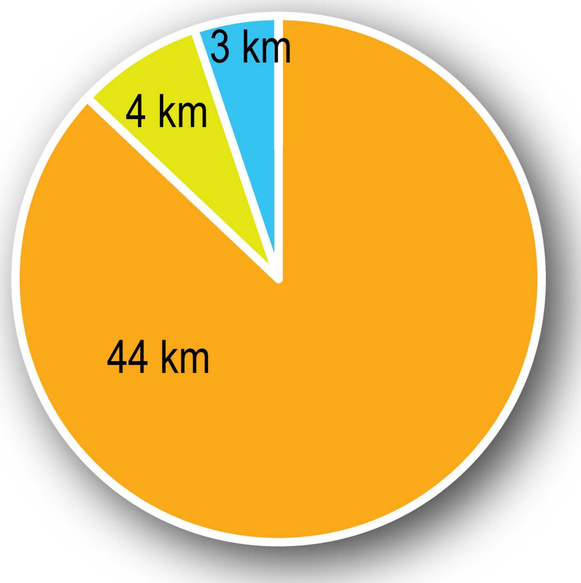
LARGE WOODY DEBRIS RECRUITMENT POTENTIAL



UGC 1A:



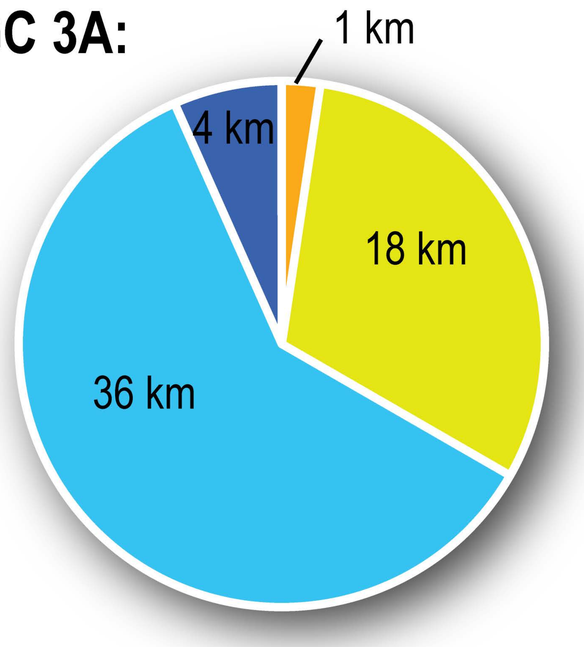
UGC 1B:



UGC 2:



UGC 3A:



UGC 3B:



UGC 4:

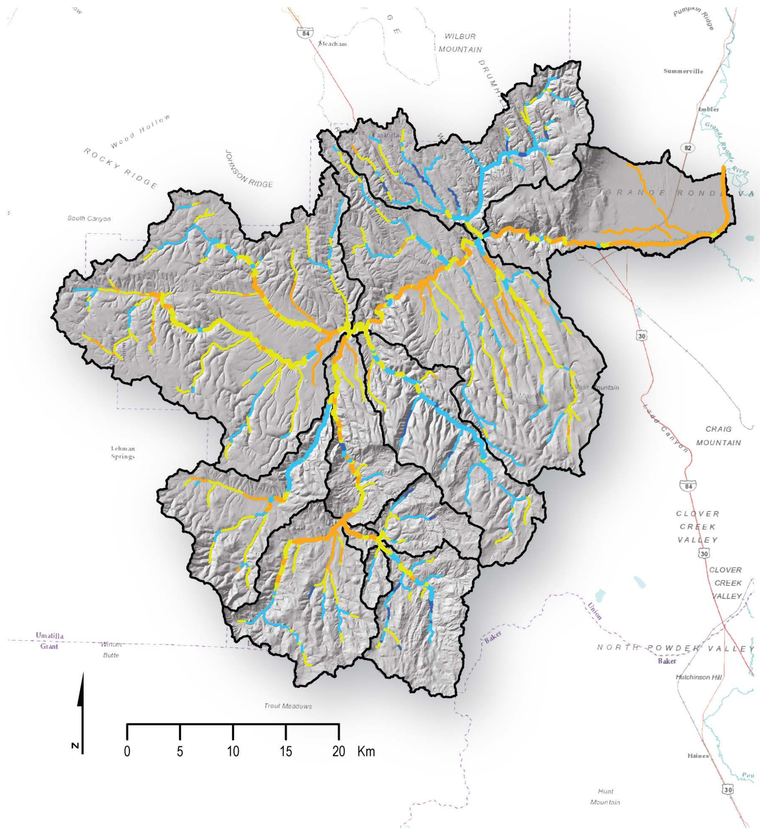


LWD Recruitment Potential

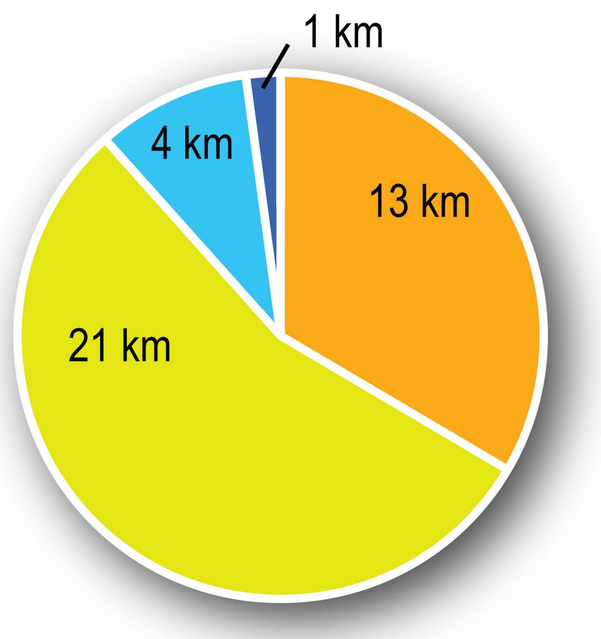
Probability of LWD Recruitment

- Minimal < 33%
- Moderate 33% to 66%
- High 66% to 90%
- Very High > 90%

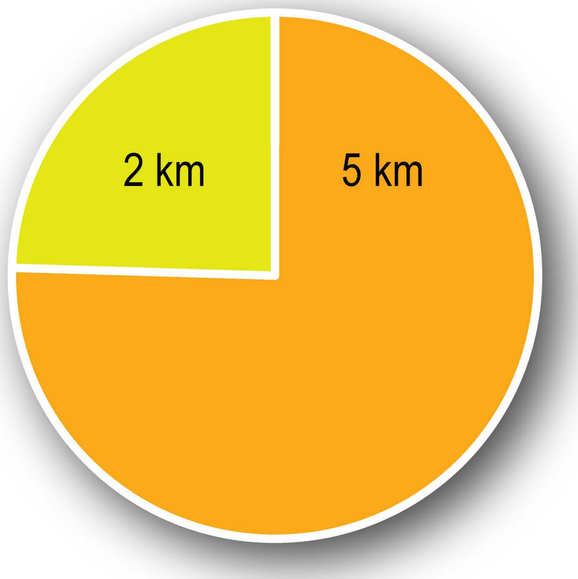
LARGE WOODY DEBRIS RECRUITMENT POTENTIAL



UGC 5:



UGC 6:



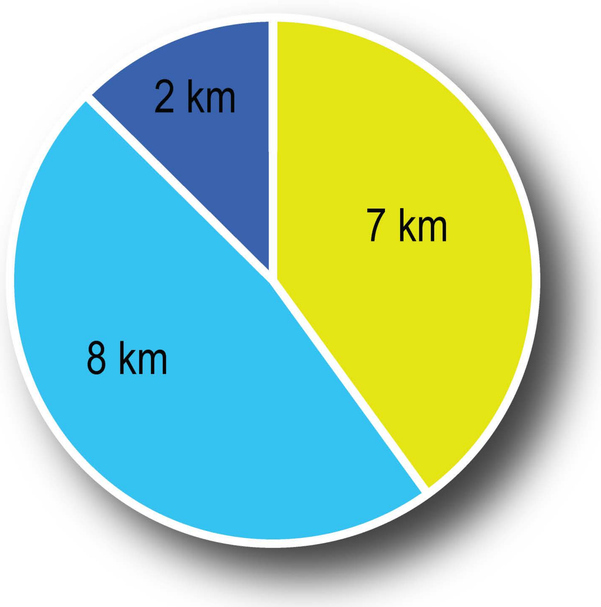
UGC 7:



UGC 8:



UGC 9:



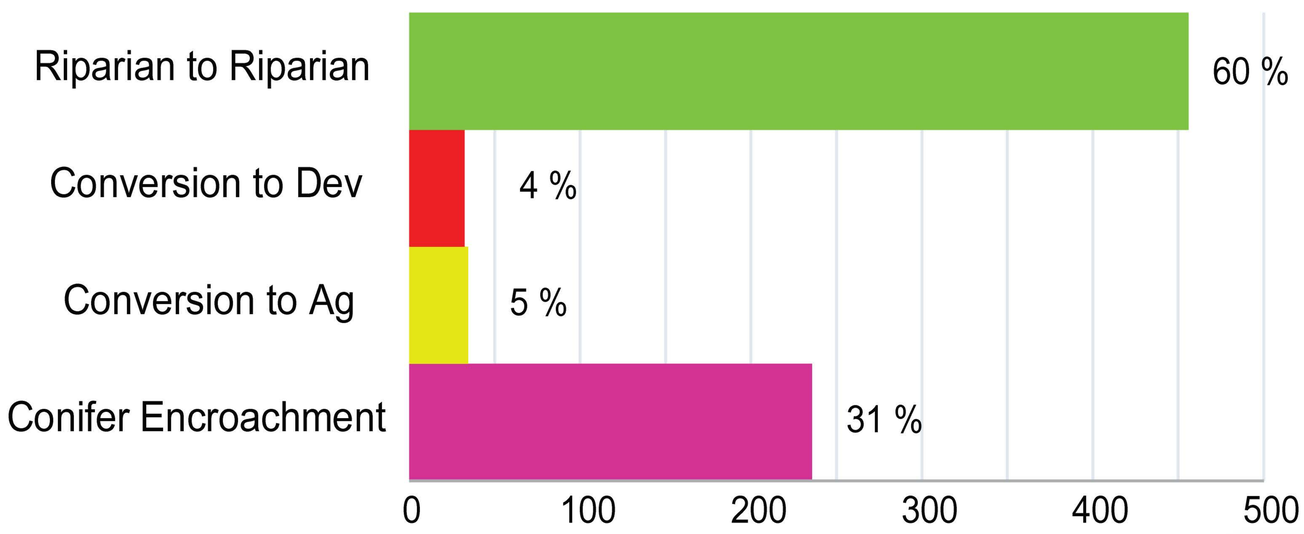
LWD Recruitment Potential

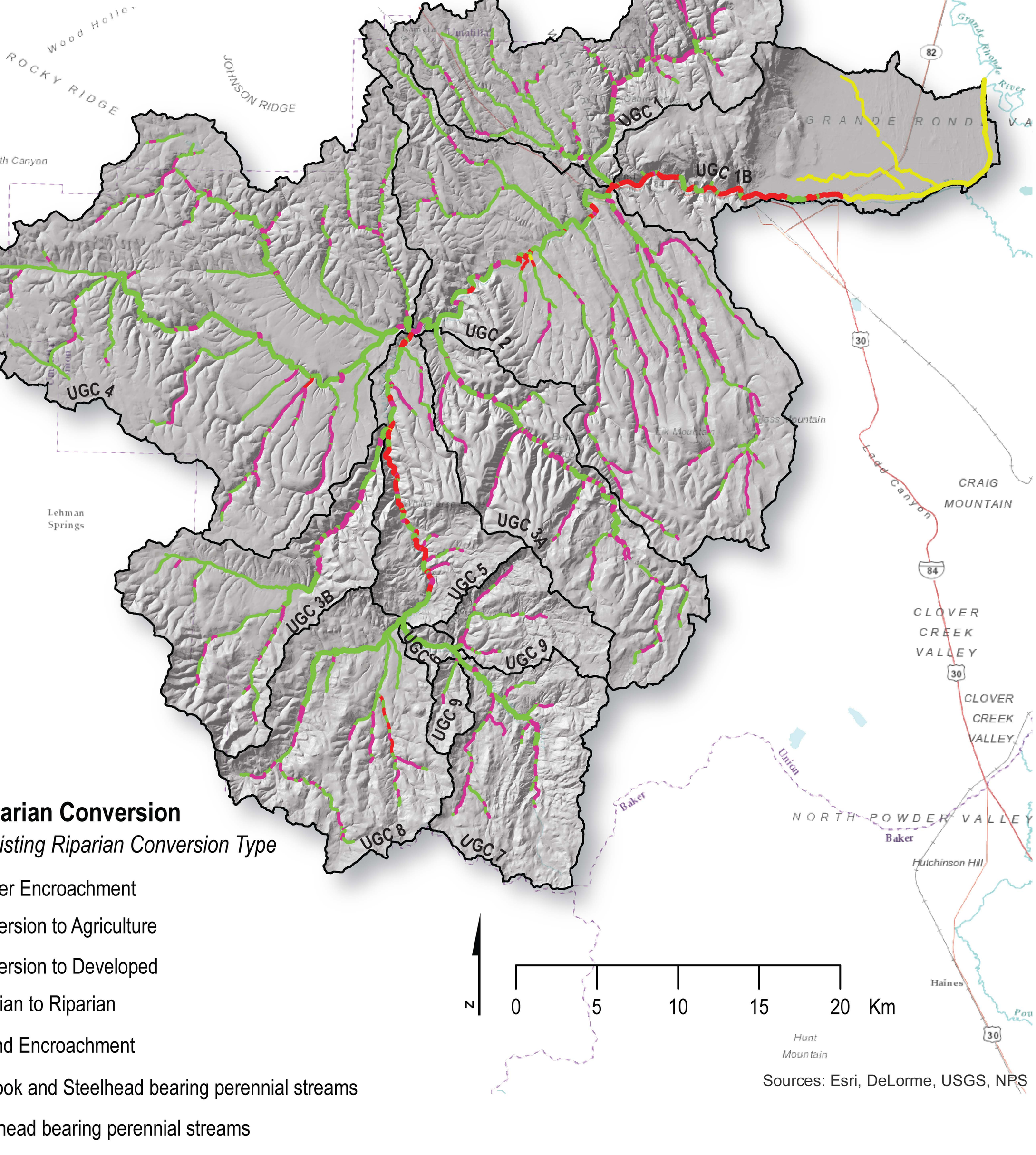
Probability of LWD Recruitment

- Minimal < 33%
- Moderate 33% to 66%
- High 66% to 90%
- Very High > 90%

RIPARIAN CONVERSION

Causes for departure from historic





RVCA - Riparian Conversion

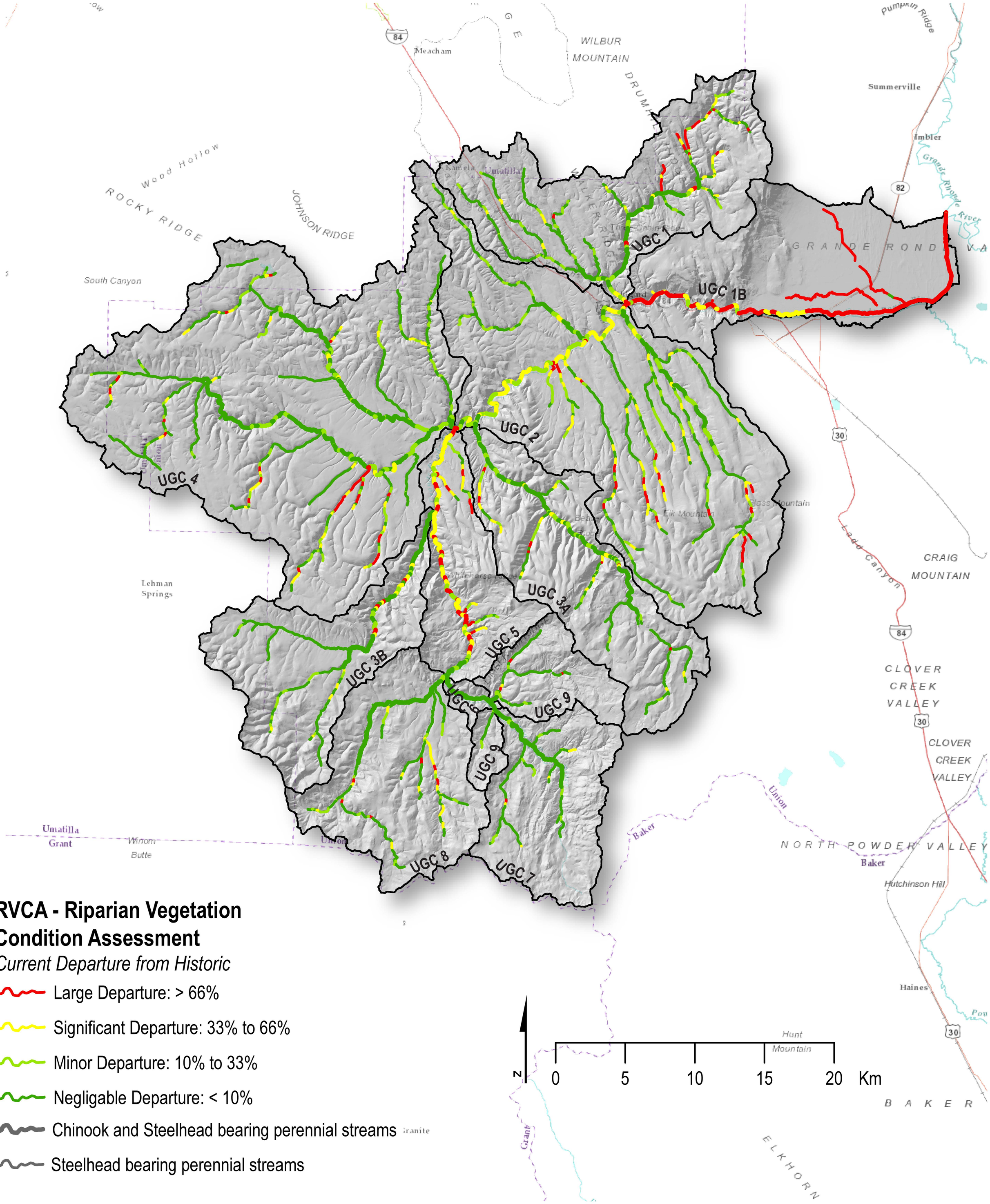
Historic to Existing Riparian Conversion Type

- Conifer Encroachment
- Conversion to Agriculture
- Conversion to Developed
- Riparian to Riparian
- Upland Encroachment
- Chinook and Steelhead bearing perennial streams
- Steelhead bearing perennial streams

Sources: Esri, DeLorme, USGS, NPS

RIPARIAN CONDITION ASSESSMENT

Estimate of current departure from historic within valley bottom



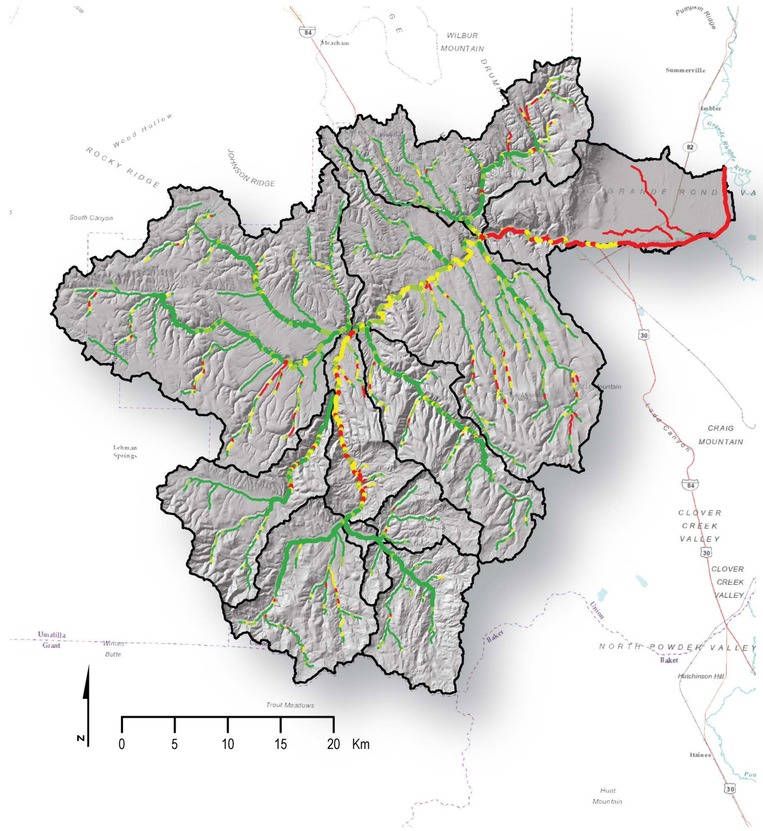
RVCA - Riparian Vegetation Condition Assessment

Current Departure from Historic

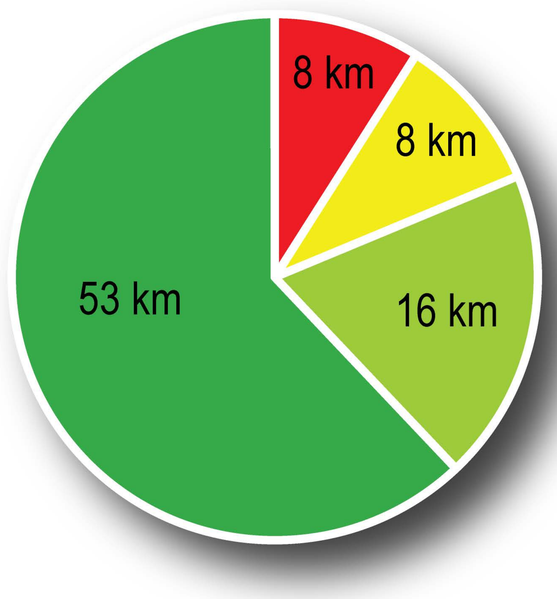
- Large Departure: > 66%
- Significant Departure: 33% to 66%
- Minor Departure: 10% to 33%
- Negligable Departure: < 10%
- Chinook and Steelhead bearing perennial streams
- Steelhead bearing perennial streams

RIPARIAN CONDITION ASSESSMENT

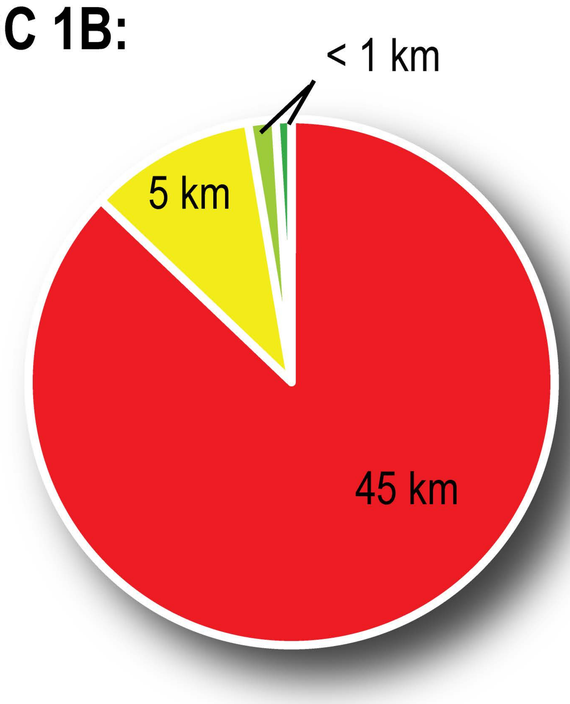
Estimate of current departure from historic within valley bottom



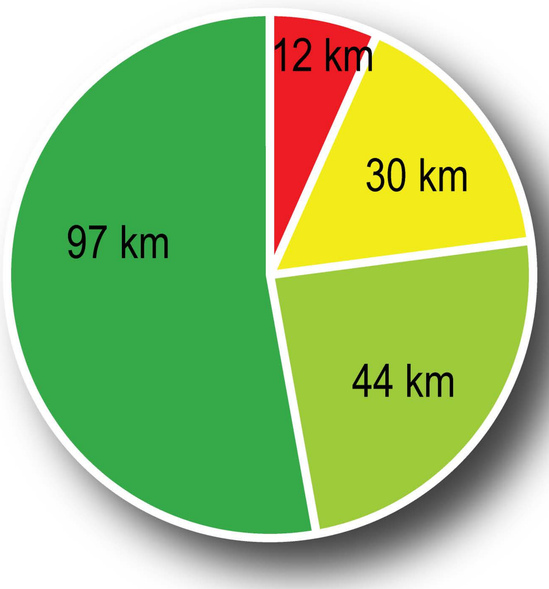
UGC 1A:



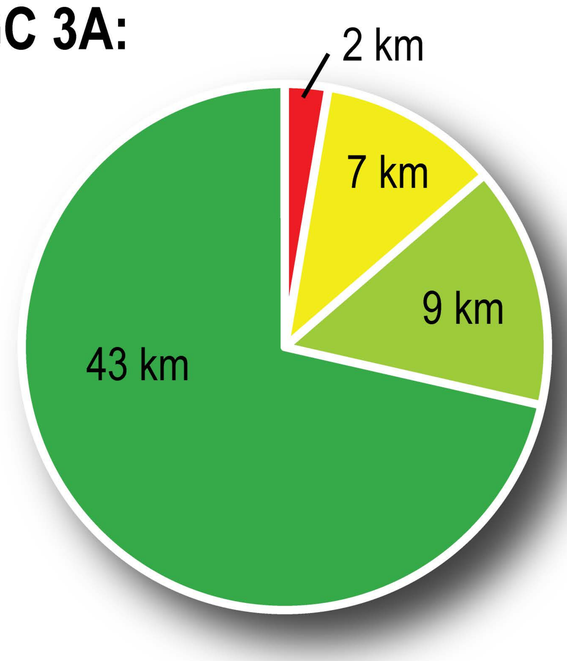
UGC 1B:



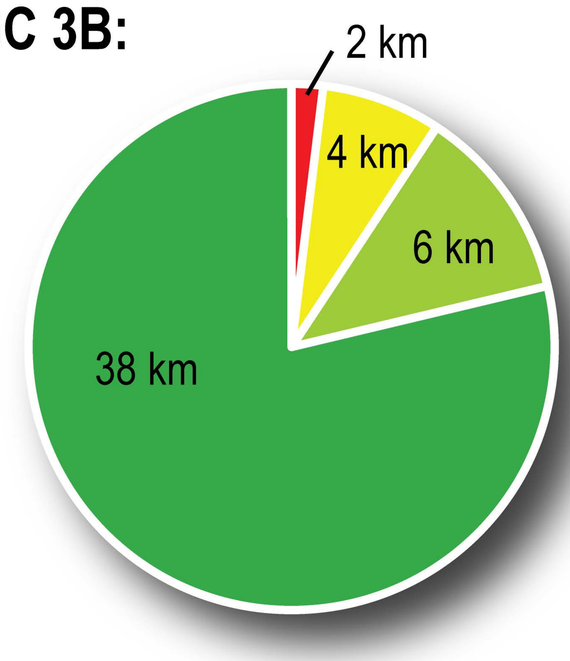
UGC 2:



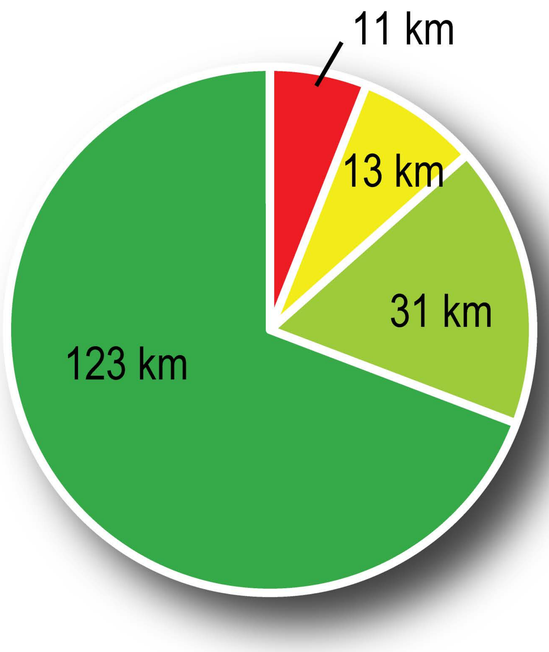
UGC 3A:



UGC 3B:



UGC 4:



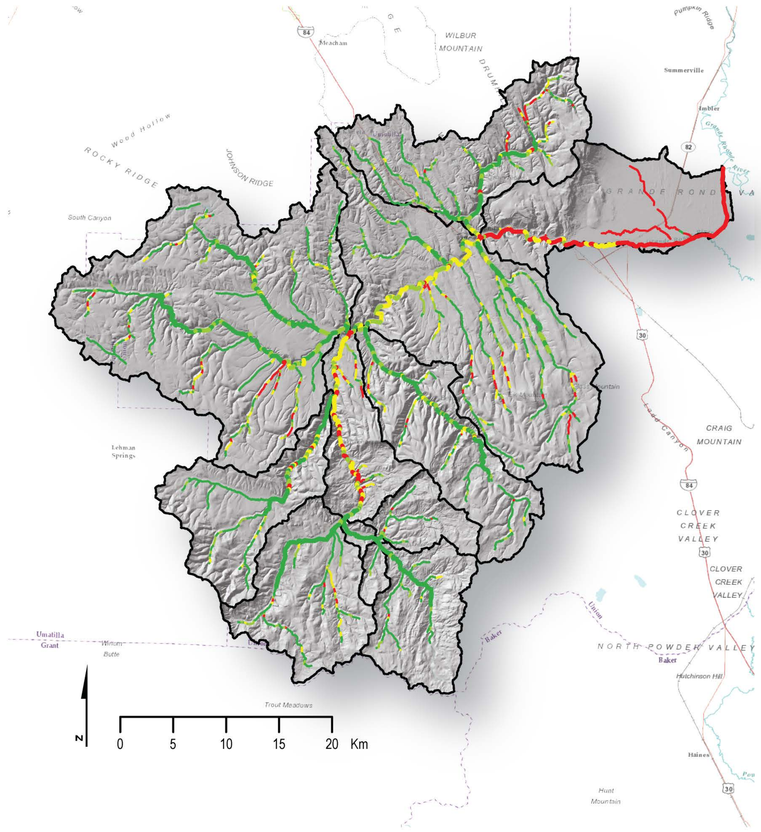
RVCA - Riparian Vegetation Condition Assessment

Current Departure from Historic

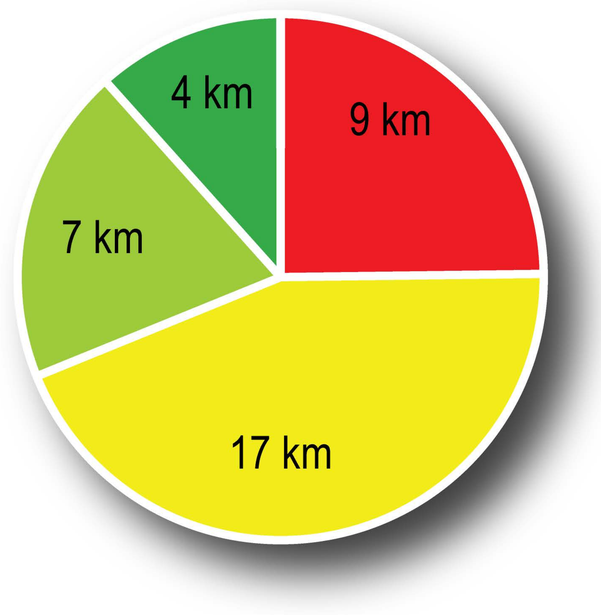
- Large Departure: > 66%
- Significant Departure: 33% to 66%
- Minor Departure: 10% to 33%
- Negligable Departure: < 10%

RIPARIAN CONDITION ASSESSMENT

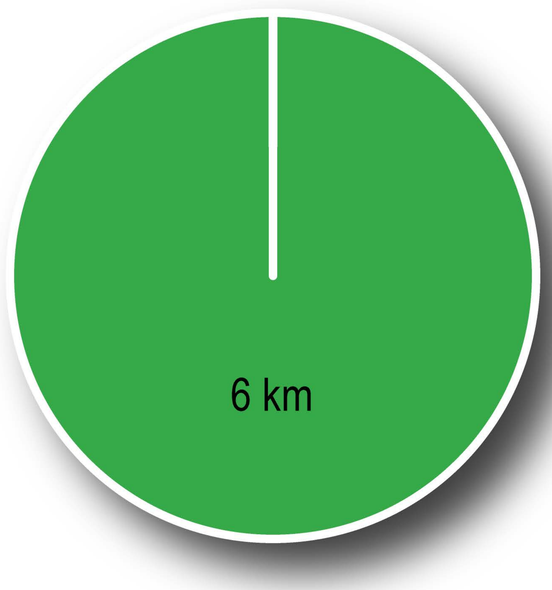
Estimate of current departure from historic within valley bottom



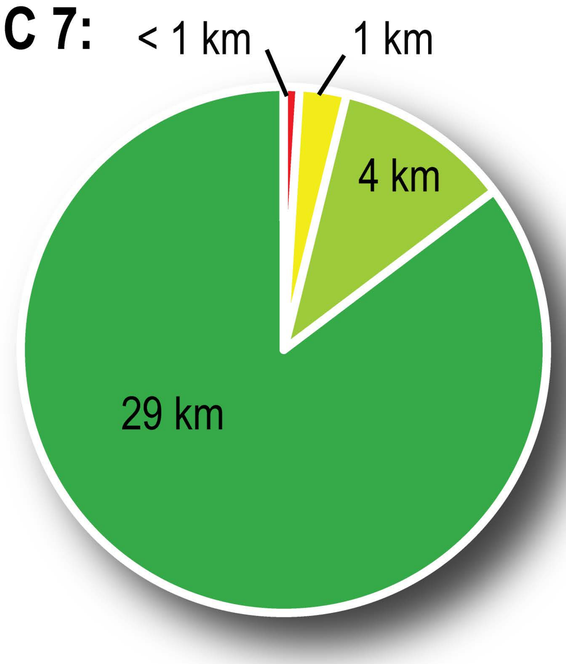
UGC 5:



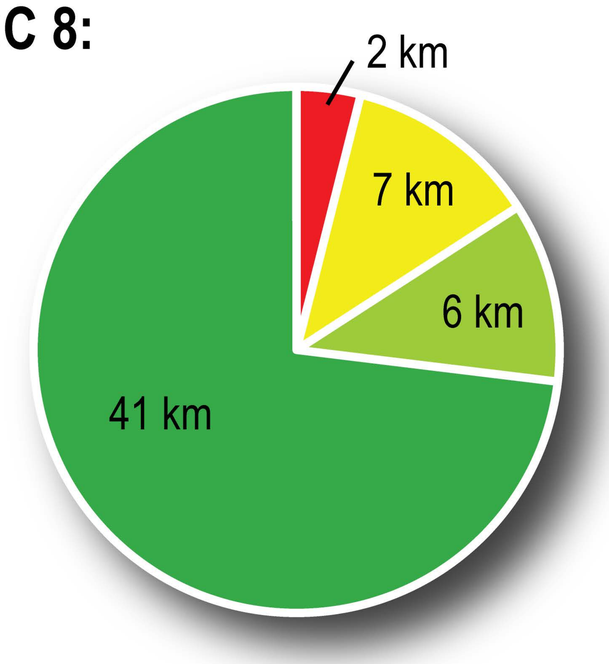
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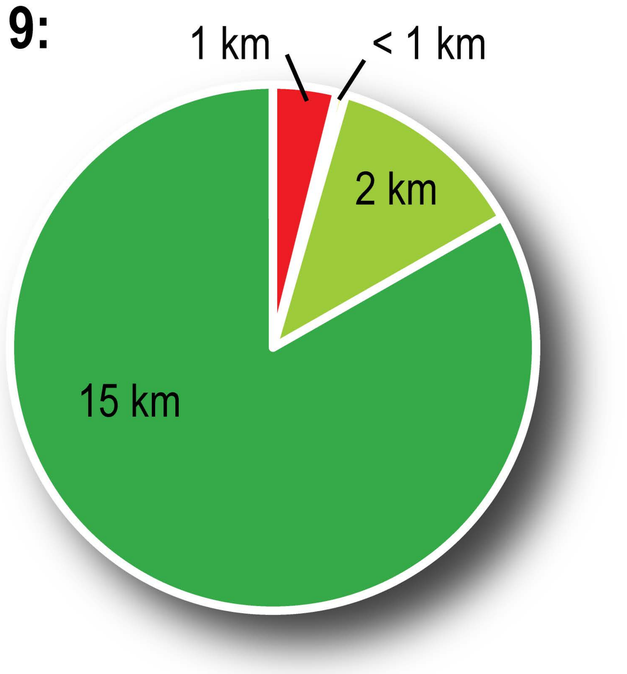
UGC 7:



UGC 8:



UGC 9:



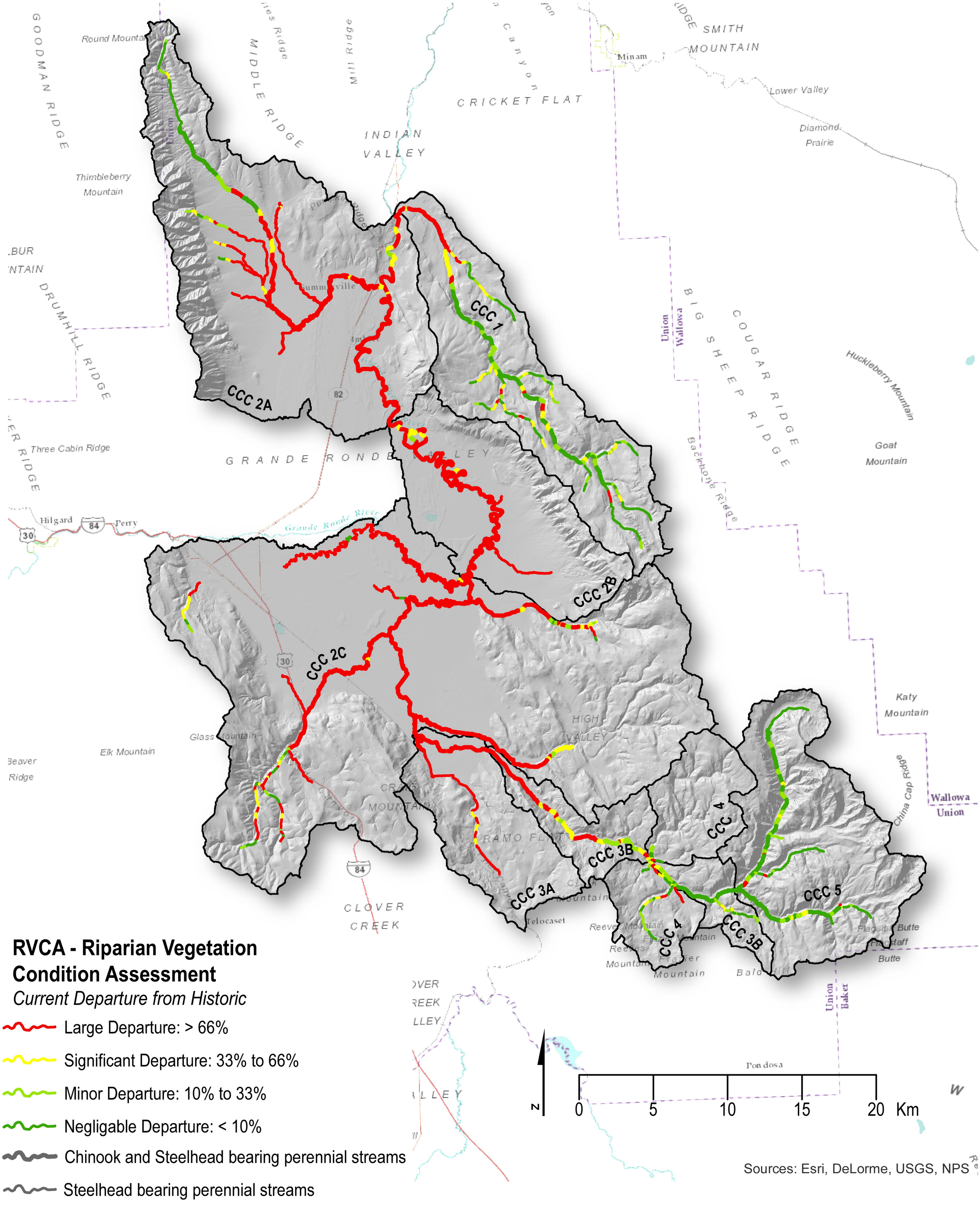
RVCA - Riparian Vegetation Condition Assessment

Current Departure from Historic

- Large Departure: > 66%
- Significant Departure: 33% to 66%
- Minor Departure: 10% to 33%
- Negligable Departure: < 10%

RIPARIAN CONDITION ASSESSMENT

Estimate of current departure from historic within valley bottom



RVCA - Riparian Vegetation Condition Assessment

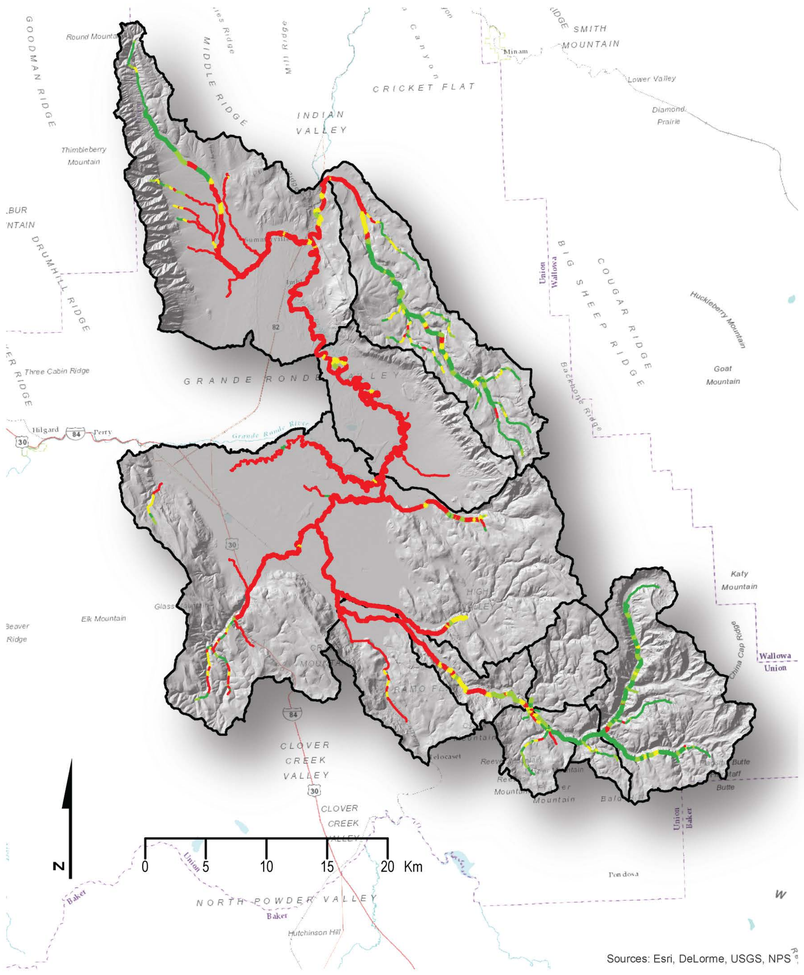
Current Departure from Historic

- Large Departure: > 66%
- Significant Departure: 33% to 66%
- Minor Departure: 10% to 33%
- Negligable Departure: < 10%
- Chinook and Steelhead bearing perennial streams
- Steelhead bearing perennial streams

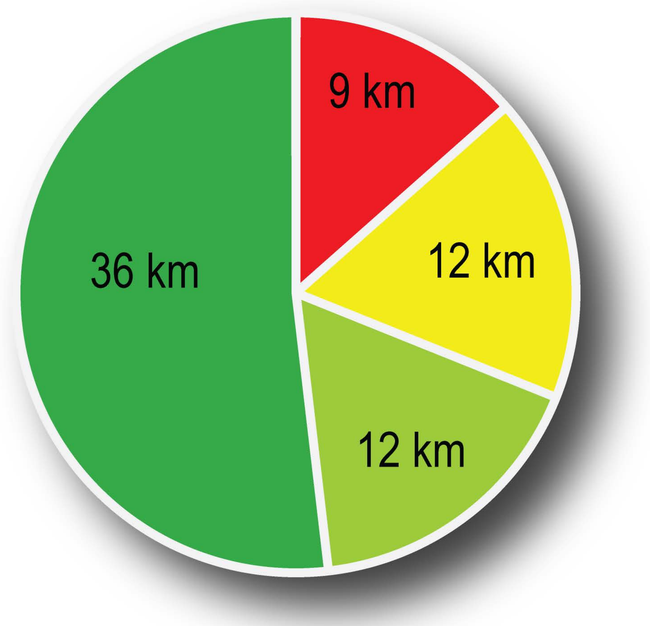
Sources: Esri, DeLorme, USGS, NPS

RIPARIAN CONDITION ASSESSMENT

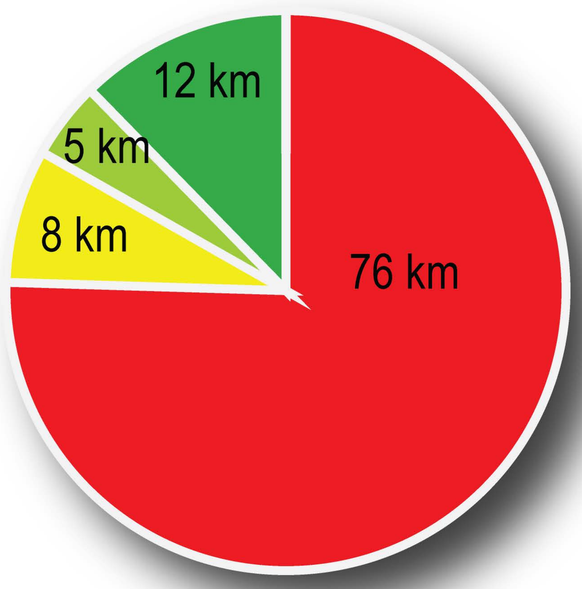
Estimate of Current Departure from Historic within Valley Bottom



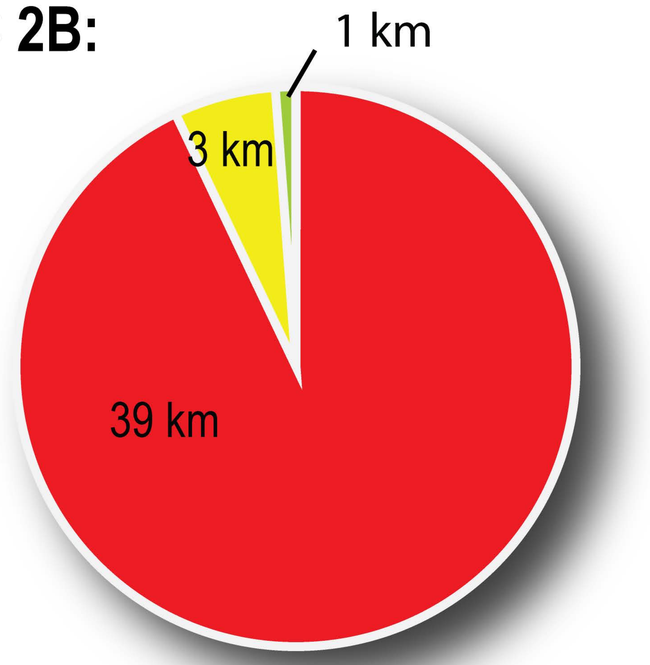
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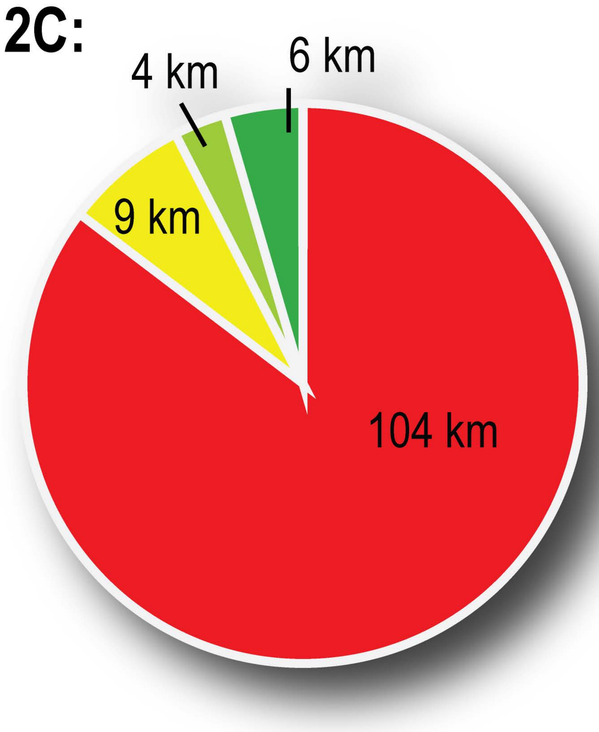
CCC 2A:



CCC 2B:



CCC 2C:



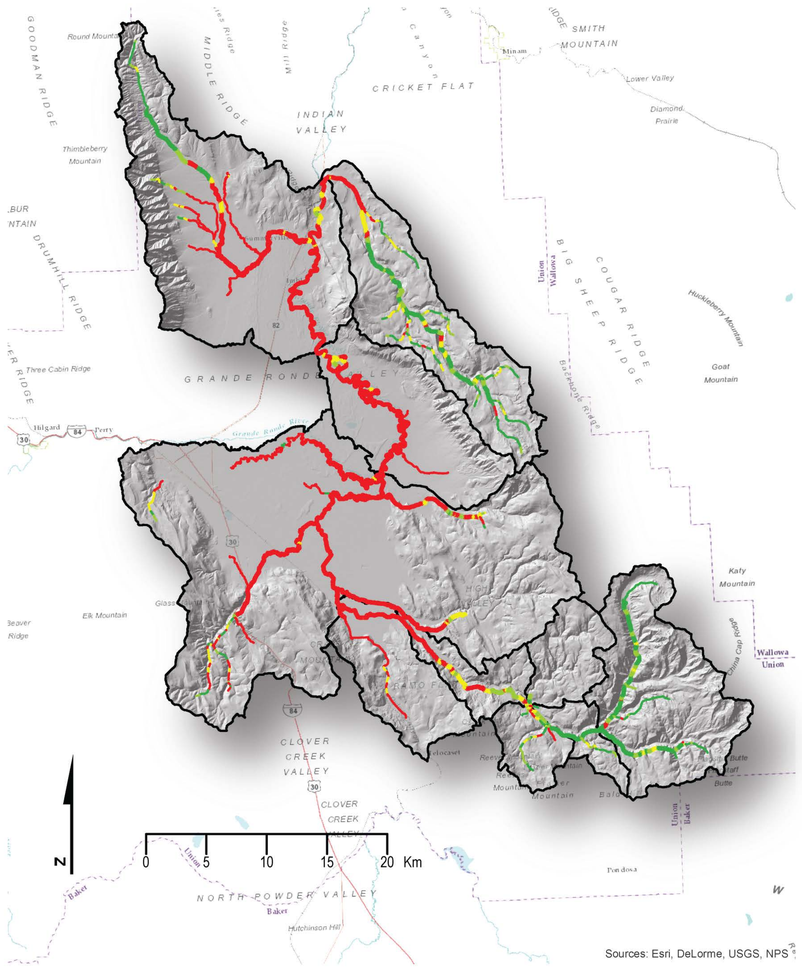
RVCA - Riparian Vegetation Condition Assessment

Current Departure from Historic

- Large Departure: > 66%
- Significant Departure: 33% to 66%
- Minor Departure: 10% to 33%
- Negligable Departure: < 10%

RIPARIAN CONDITION ASSESSMENT

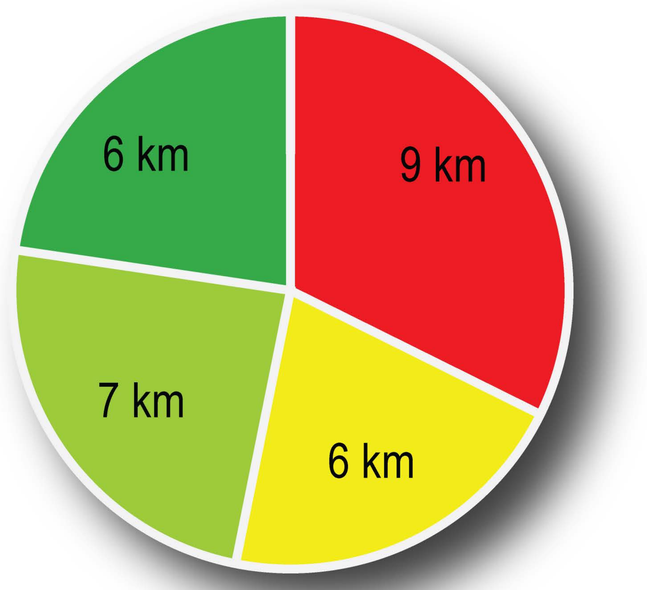
Estimate of Current Departure from Historic within Valley Bottom



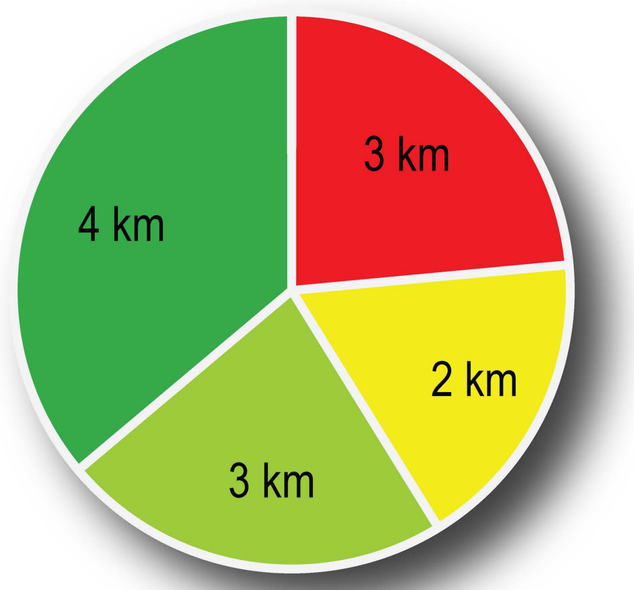
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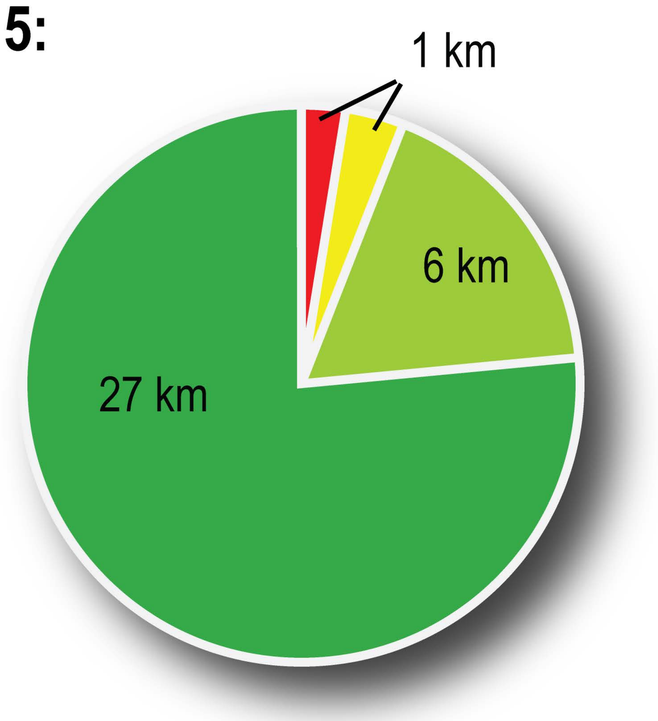
CCC 3B:



CCC 4:



CCC 5:



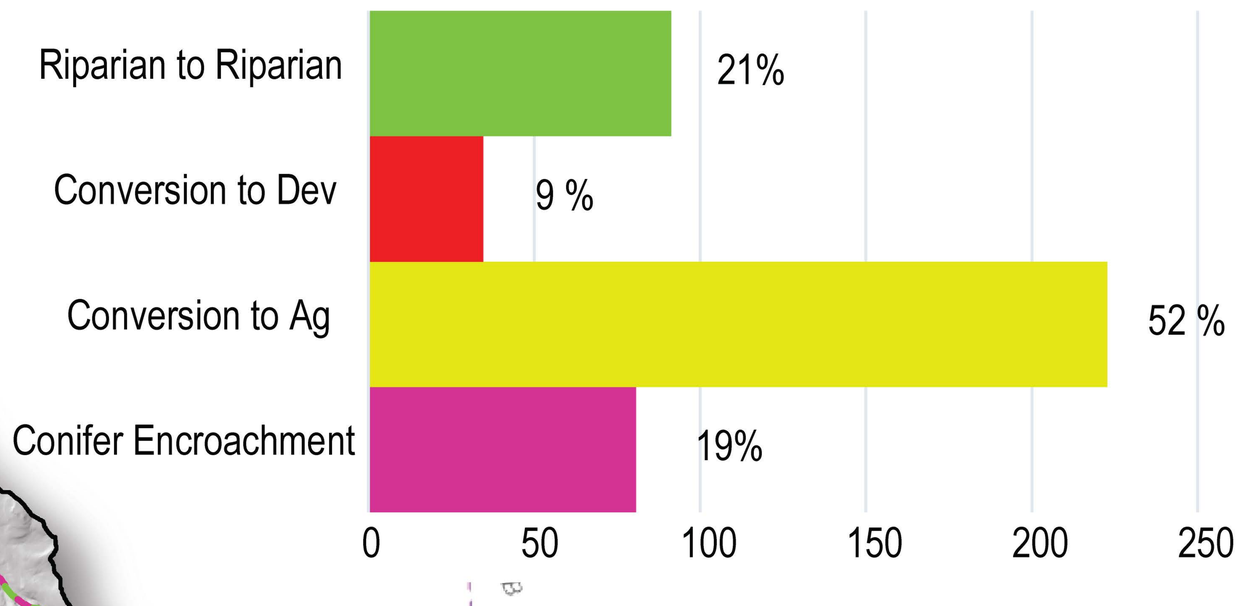
RVCA - Riparian Vegetation Condition Assessment

Current Departure from Historic

- Large Departure: > 66%
- Significant Departure: 33% to 66%
- Minor Departure: 10% to 33%
- Negligable Departure: < 10%

RIPARIAN CONVERSION

Causes for departure from historic



RVCA - Riparian Conversion

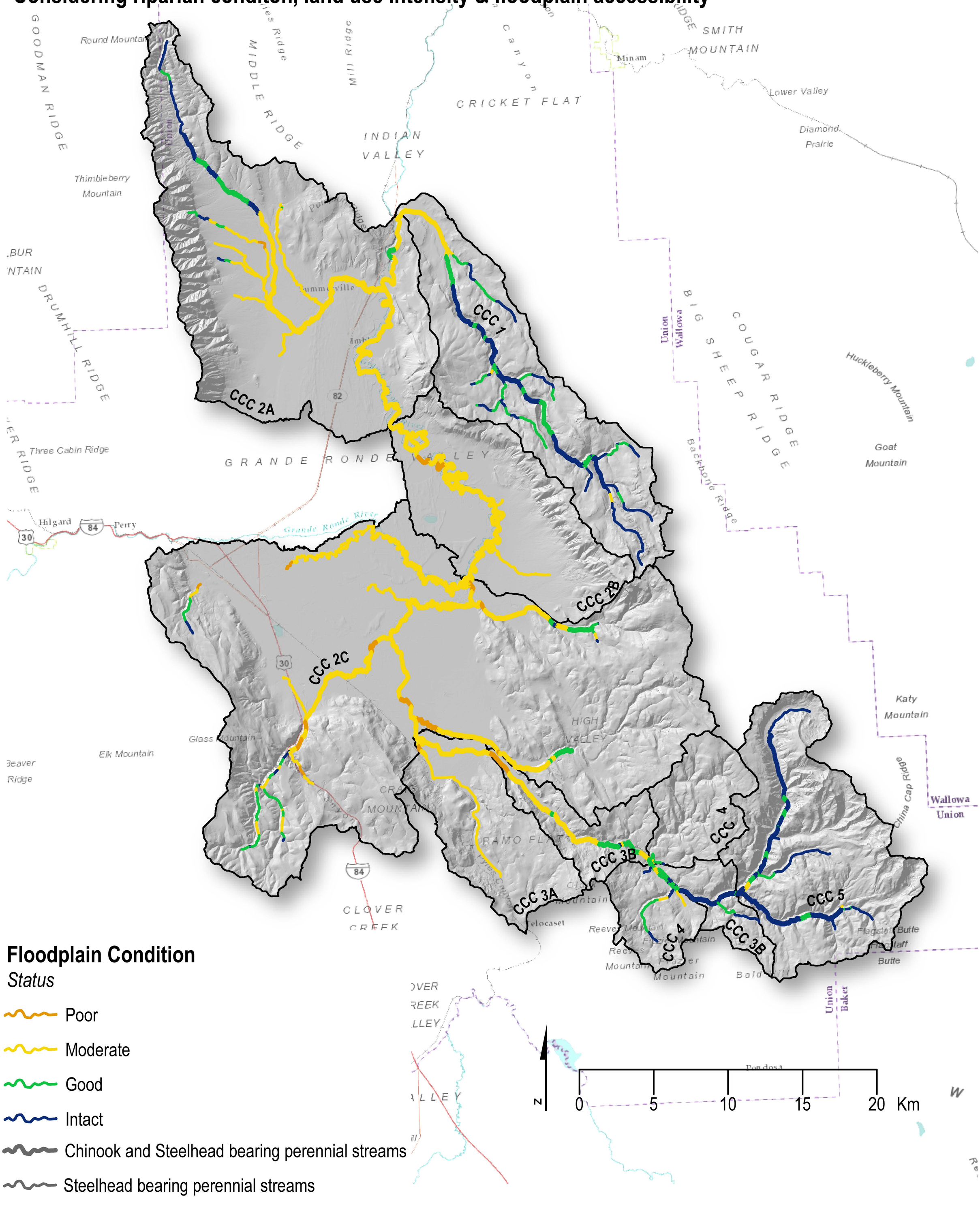
Historic to Existing Riparian Conversion Type

- Conifer Encroachment
- Conversion to Agriculture
- Conversion to Developed
- Riparian to Riparian
- Upland Encroachment
- Chinook and Steelhead bearing perennial streams
- Steelhead bearing perennial streams

Sources: Esri, DeLorme, USGS, NPS

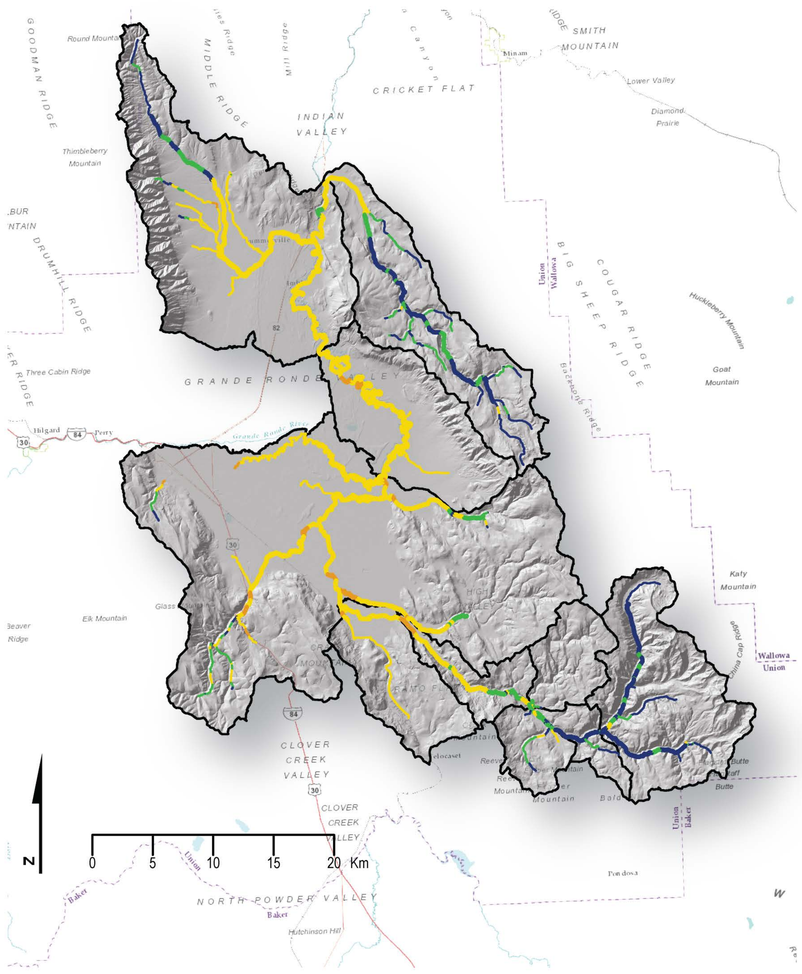
FLOODPLAIN CONDITION ASSESSMENT

Considering riparian conditon, land use intensity & floodplain accessibility

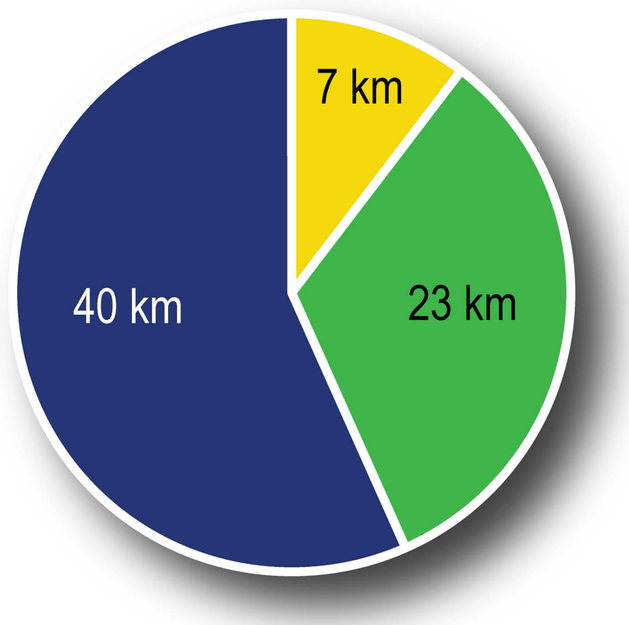


FLOODPLAIN CONDITION ASSESSMENT

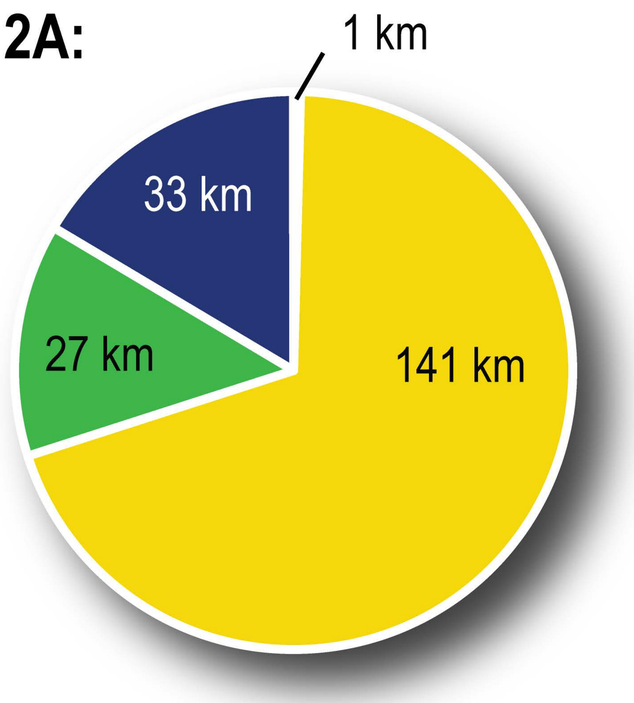
Considering riparian conditon, land use intensity & floodplain accessibility



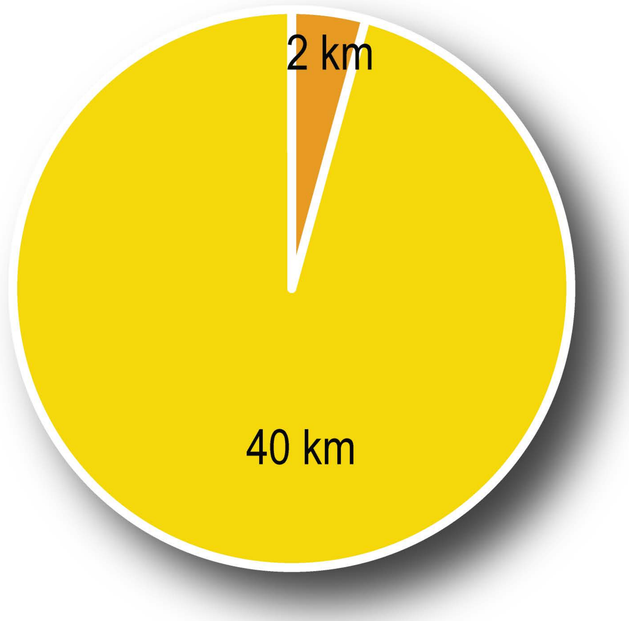
CCC 1:



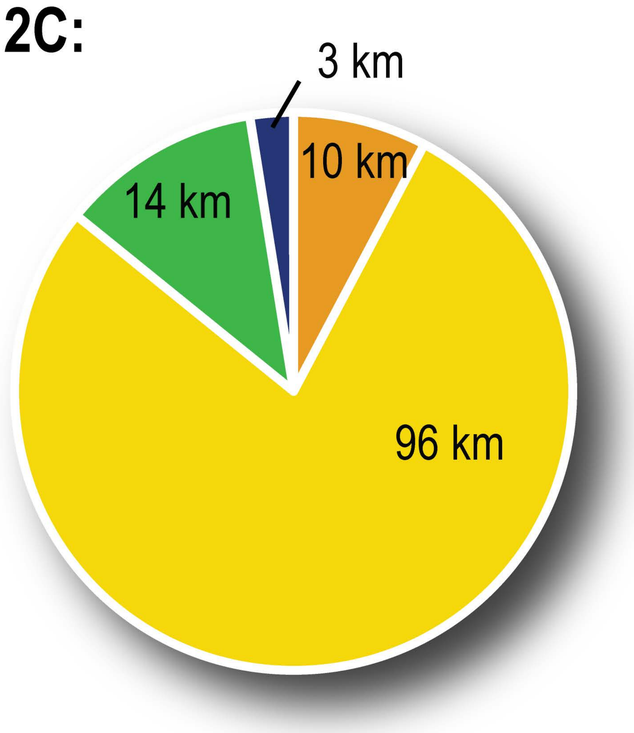
CCC 2A:



CCC 2B:



CCC 2C:



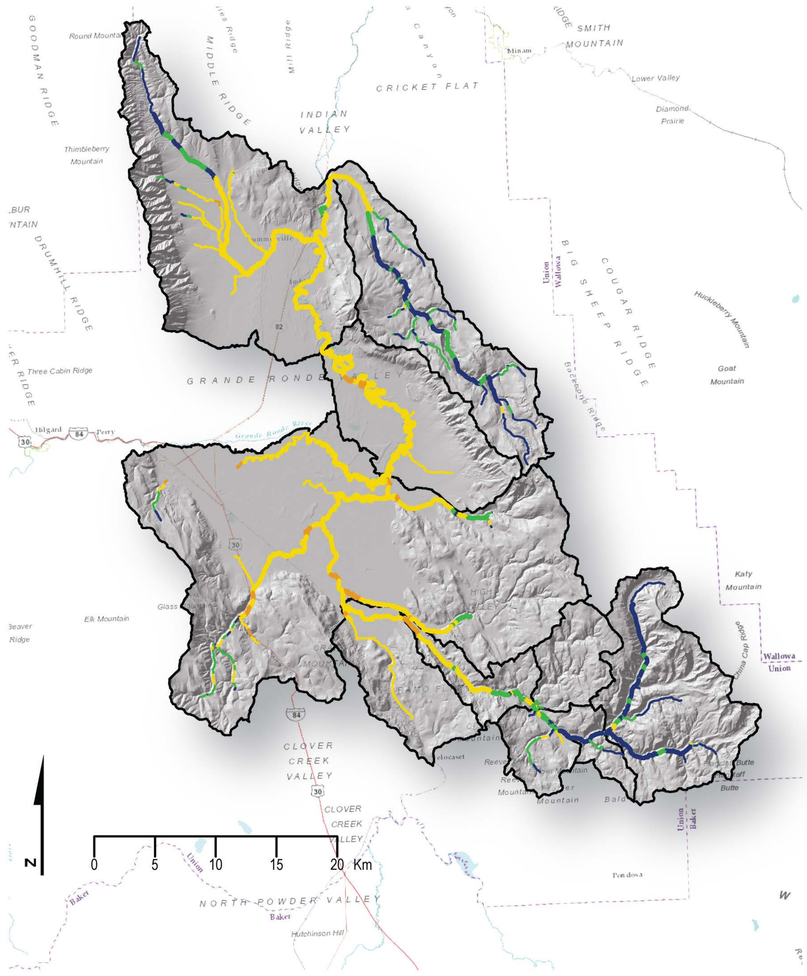
Floodplain Condition

Status

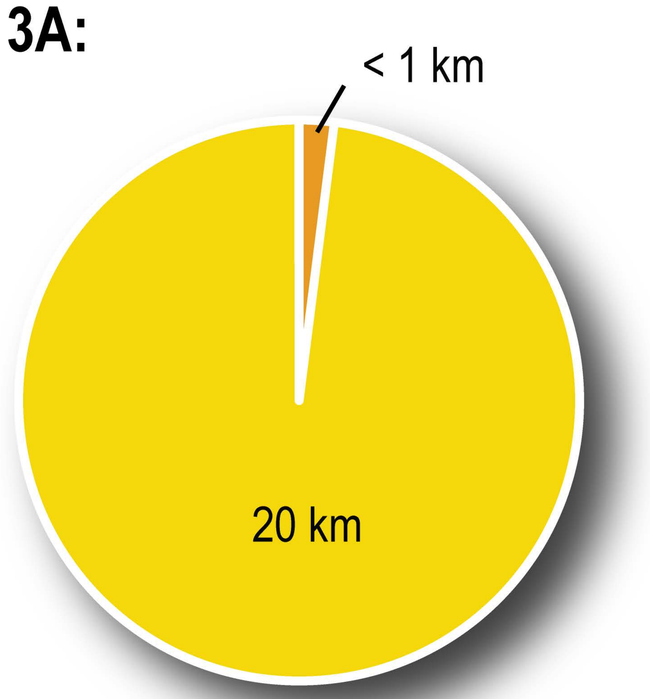
- Poor
- Moderate
- Good
- Intact

FLOODPLAIN CONDITION ASSESSMENT

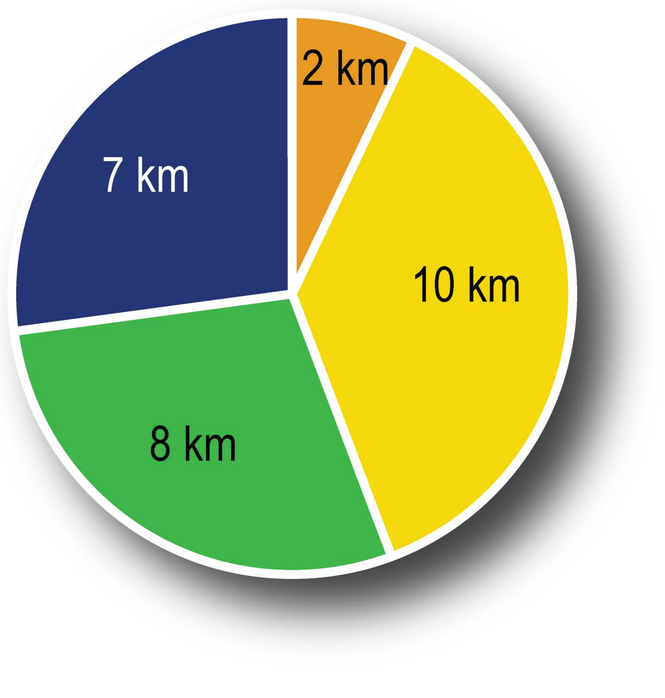
Considering riparian conditon, land use intensity & floodplain accessibility



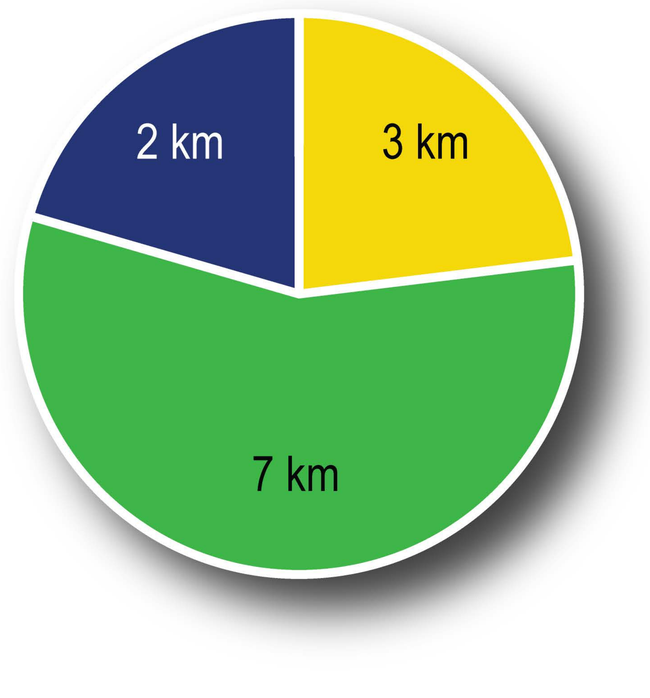
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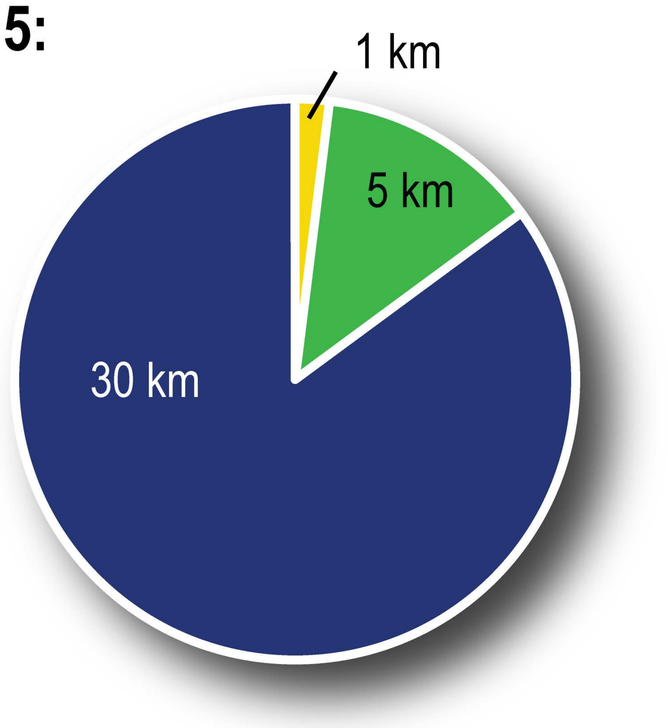
CCC 3B:



CCC 4:



CCC 5:

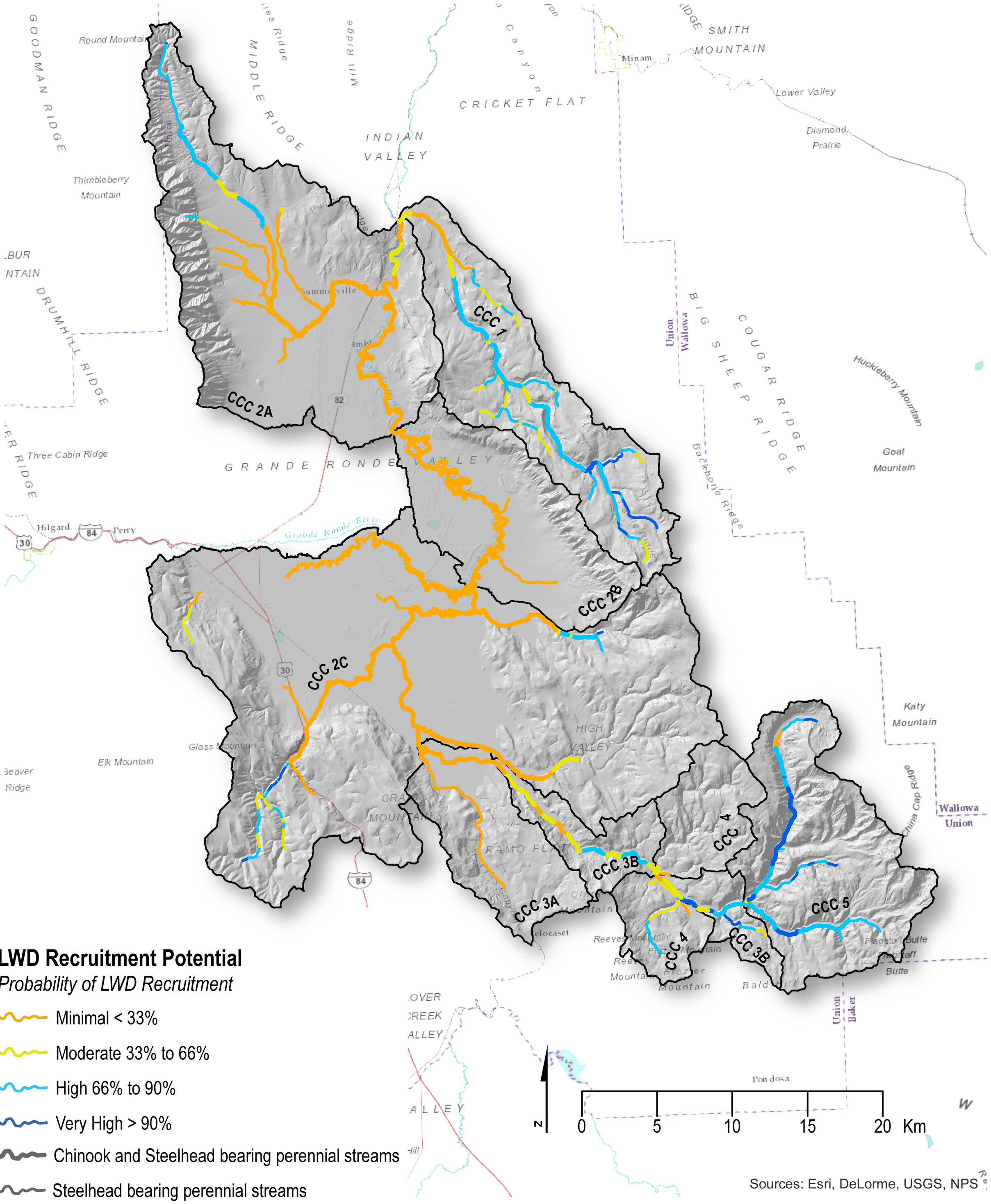


Floodplain Condition

Status

- Poor
- Moderate
- Good
- Intact

LARGE WOODY DEBRIS RECRUITMENT POTENTIAL



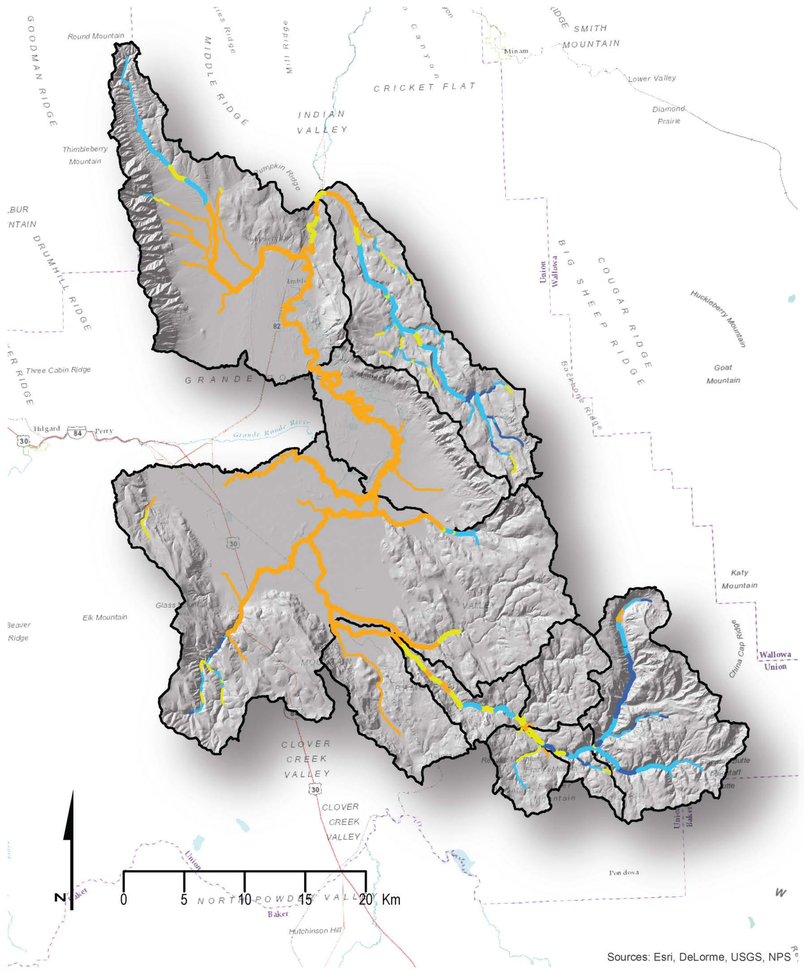
LWD Recruitment Potential

Probability of LWD Recruitment

- Minimal < 33%
- Moderate 33% to 66%
- High 66% to 90%
- Very High > 90%
- Chinook and Steelhead bearing perennial streams
- Steelhead bearing perennial streams

Sources: Esri, DeLorme, USGS, NPS

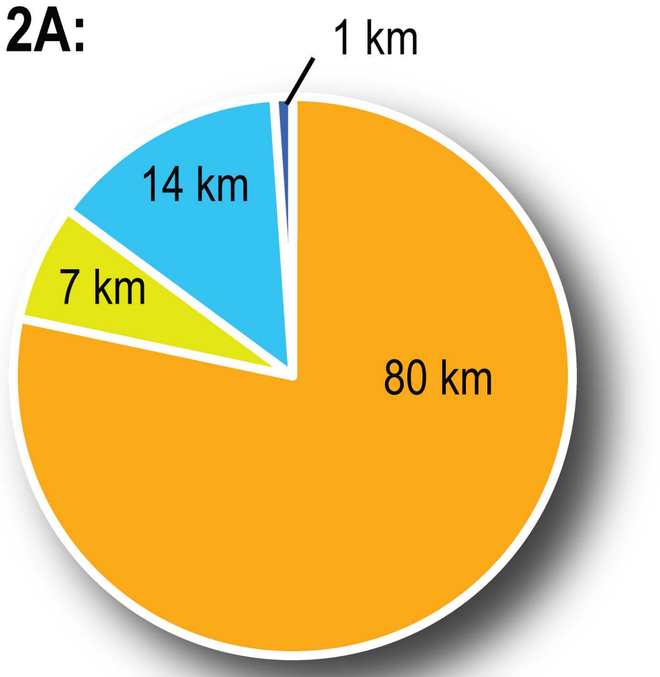
LARGE WOODY DEBRIS RECRUITMENT POTENTIAL



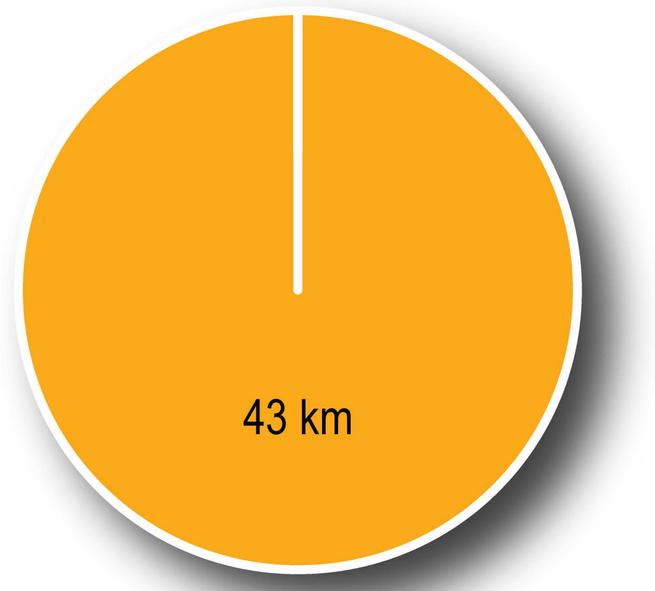
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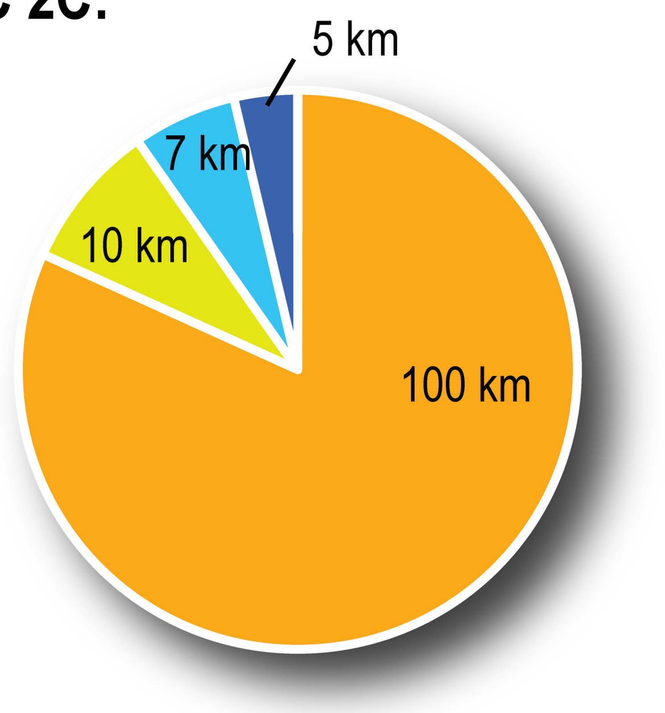
CCC 2A:



CCC 2B:



CCC 2C:

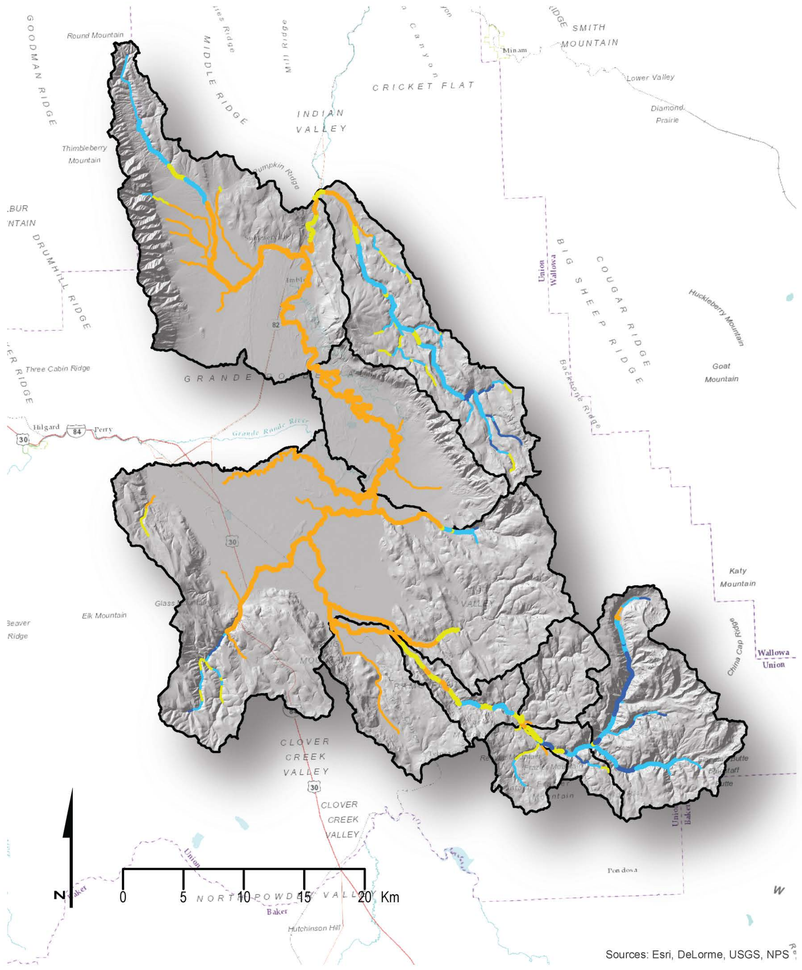


LWD Recruitment Potential

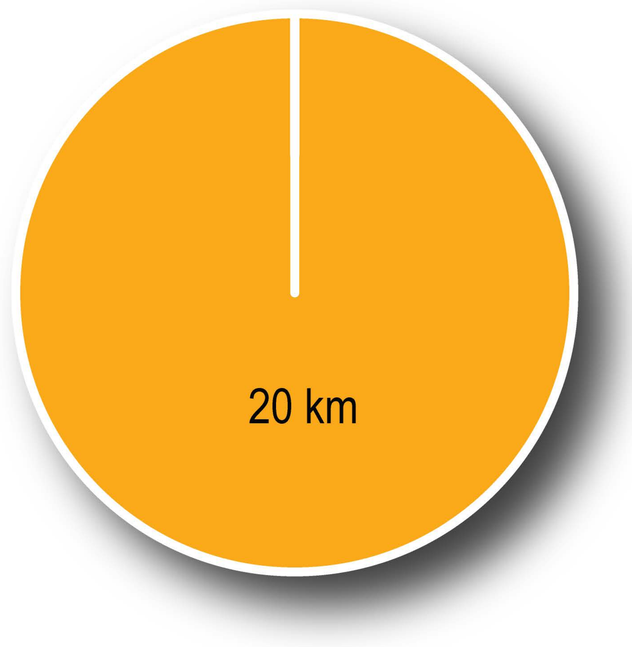
Probability of LWD Recruitment

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LARGE WOODY DEBRIS RECRUITMENT POTENTIAL



CCC 3A:



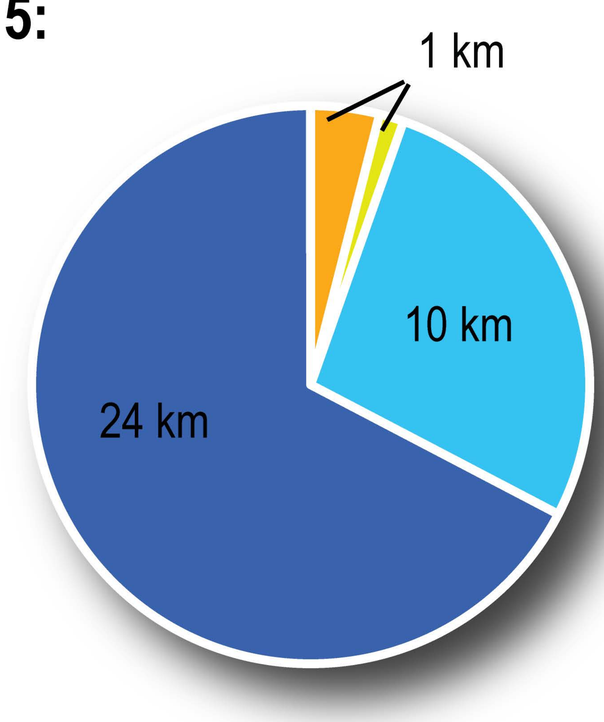
CCC 3B:



CCC 4:



CCC 5:



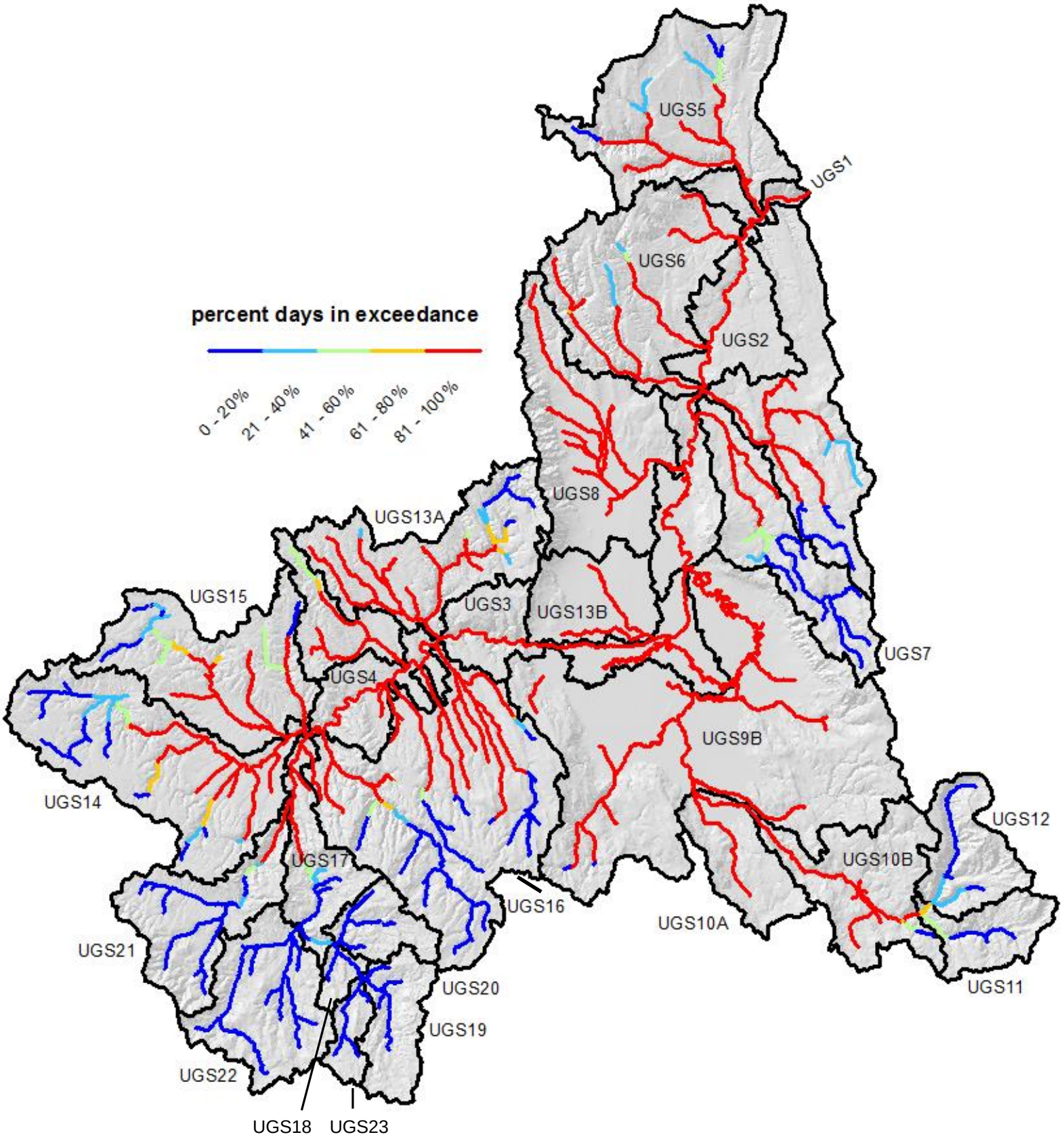
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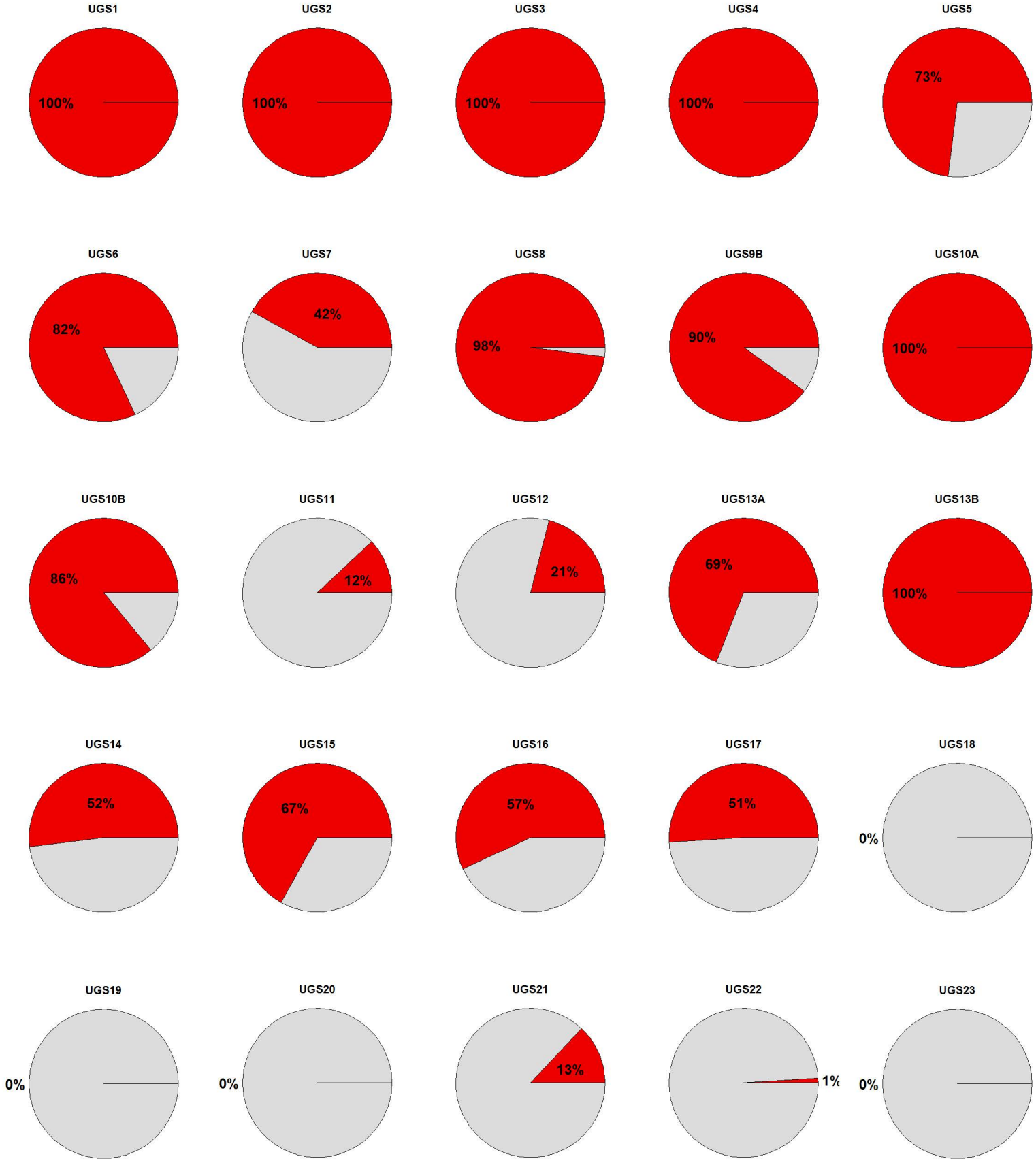
Upper Grande Ronde 2011

Percent summer days (20 July – 31 August) in exceedance of 18°C maximum stream temperature
Steelhead extent



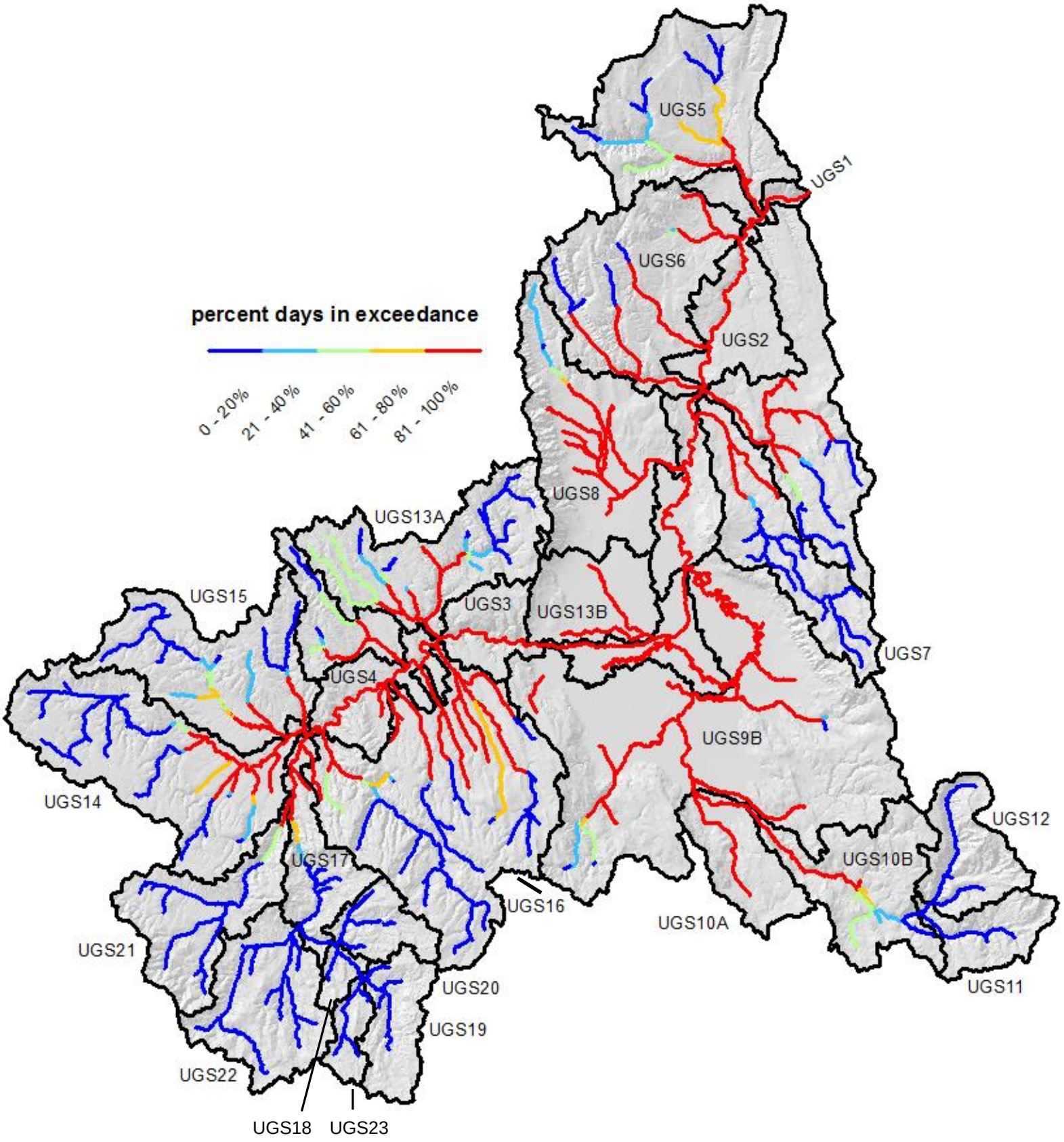
Upper Grande Ronde 2011

Percent summer days (20 July – 31 August) in exceedance of 18°C maximum stream temperature
Steelhead extent



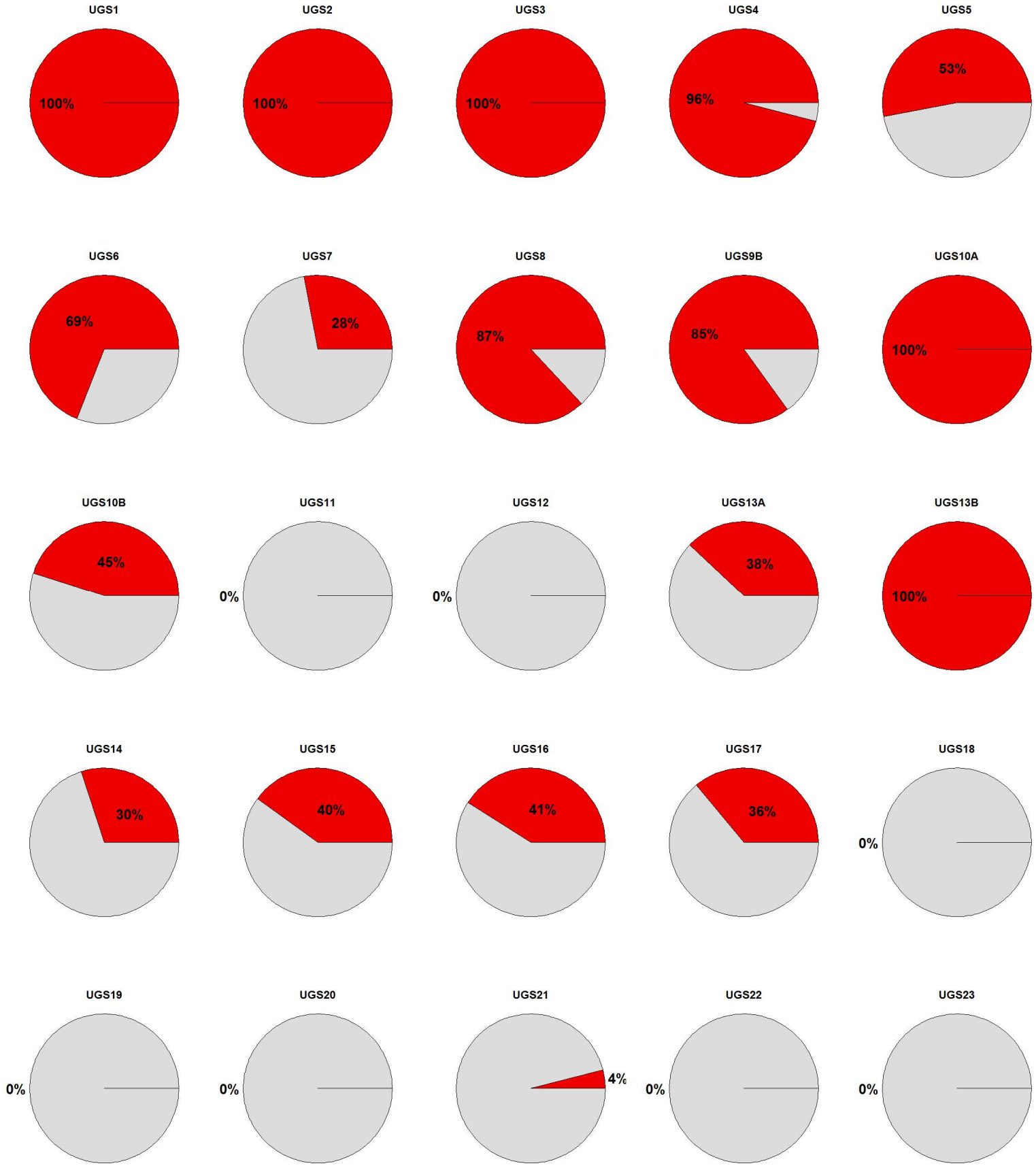
Upper Grande Ronde 2011

Percent summer days (20 July – 31 August) in exceedance of 20°C maximum stream temperature
Steelhead extent



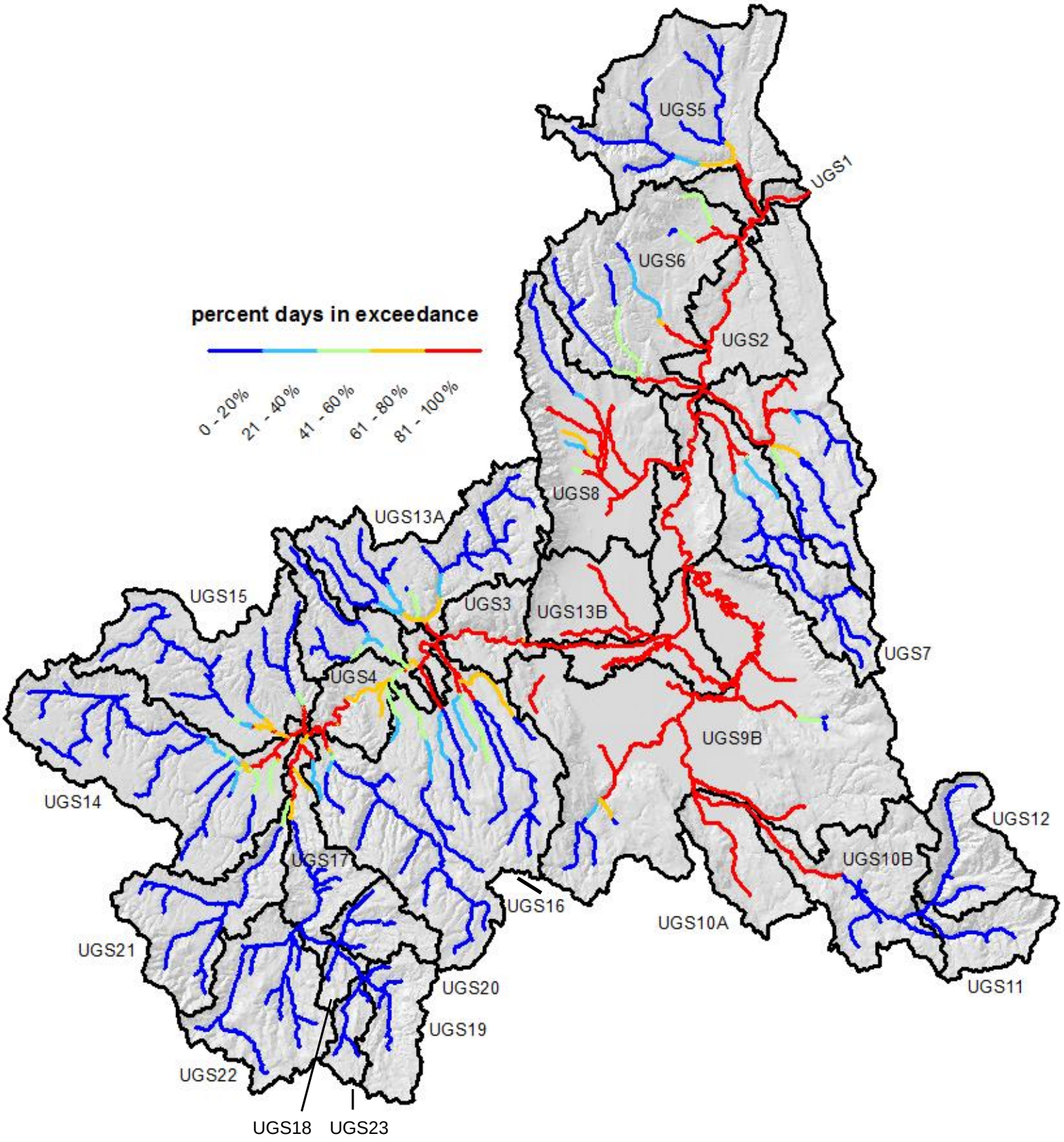
Upper Grande Ronde 2011

Percent summer days (20 July – 31 August) in exceedance of 20°C maximum stream temperature
Steelhead extent



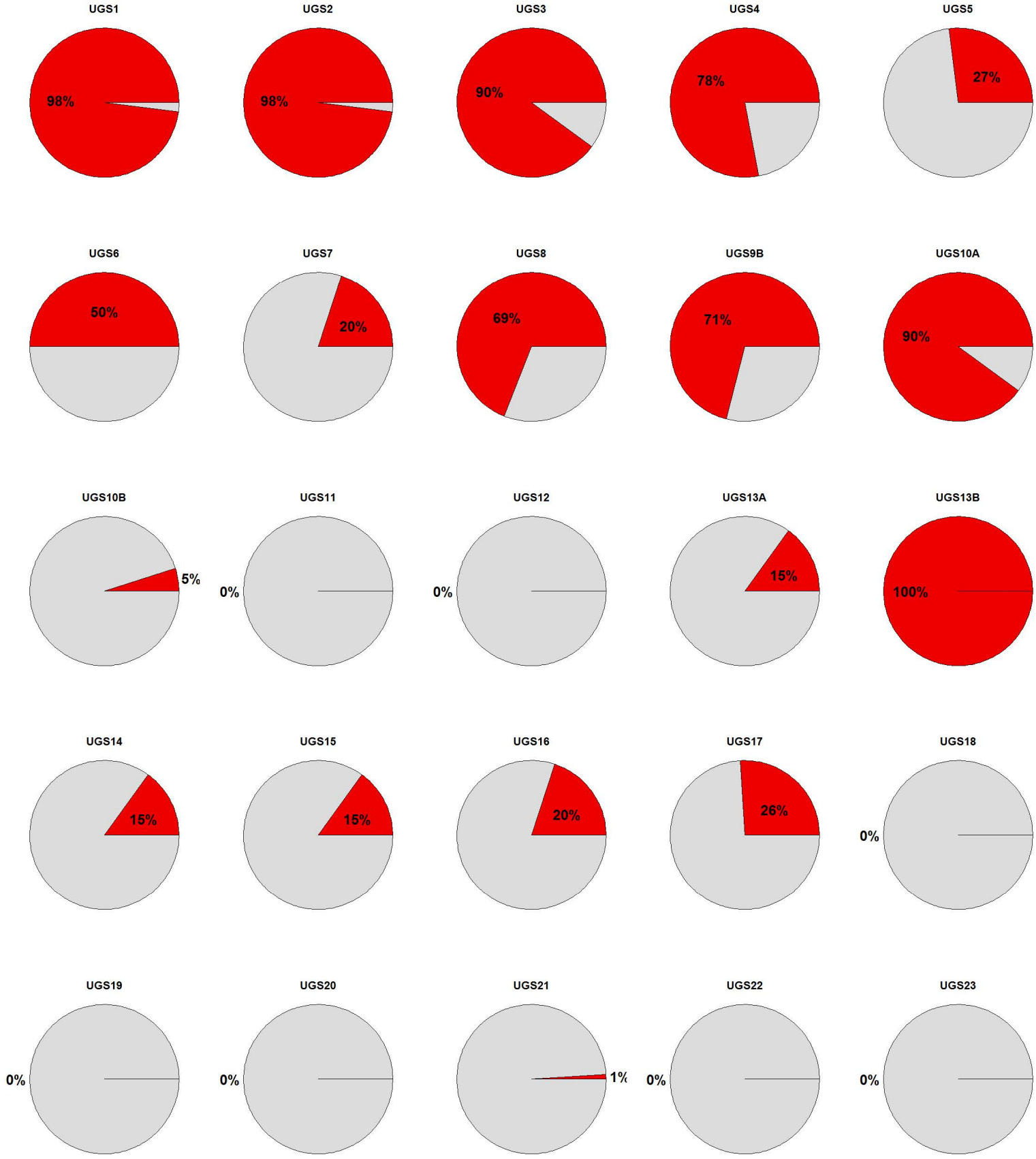
Upper Grande Ronde 2011

Percent summer days (20 July – 31 August) in exceedance of 22°C maximum stream temperature
Steelhead extent



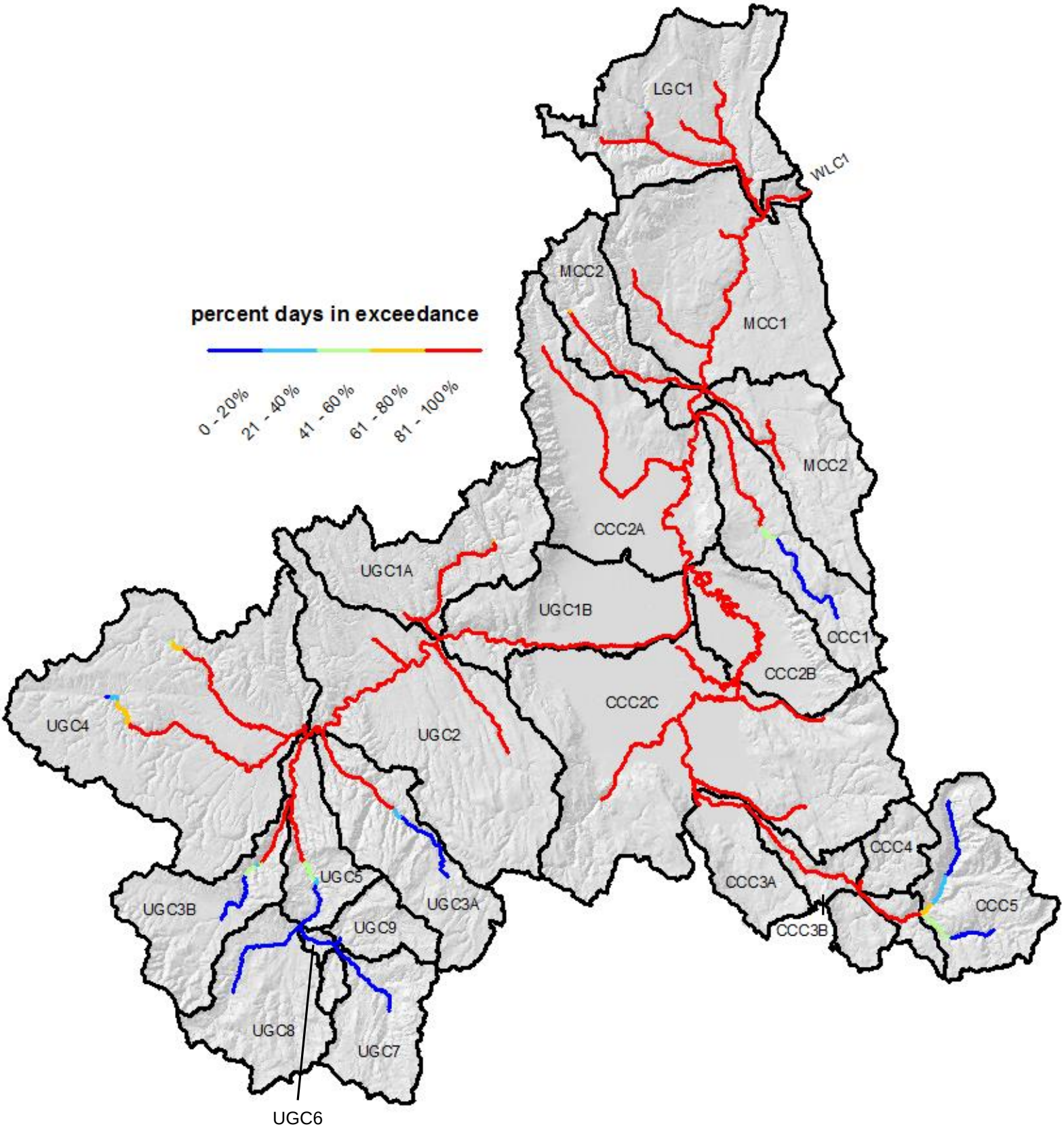
Upper Grande Ronde 2011

Percent summer days (20 July – 31 August) in exceedance of 22°C maximum stream temperature
Steelhead extent



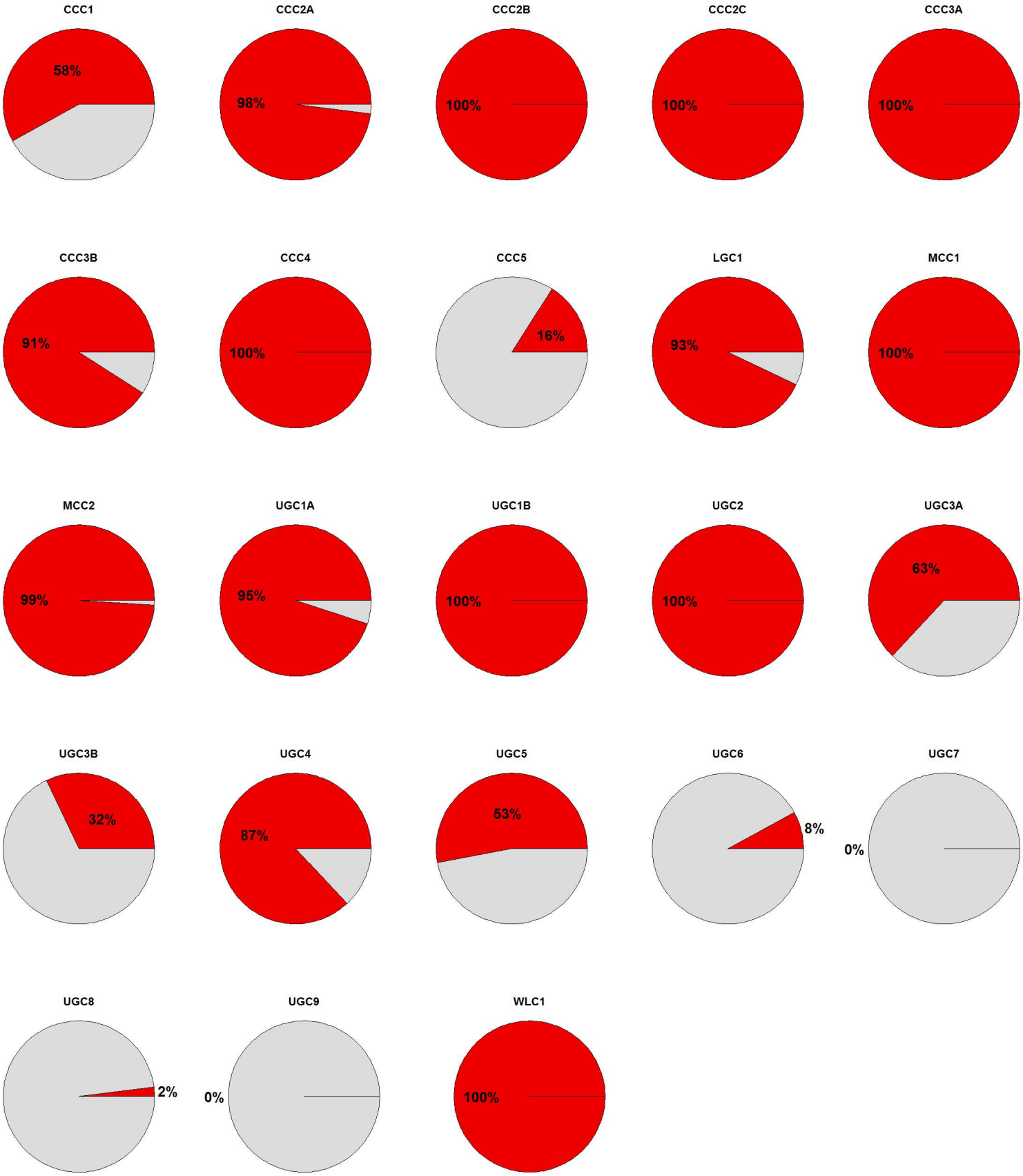
Upper Grande Ronde 2011

Percent summer days (20 July – 31 August) in exceedance of 18°C maximum stream temperature
Chinook extent



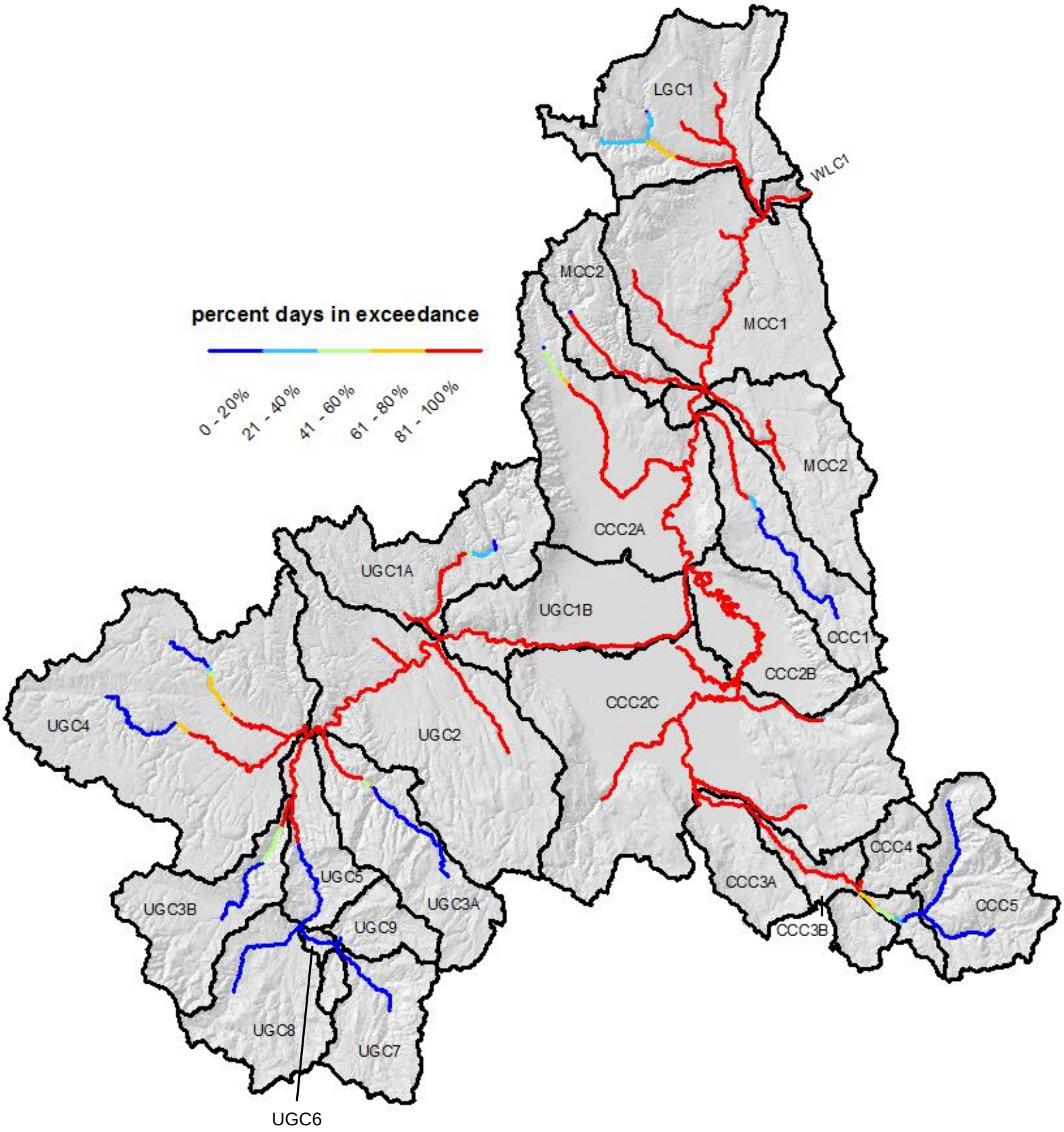
Upper Grande Ronde 2011

Percent summer days (20 July – 31 August) in exceedance of 18°C maximum stream temperature
Chinook extent



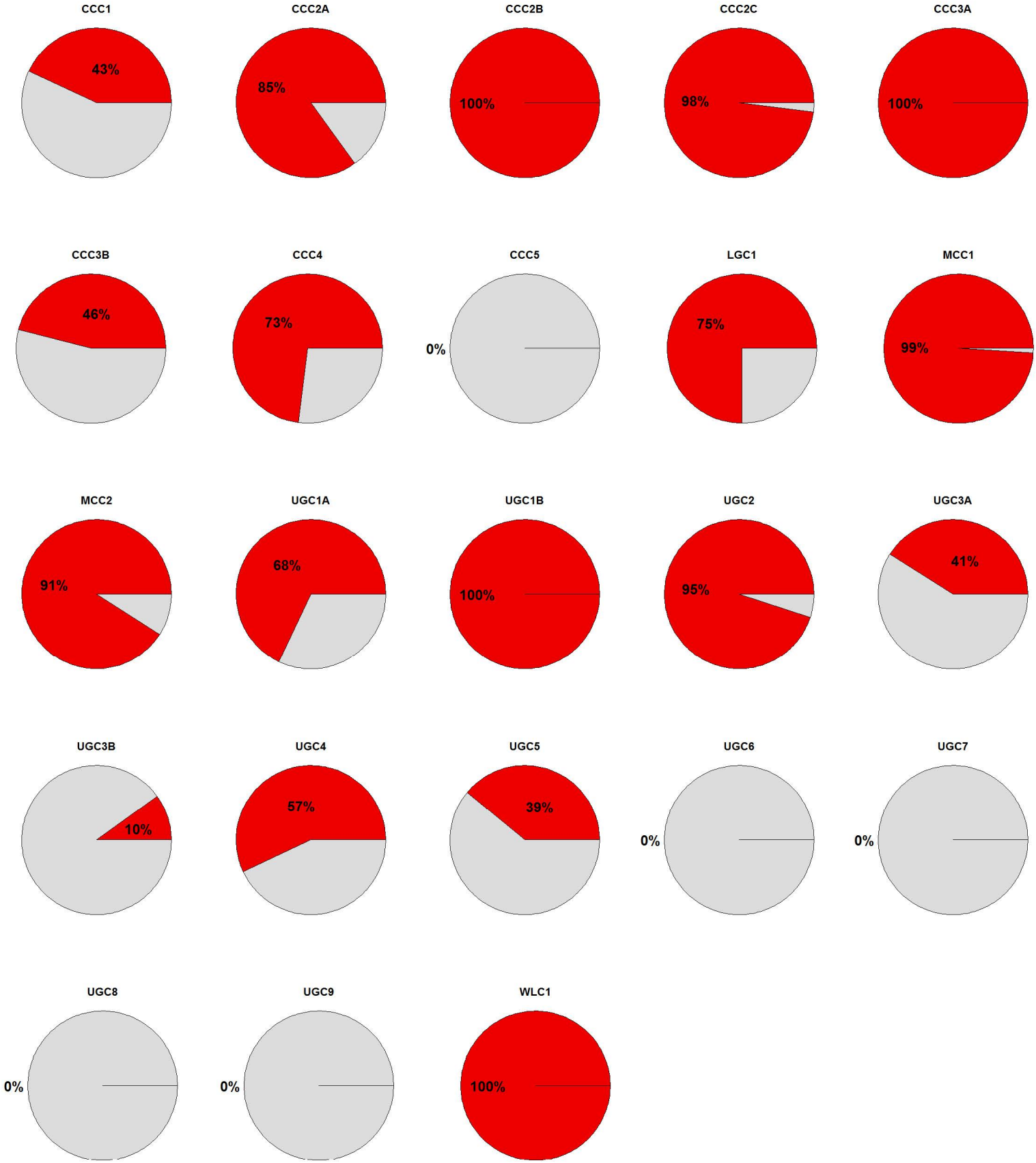
Upper Grande Ronde 2011

Percent summer days (20 July – 31 August) in exceedance of 20°C maximum stream temperature
Chinook extent



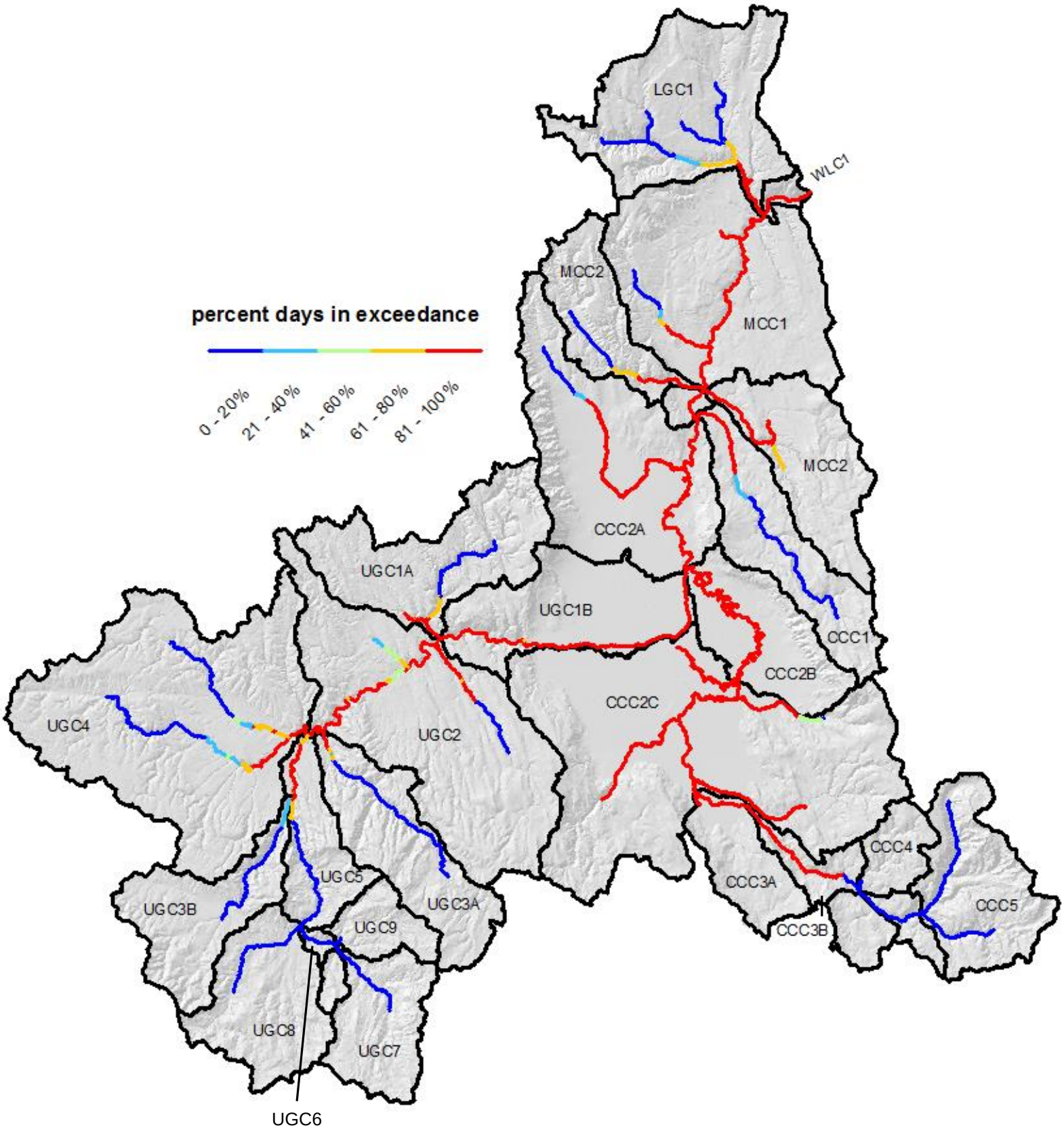
Upper Grande Ronde 2011

Percent summer days (20 July – 31 August) in exceedance of 20°C maximum stream temperature
Chinook extent



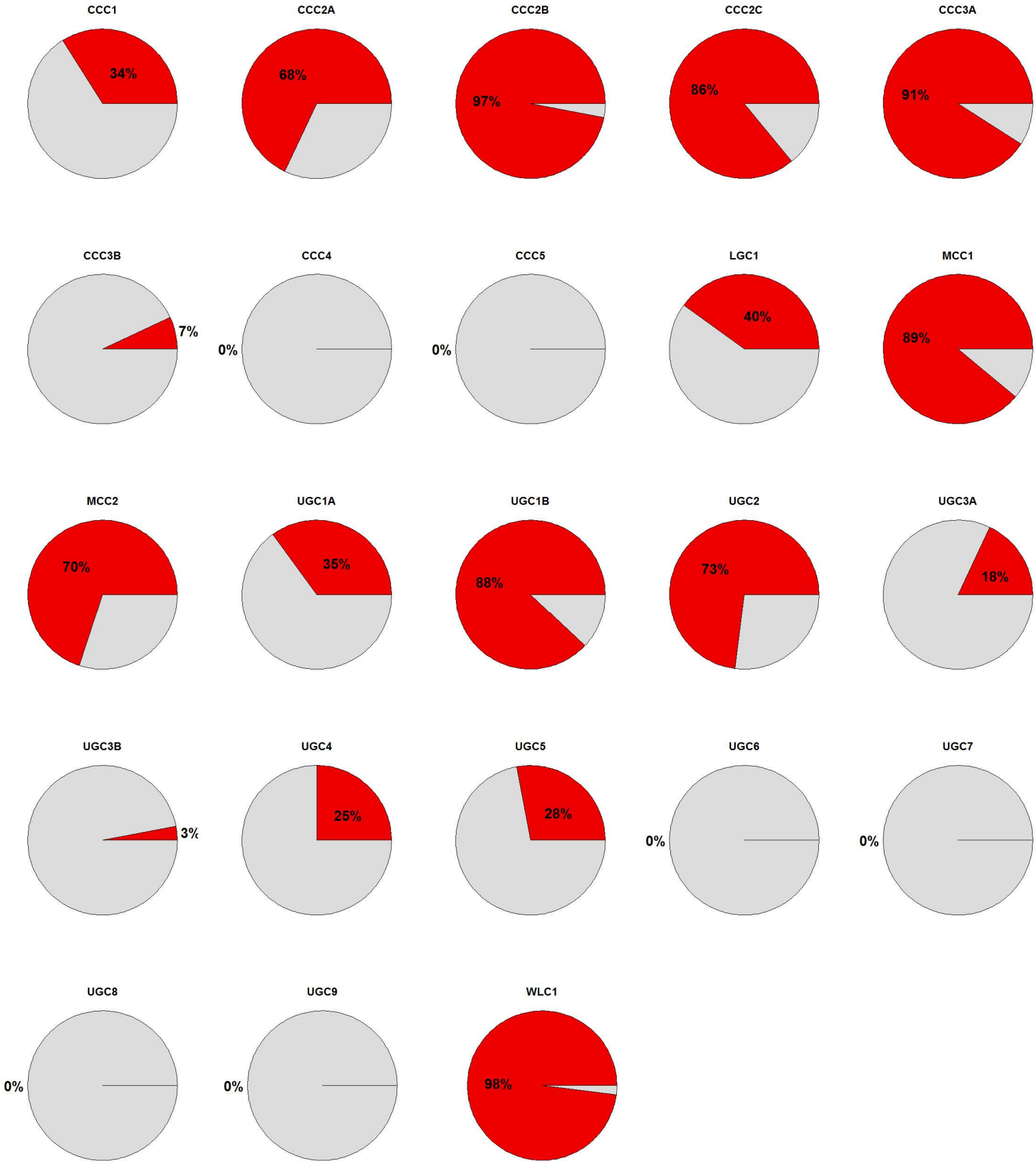
Upper Grande Ronde 2011

Percent summer days (20 July – 31 August) in exceedance of 22°C maximum stream temperature
Chinook extent



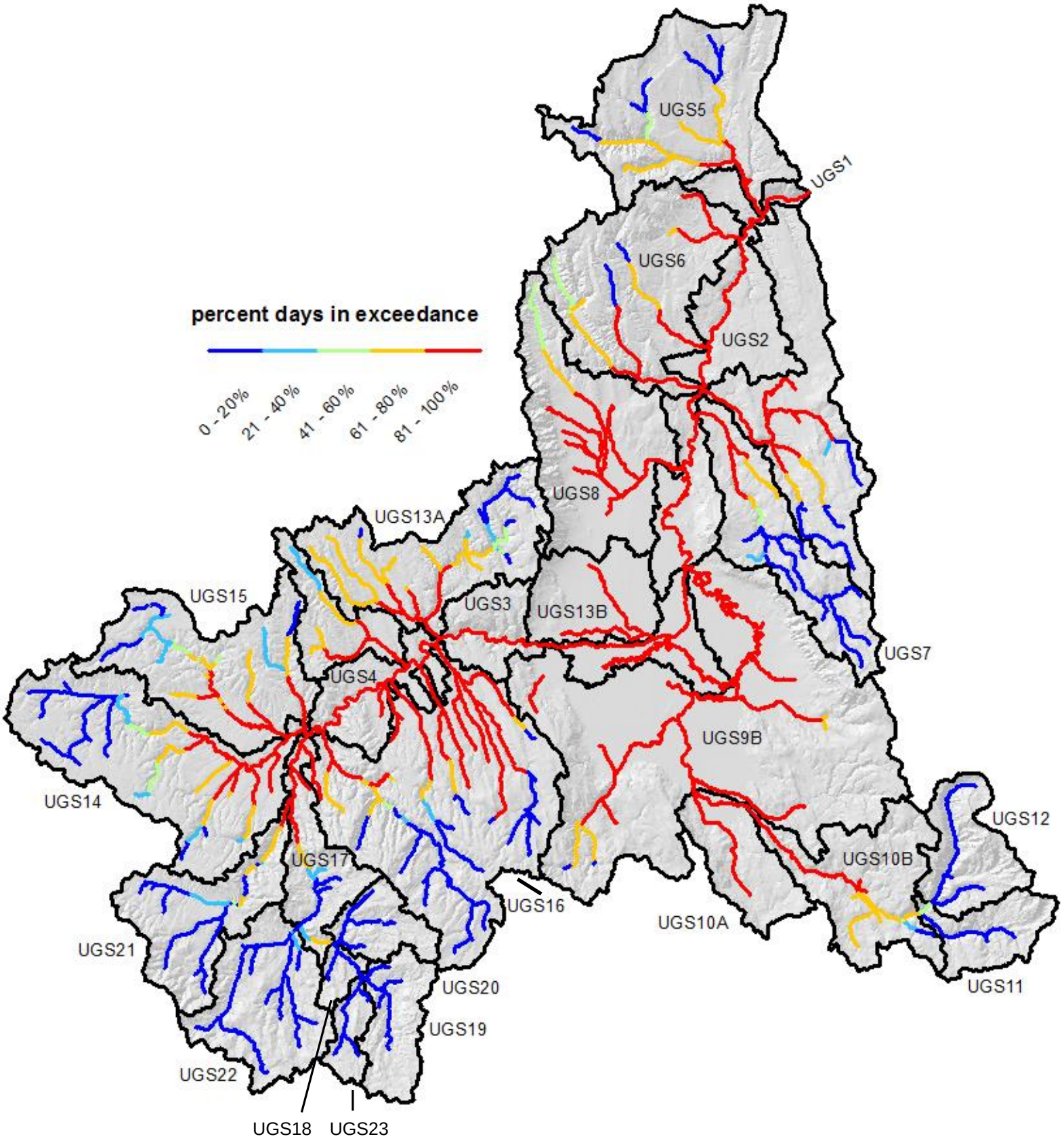
Upper Grande Ronde 2011

Percent summer days (20 July – 31 August) in exceedance of 22°C maximum stream temperature
Chinook extent



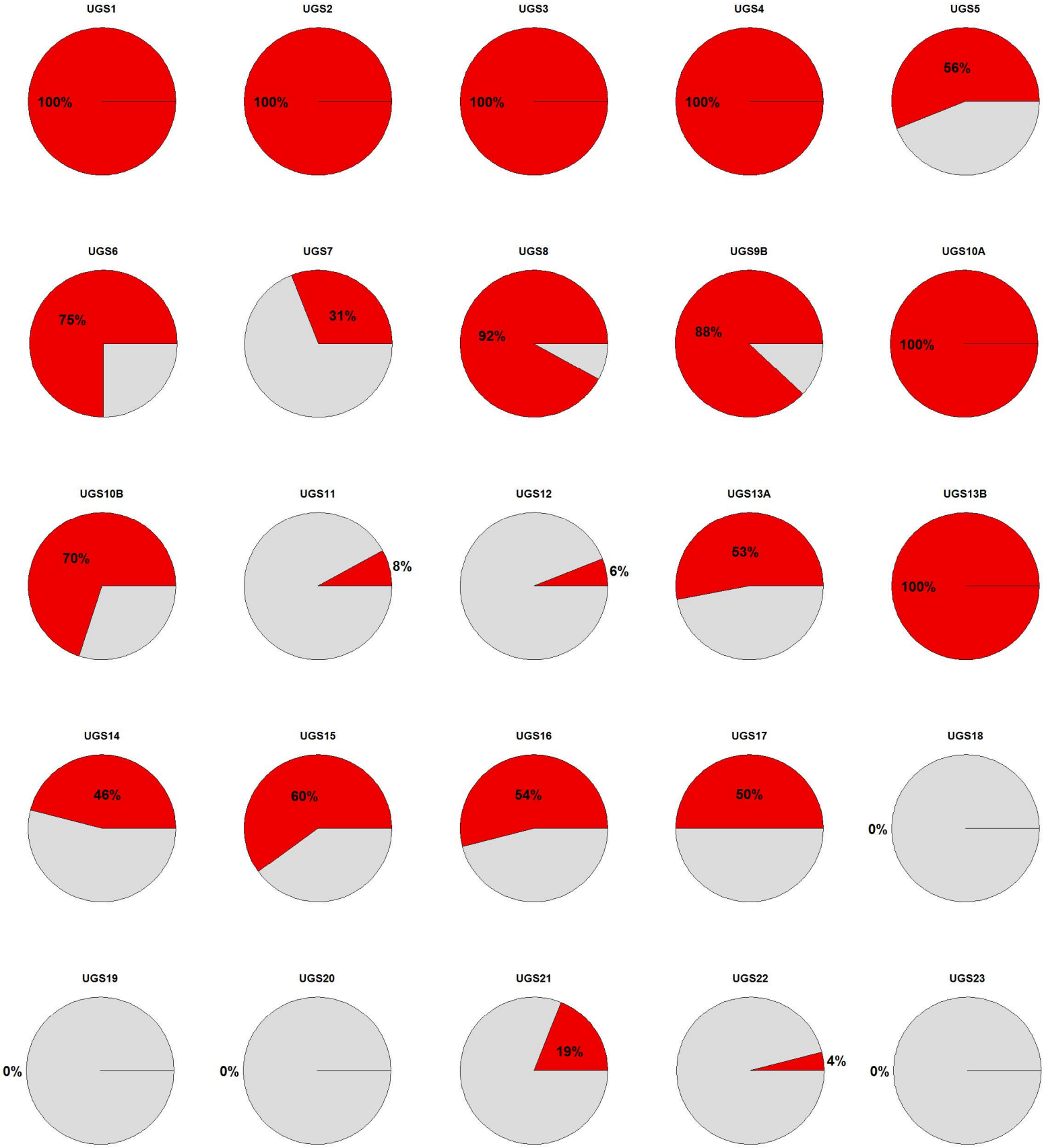
Upper Grande Ronde 2012

Percent summer days (20 July – 31 August) in exceedance of 18°C maximum stream temperature
Steelhead extent



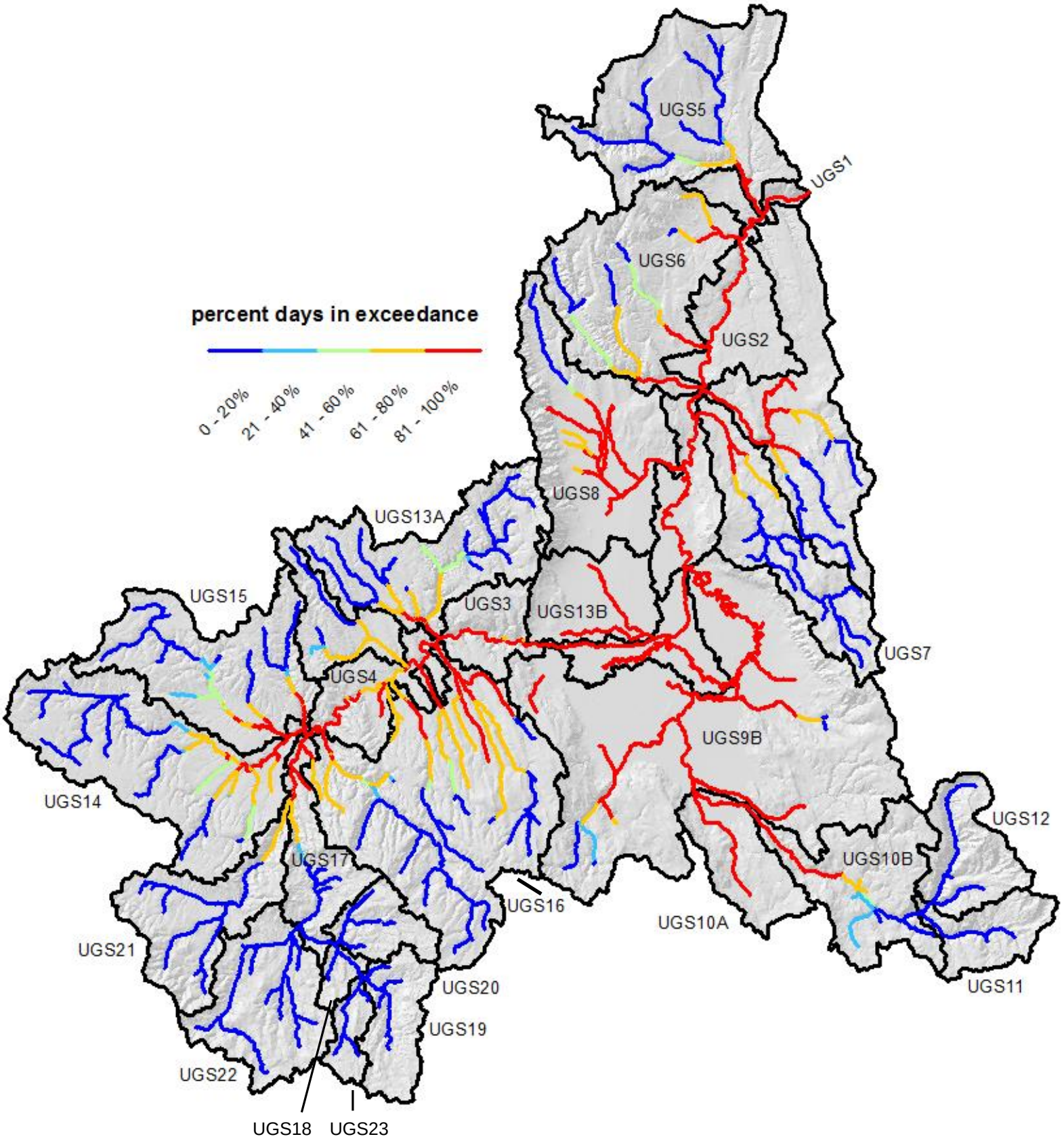
Upper Grande Ronde 2012

Percent summer days (20 July – 31 August) in exceedance of 18°C maximum stream temperature
Steelhead extent



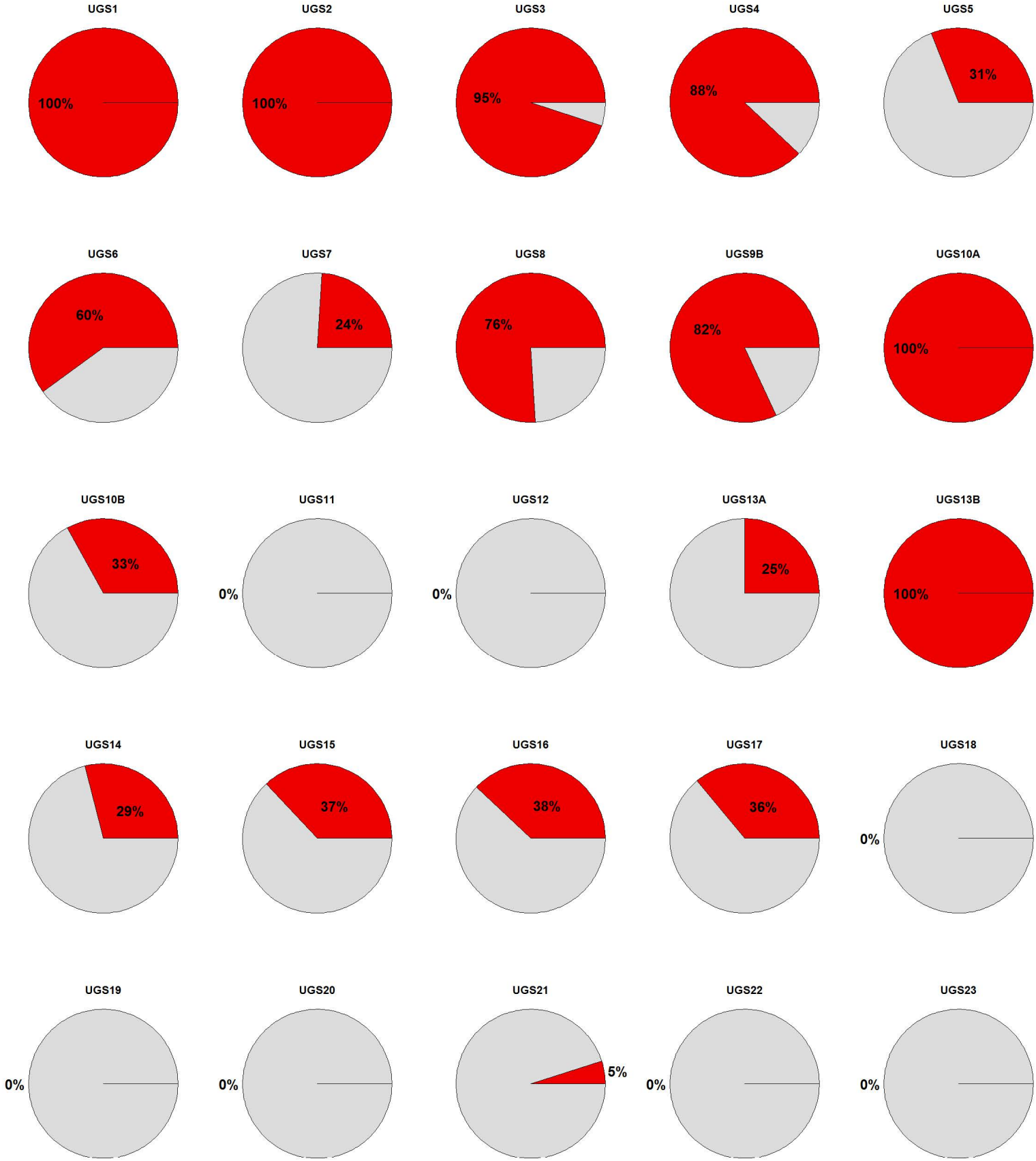
Upper Grande Ronde 2012

Percent summer days (20 July – 31 August) in exceedance of 20°C maximum stream temperature
Steelhead extent



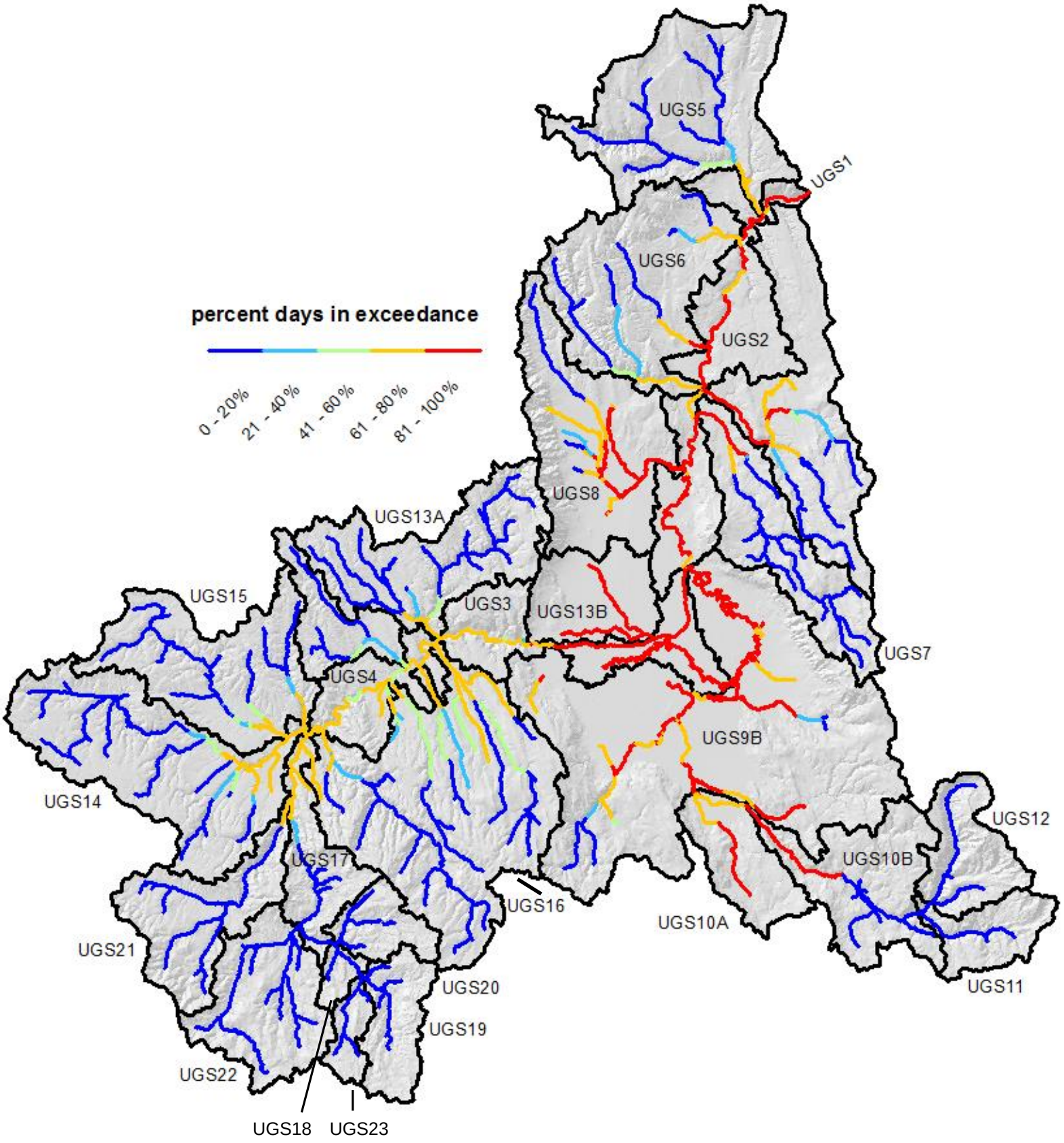
Upper Grande Ronde 2012

Percent summer days (20 July – 31 August) in exceedance of 20°C maximum stream temperature
Steelhead extent



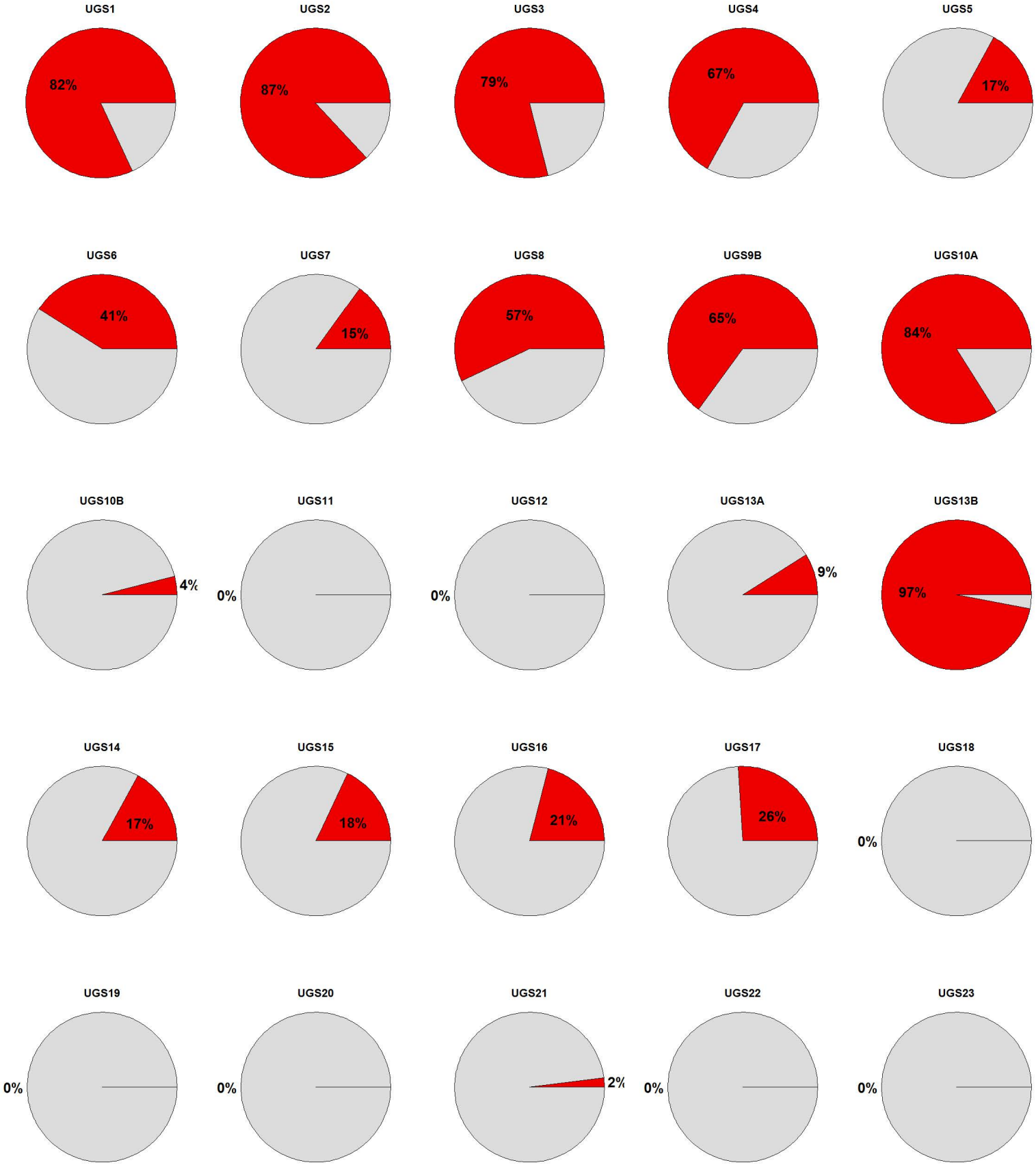
Upper Grande Ronde 2012

Percent summer days (20 July – 31 August) in exceedance of 22°C maximum stream temperature
Steelhead extent



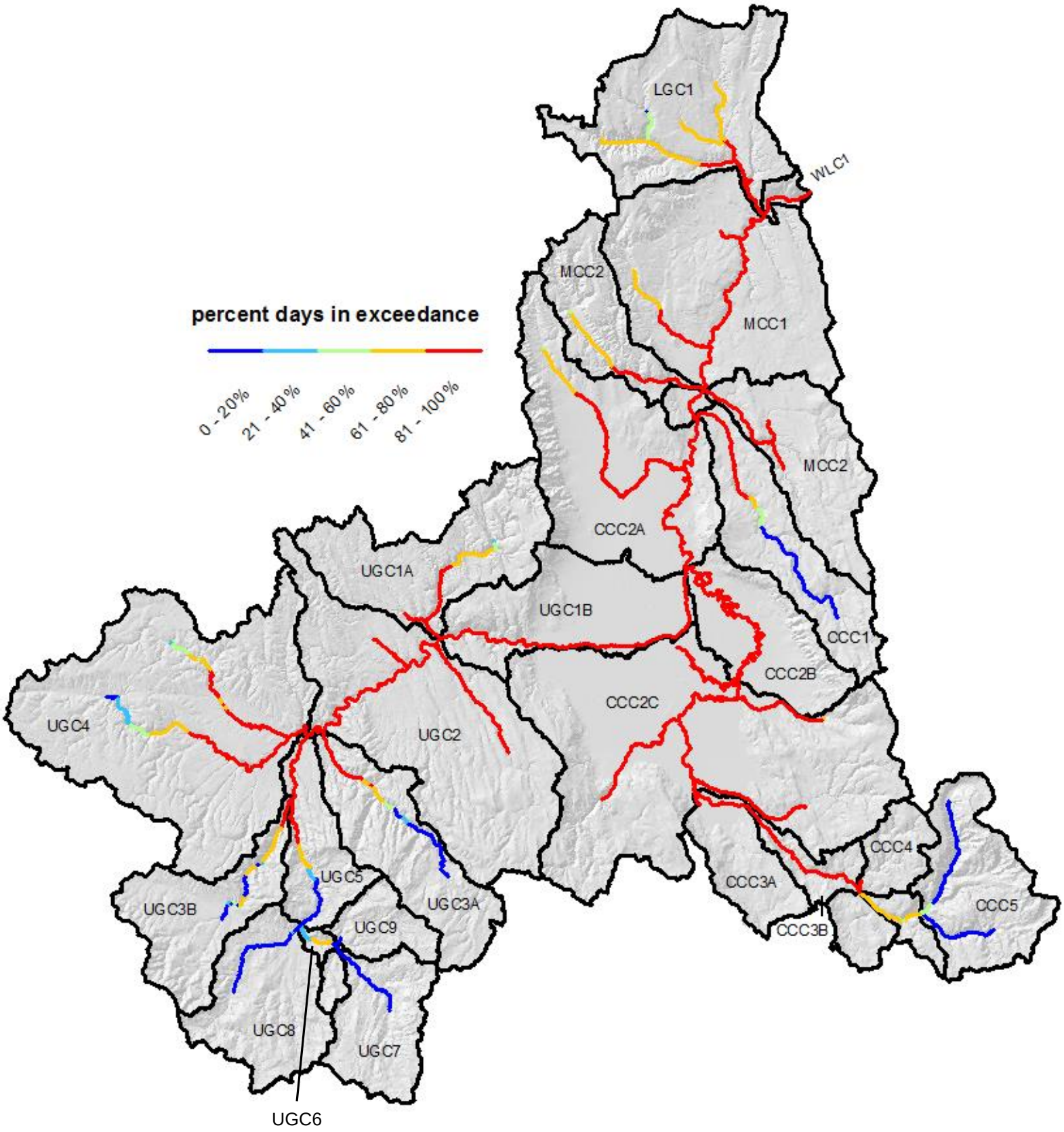
Upper Grande Ronde 2012

Percent summer days (20 July – 31 August) in exceedance of 22°C maximum stream temperature
Steelhead extent



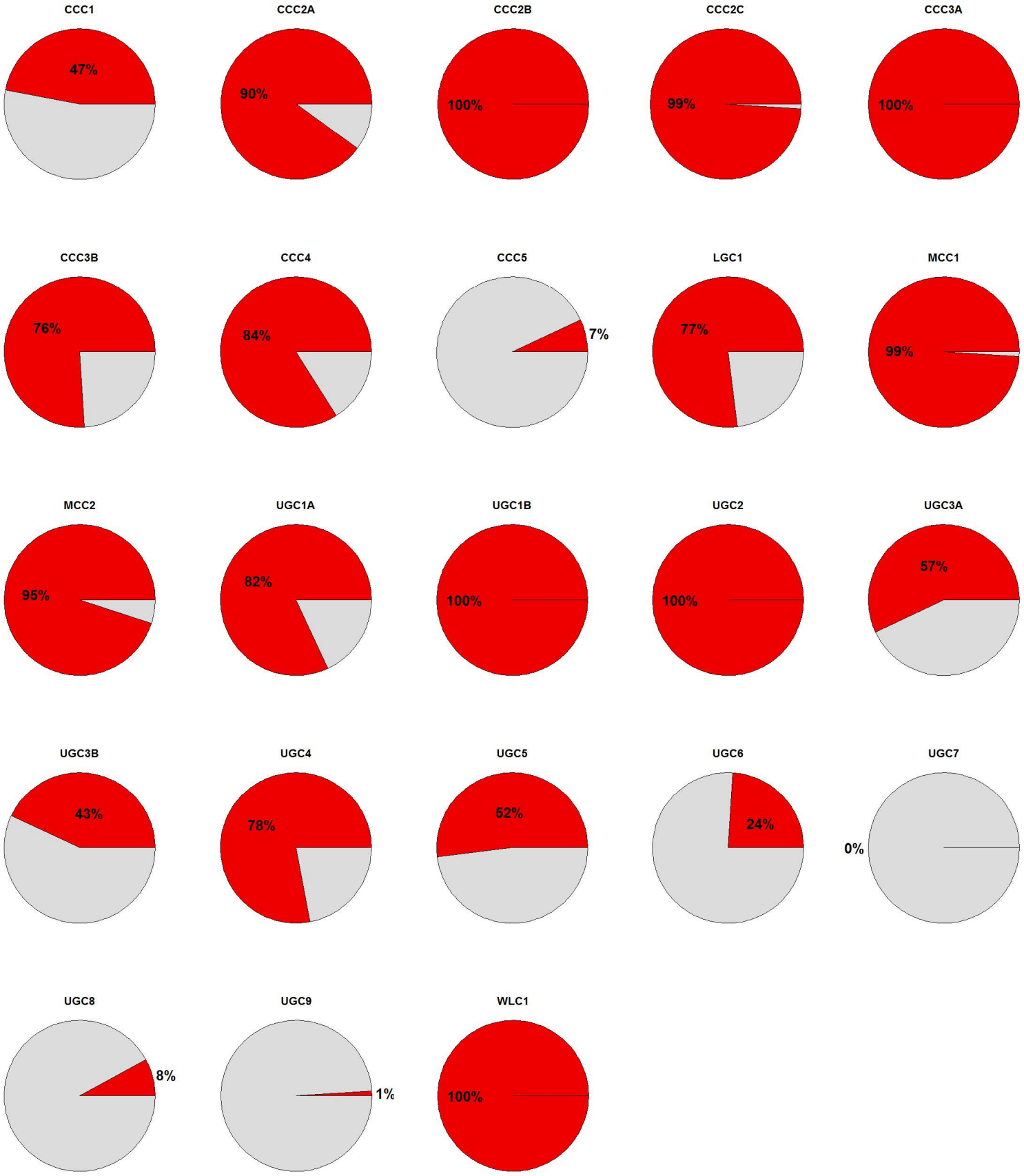
Upper Grande Ronde 2012

Percent summer days (20 July – 31 August) in exceedance of 18°C maximum stream temperature
Chinook extent



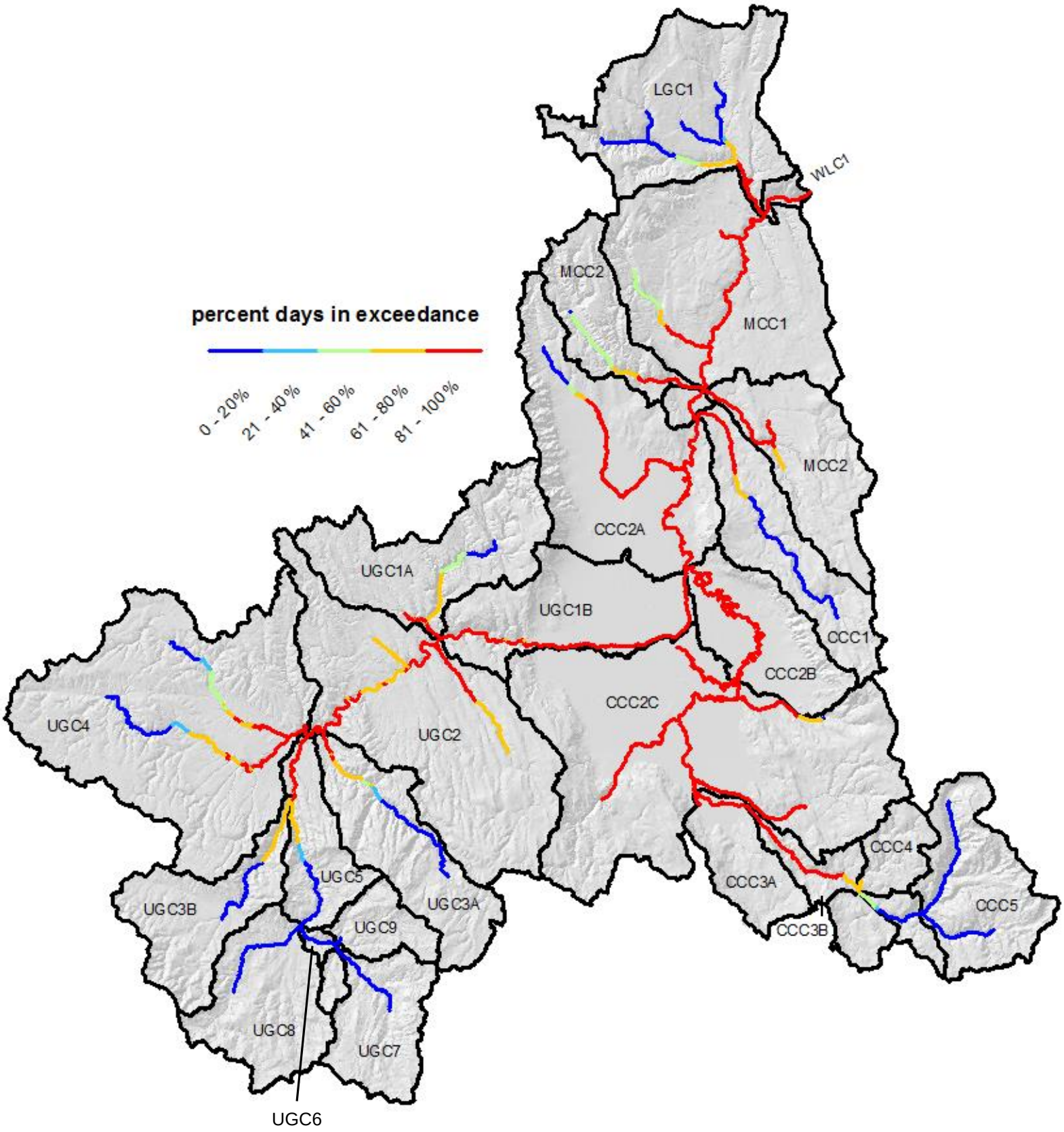
Upper Grande Ronde 2012

Percent summer days (20 July – 31 August) in exceedance of 18°C maximum stream temperature
Chinook extent



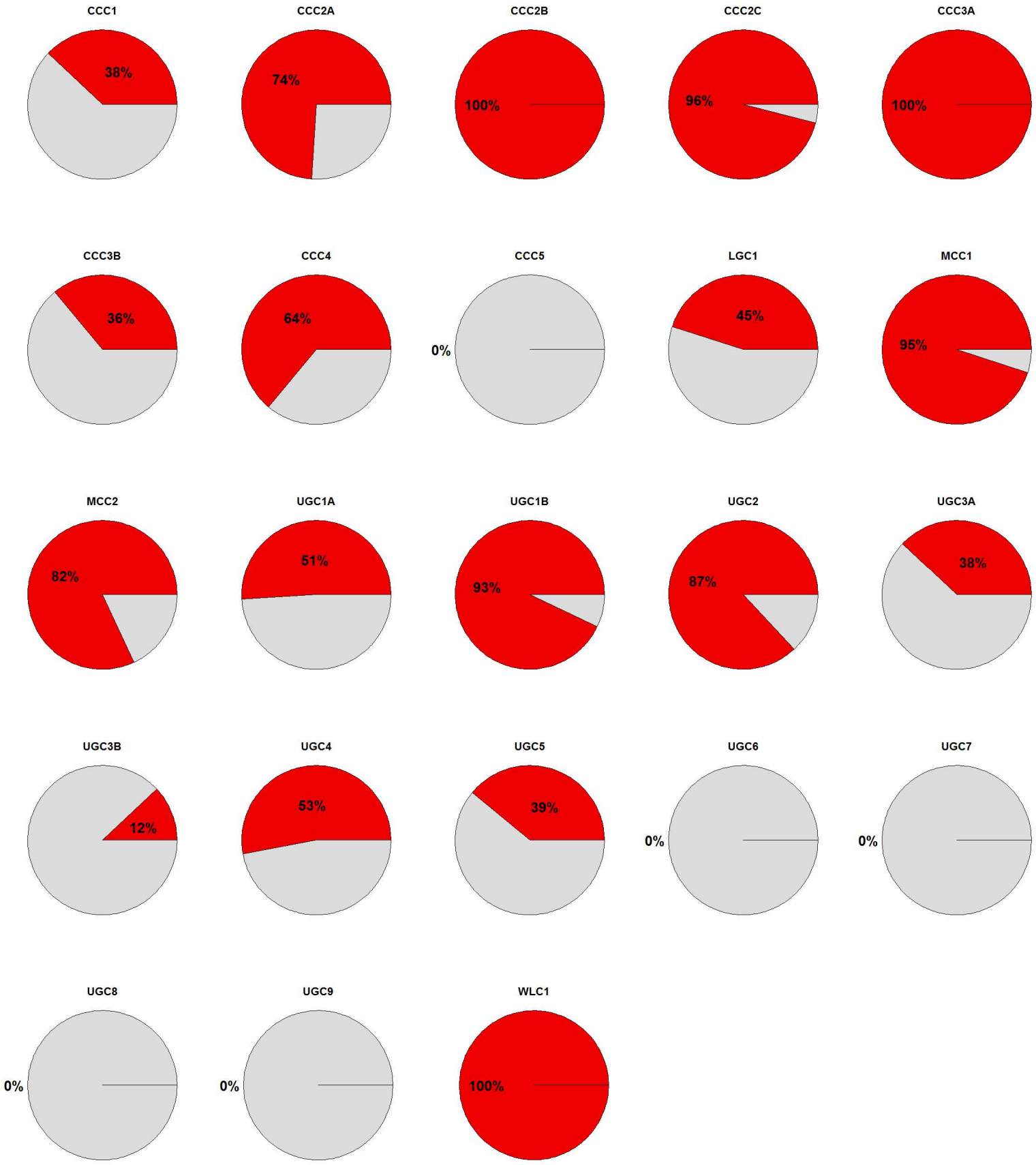
Upper Grande Ronde 2012

Percent summer days (20 July – 31 August) in exceedance of 20°C maximum stream temperature
Chinook extent



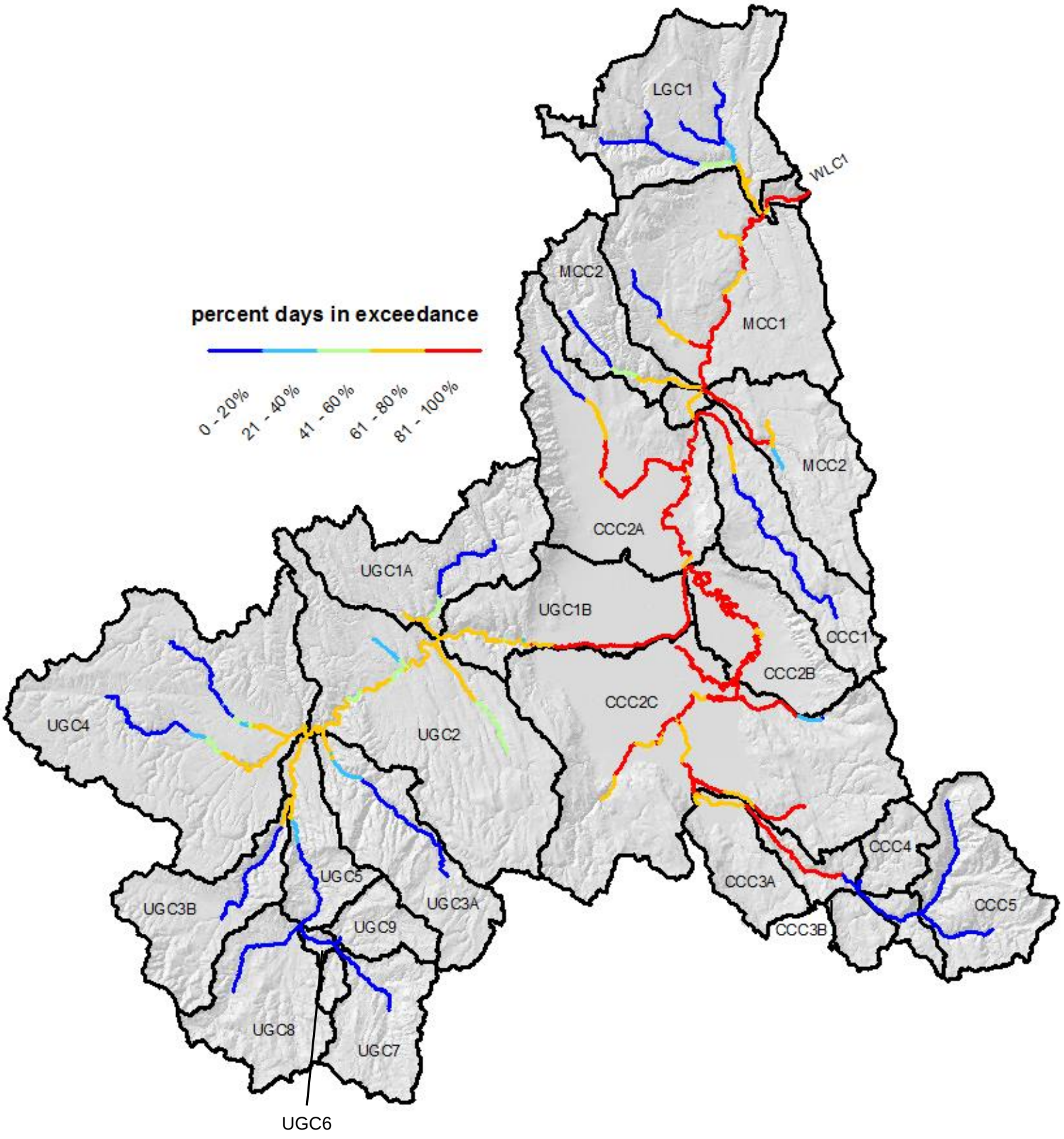
Upper Grande Ronde 2012

Percent summer days (20 July – 31 August) in exceedance of 20°C maximum stream temperature
Chinook extent



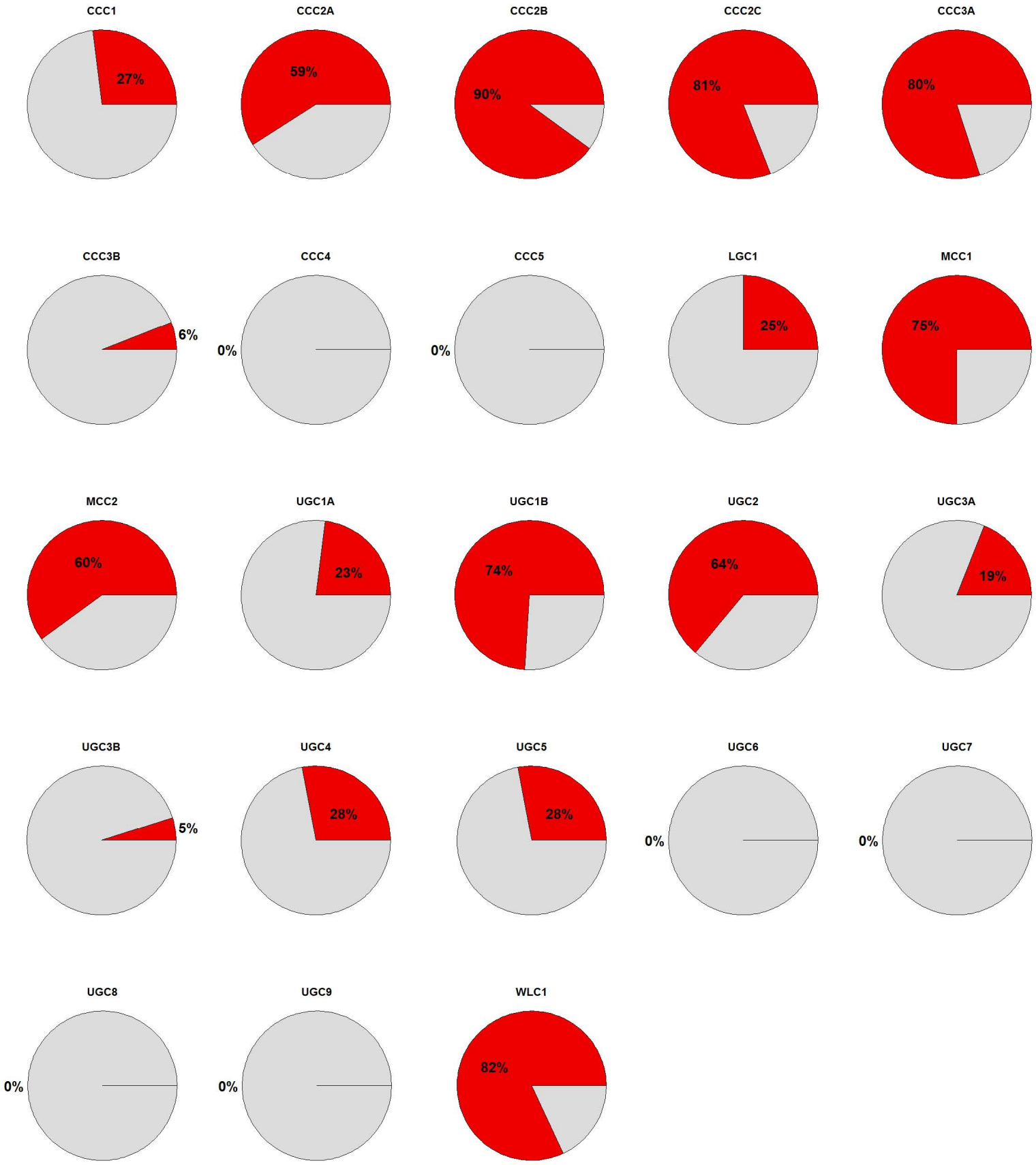
Upper Grande Ronde 2012

Percent summer days (20 July – 31 August) in exceedance of 22°C maximum stream temperature
Chinook extent



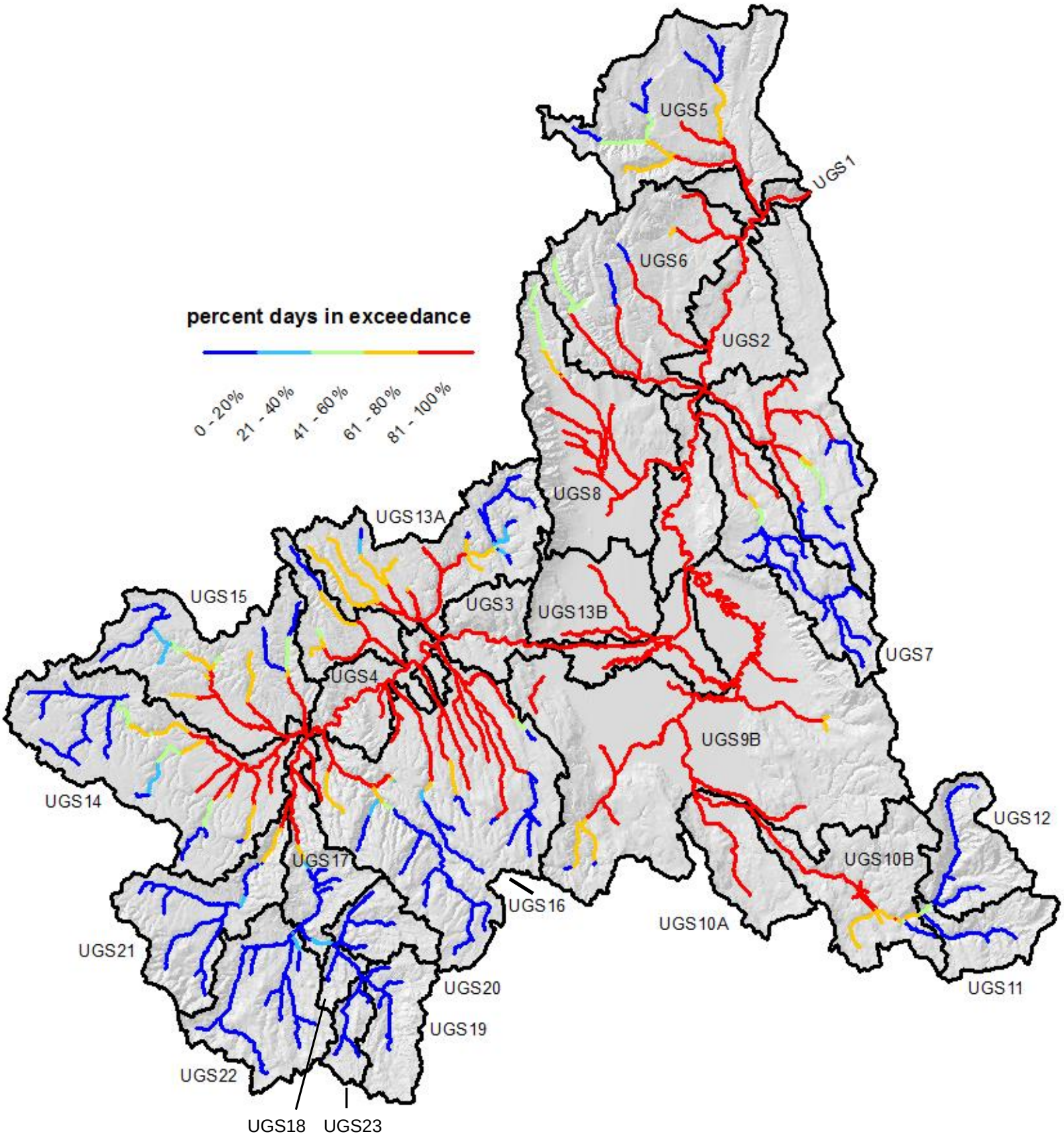
Upper Grande Ronde 2012

Percent summer days (20 July – 31 August) in exceedance of 22°C maximum stream temperature
Chinook extent



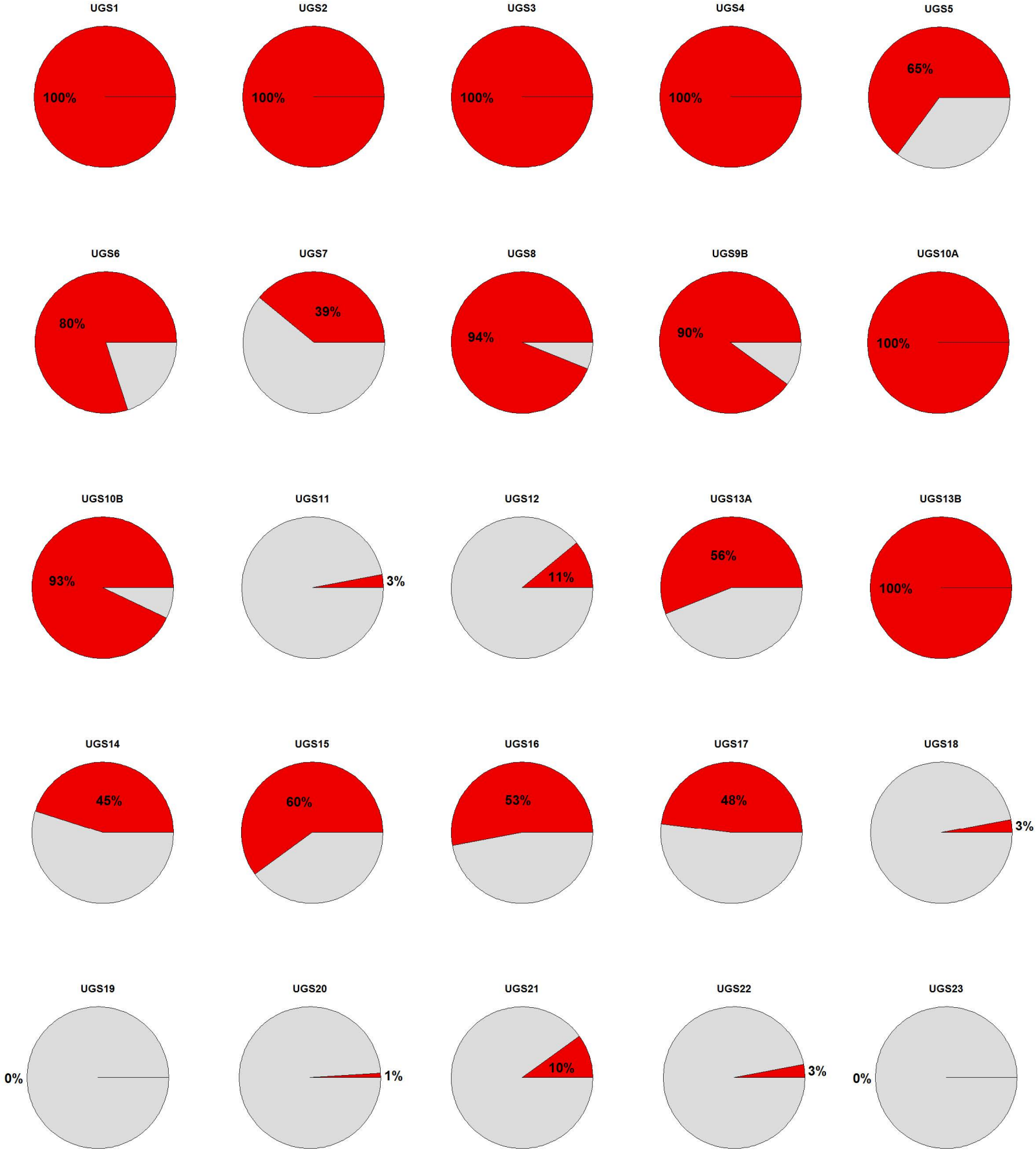
Upper Grande Ronde 2013

Percent summer days (20 July – 31 August) in exceedance of 18°C maximum stream temperature
Steelhead extent



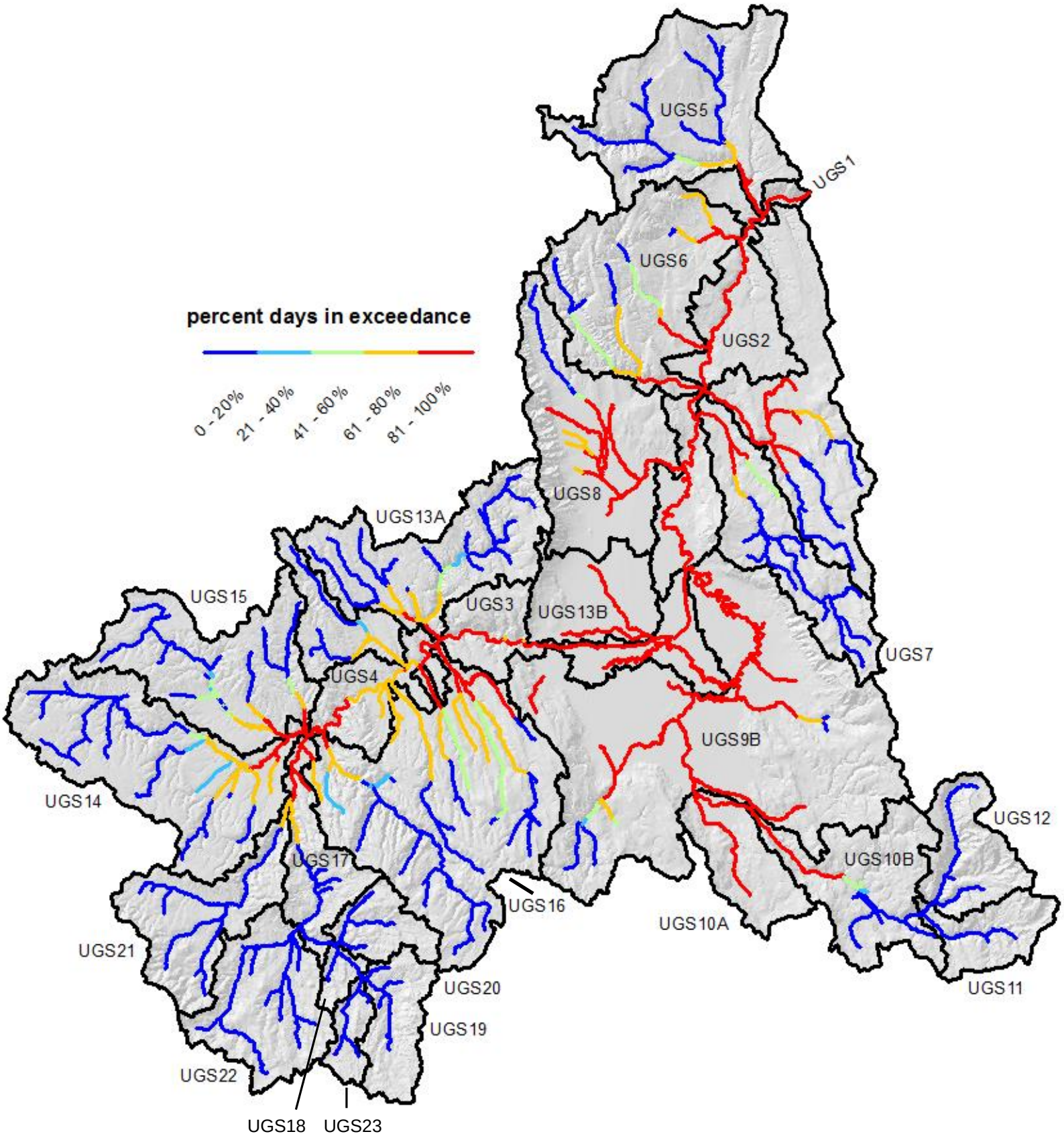
Upper Grande Ronde 2013

Percent summer days (20 July – 31 August) in exceedance of 18°C maximum stream temperature
Steelhead extent



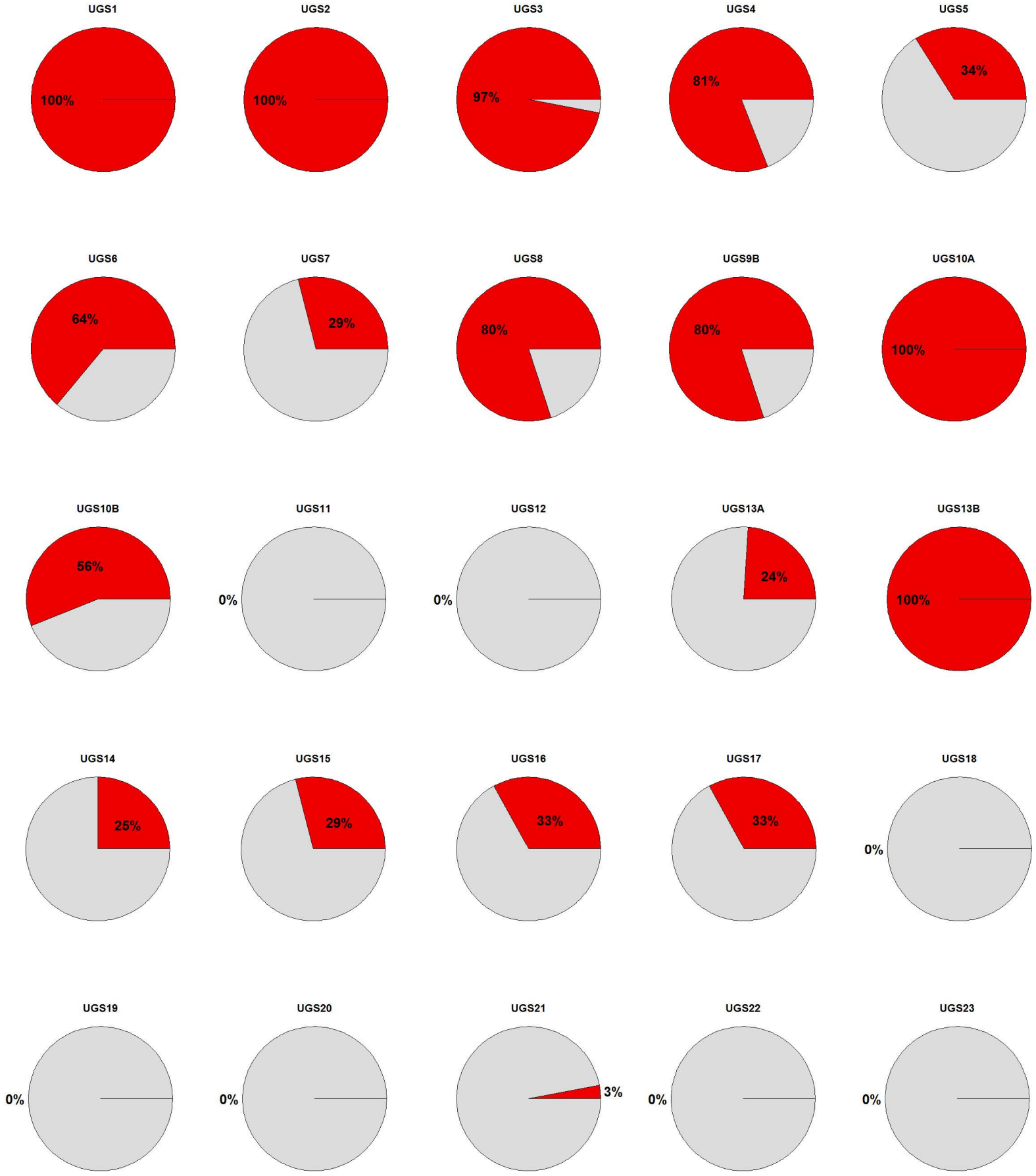
Upper Grande Ronde 2013

Percent summer days (20 July – 31 August) in exceedance of 20°C maximum stream temperature
Steelhead extent



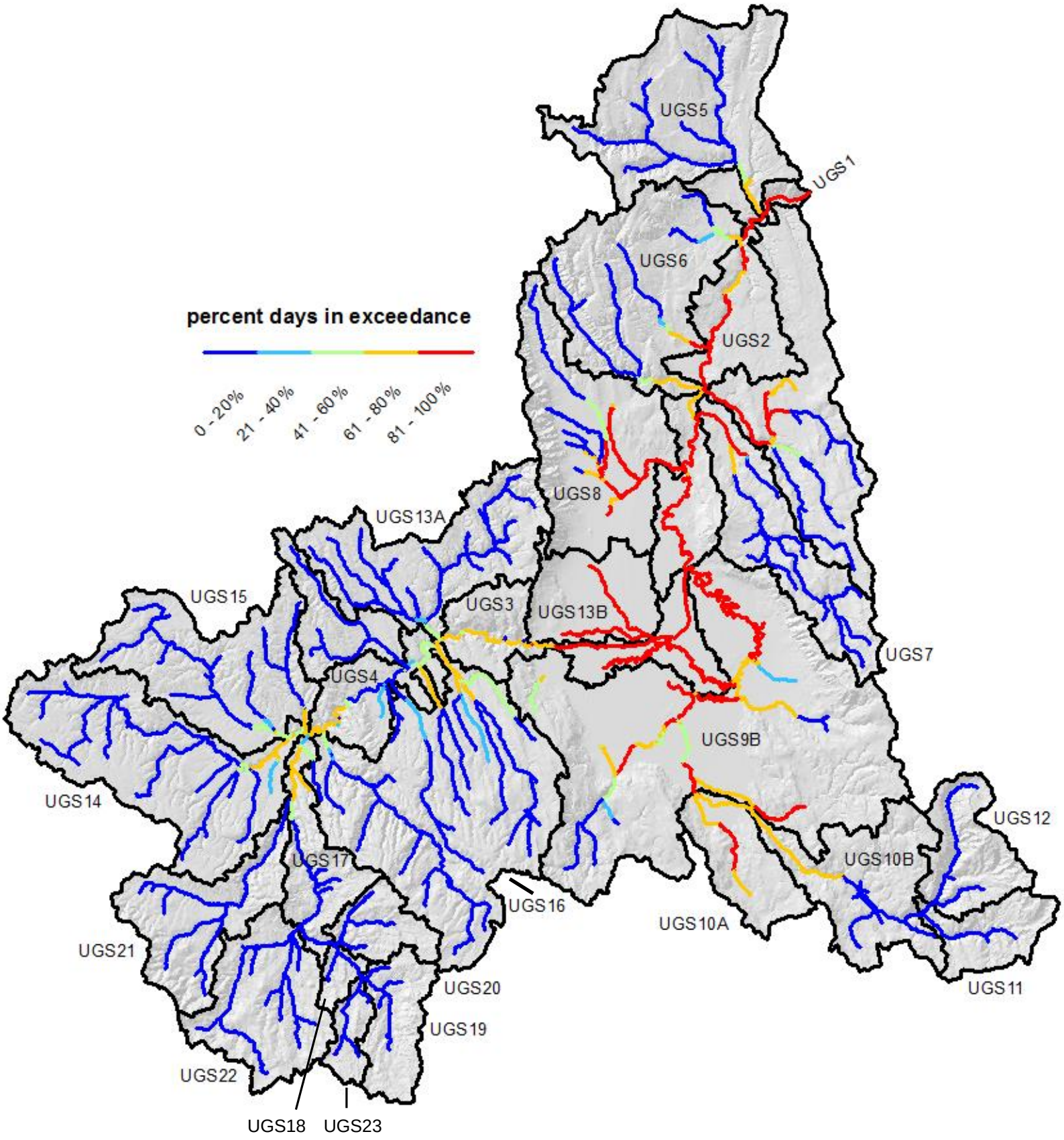
Upper Grande Ronde 2013

Percent summer days (20 July – 31 August) in exceedance of 20°C maximum stream temperature
Steelhead extent



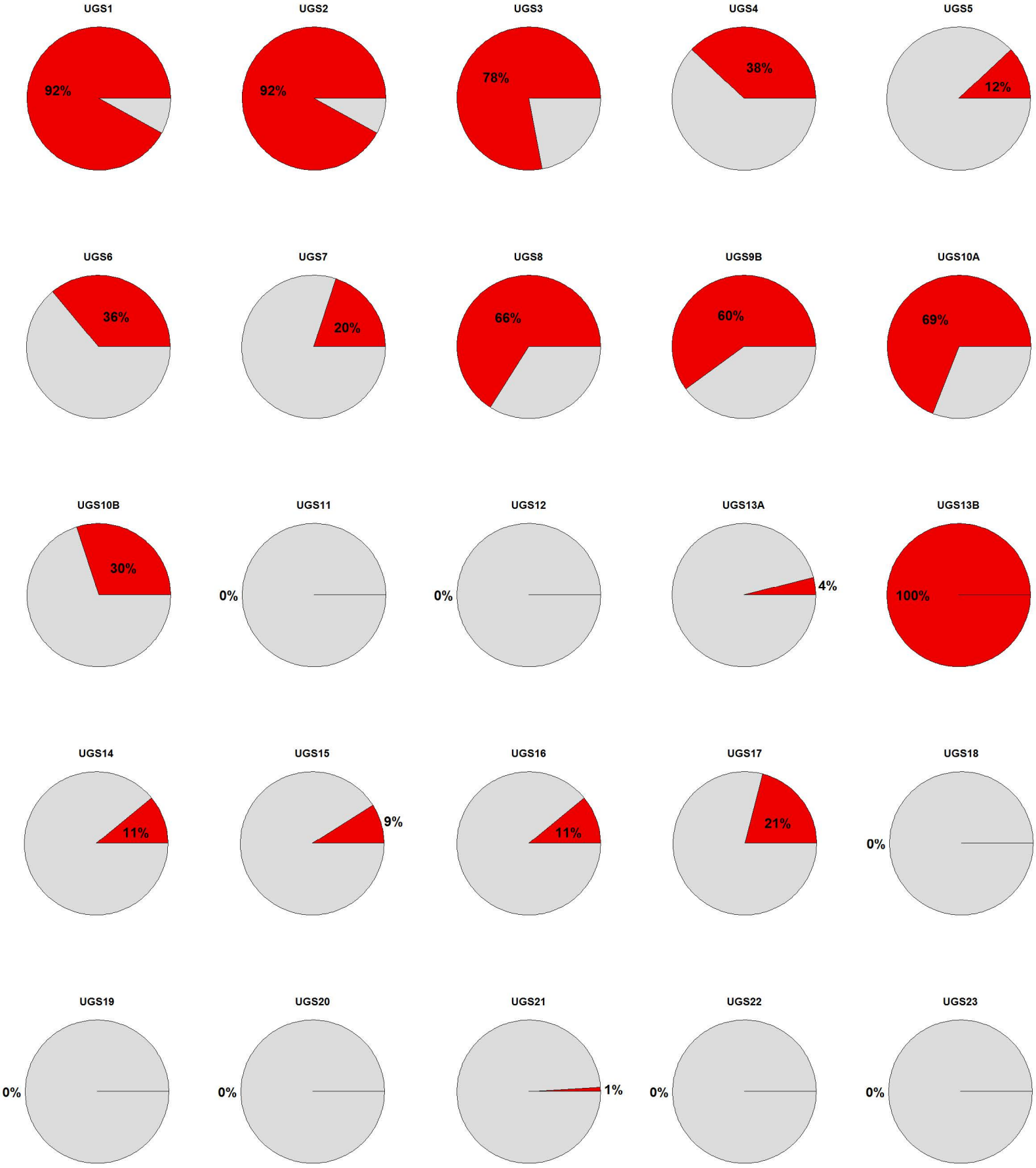
Upper Grande Ronde 2013

Percent summer days (20 July – 31 August) in exceedance of 22°C maximum stream temperature
Steelhead extent



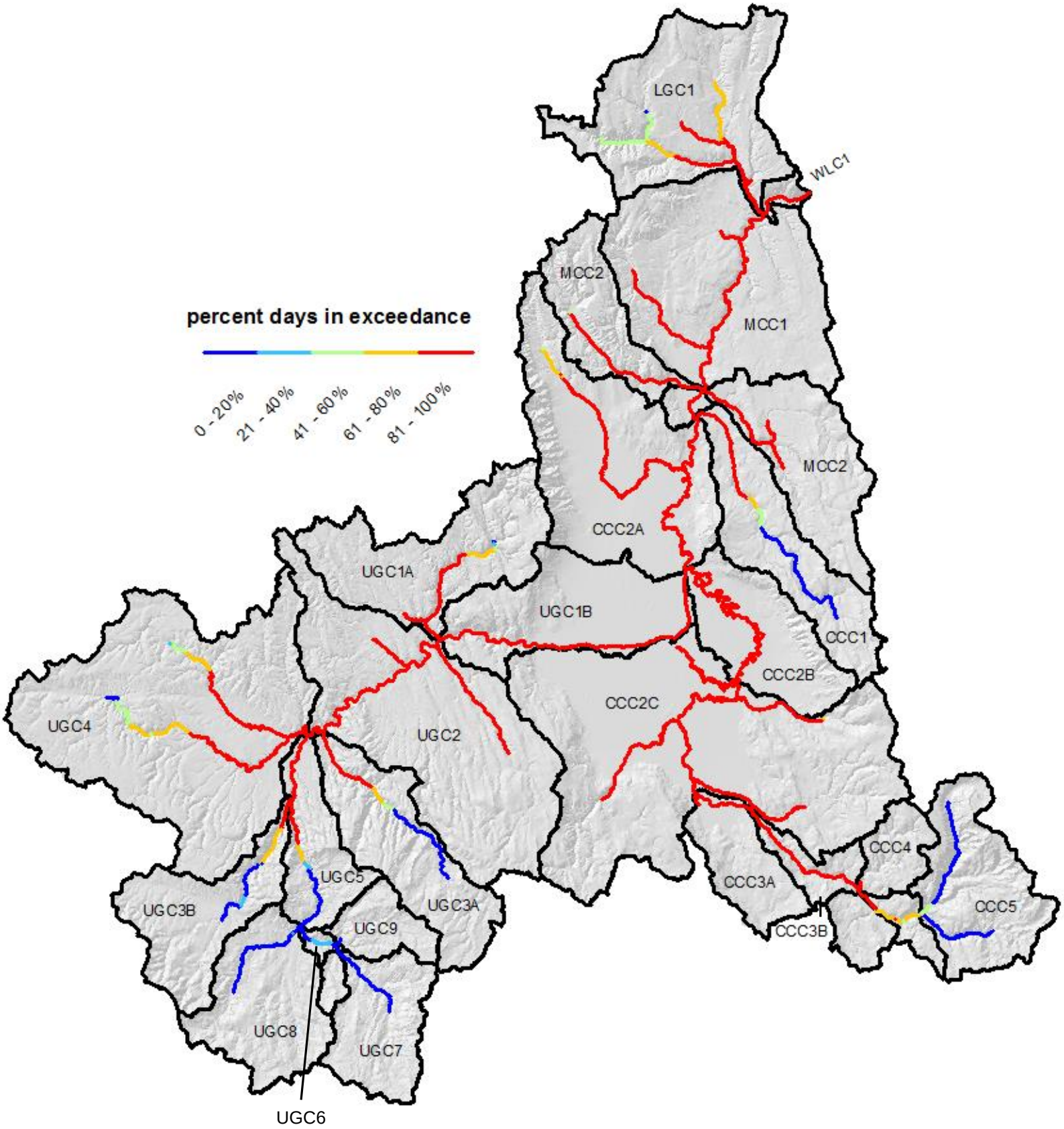
Upper Grande Ronde 2013

Percent summer days (20 July – 31 August) in exceedance of 22°C maximum stream temperature
Steelhead extent



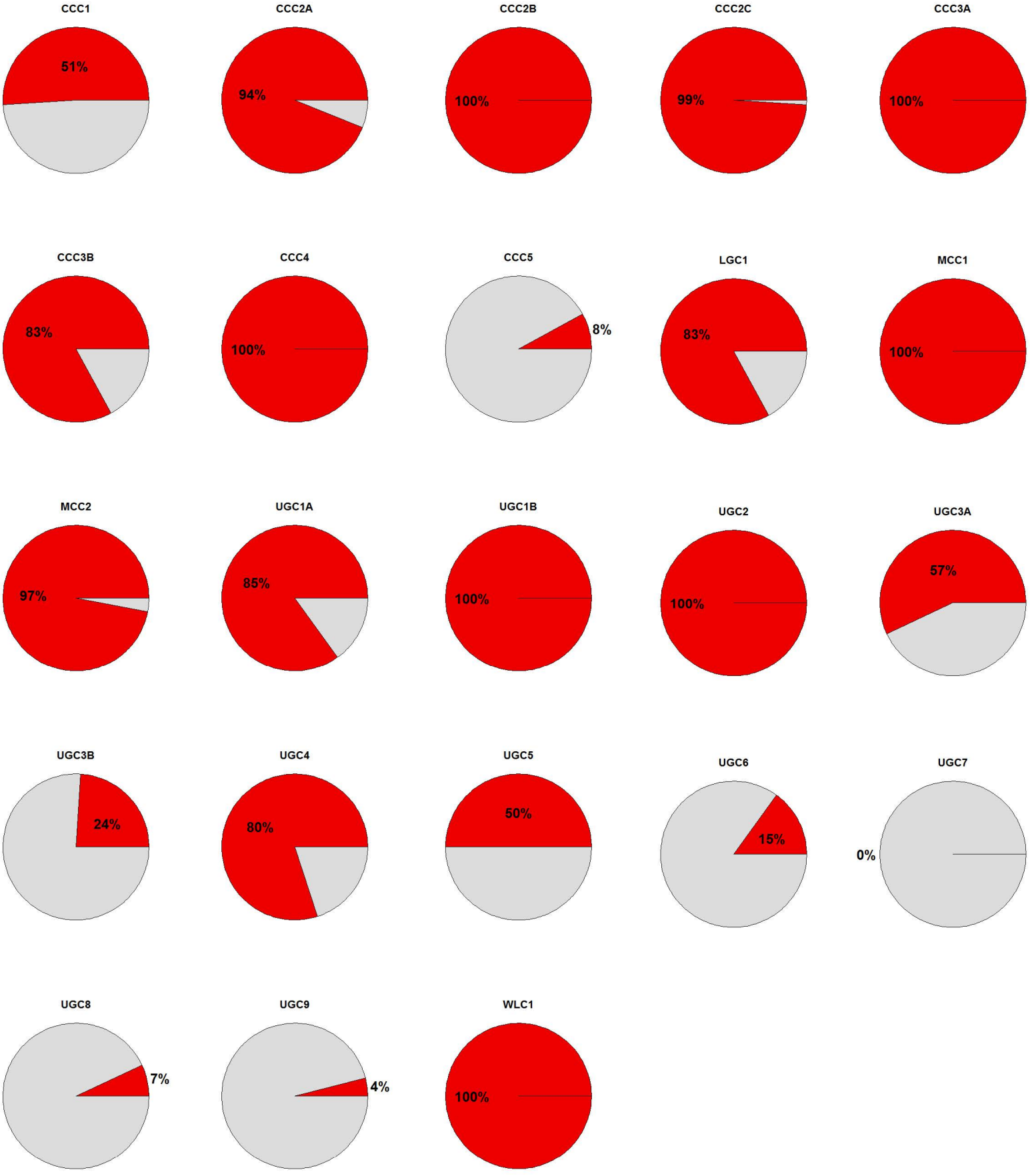
Upper Grande Ronde 2013

Percent summer days (20 July – 31 August) in exceedance of 18°C maximum stream temperature
Chinook extent



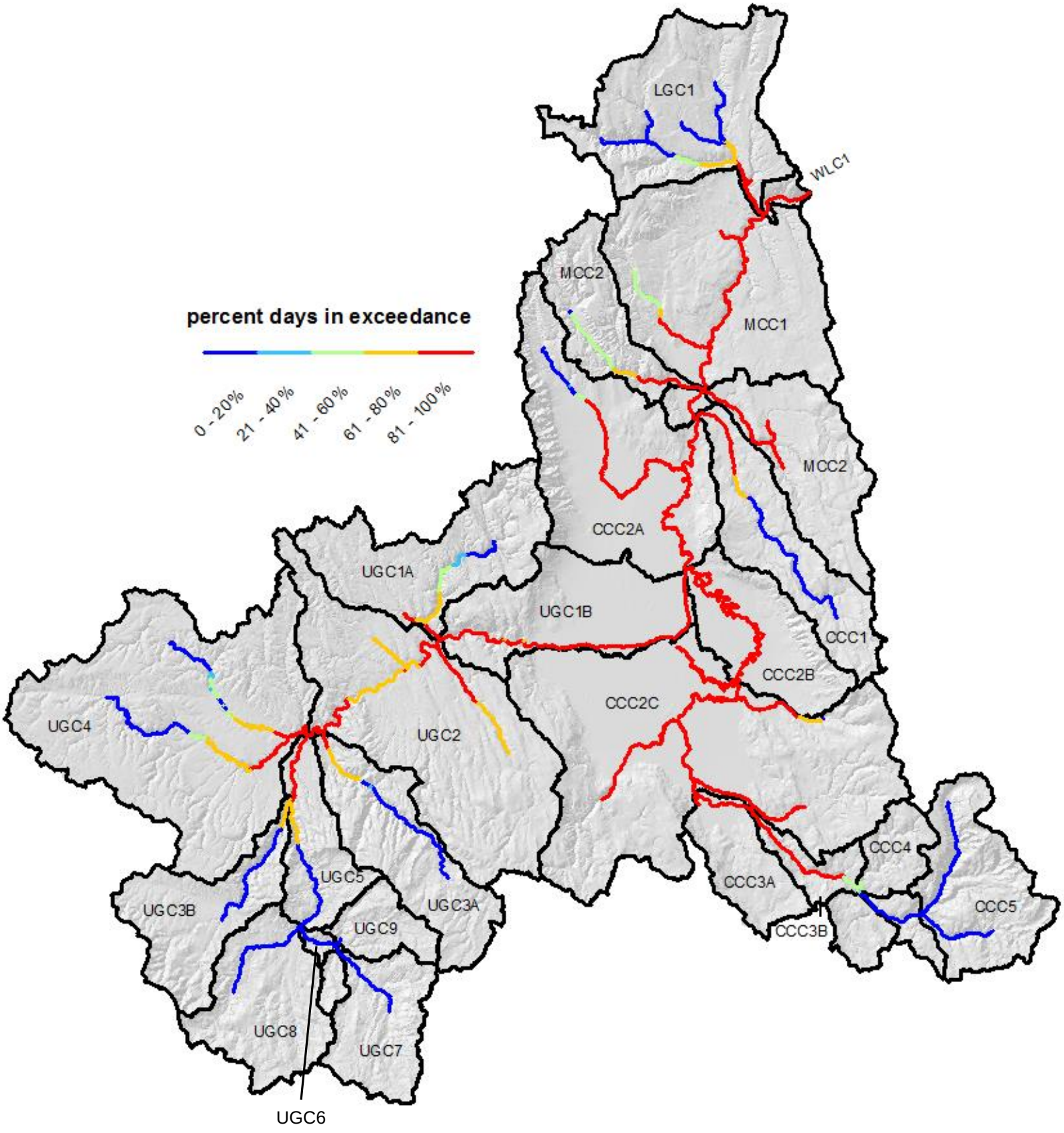
Upper Grande Ronde 2013

Percent summer days (20 July – 31 August) in exceedance of 18°C maximum stream temperature
Chinook extent



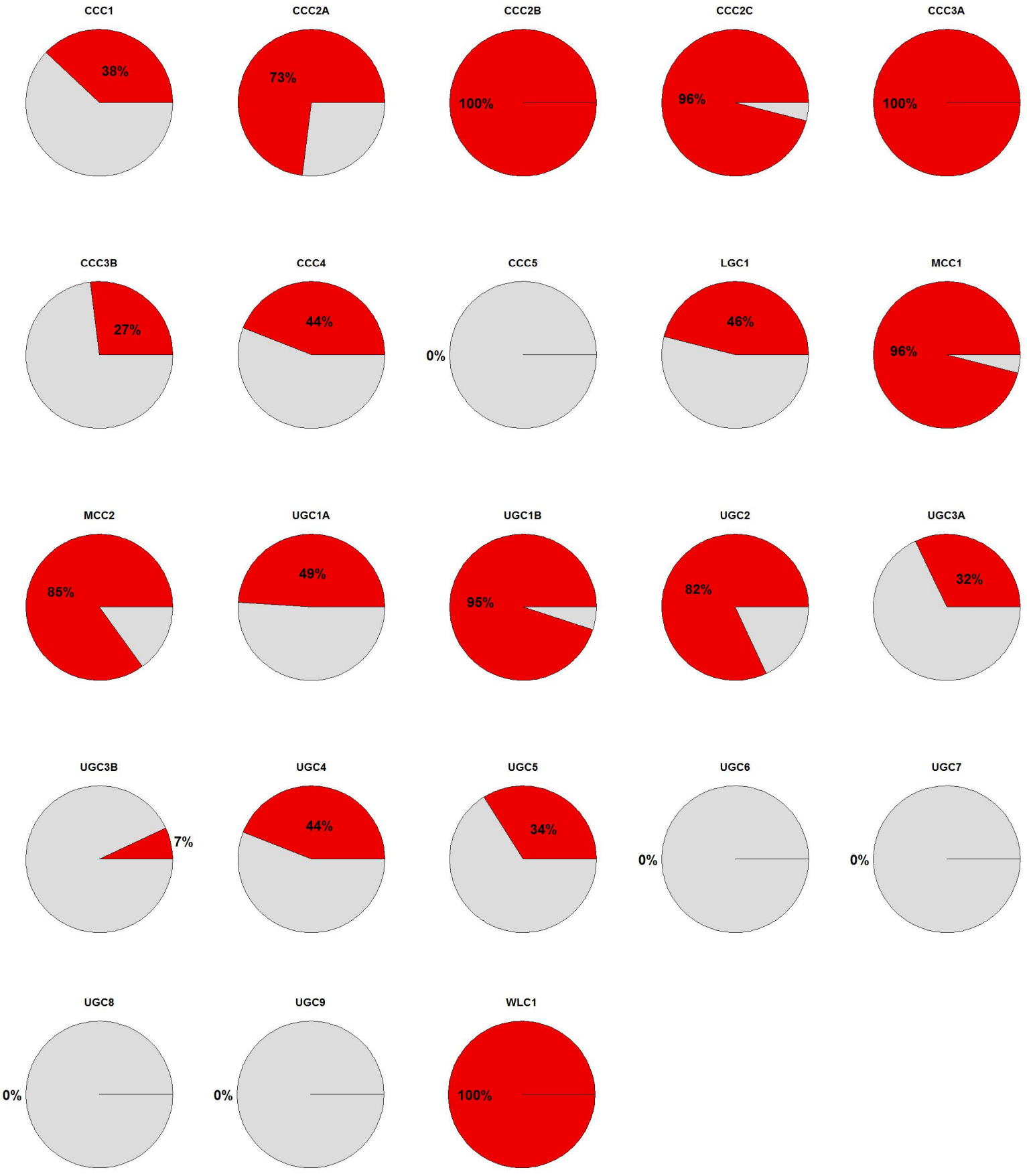
Upper Grande Ronde 2013

Percent summer days (20 July – 31 August) in exceedance of 20°C maximum stream temperature
Chinook extent



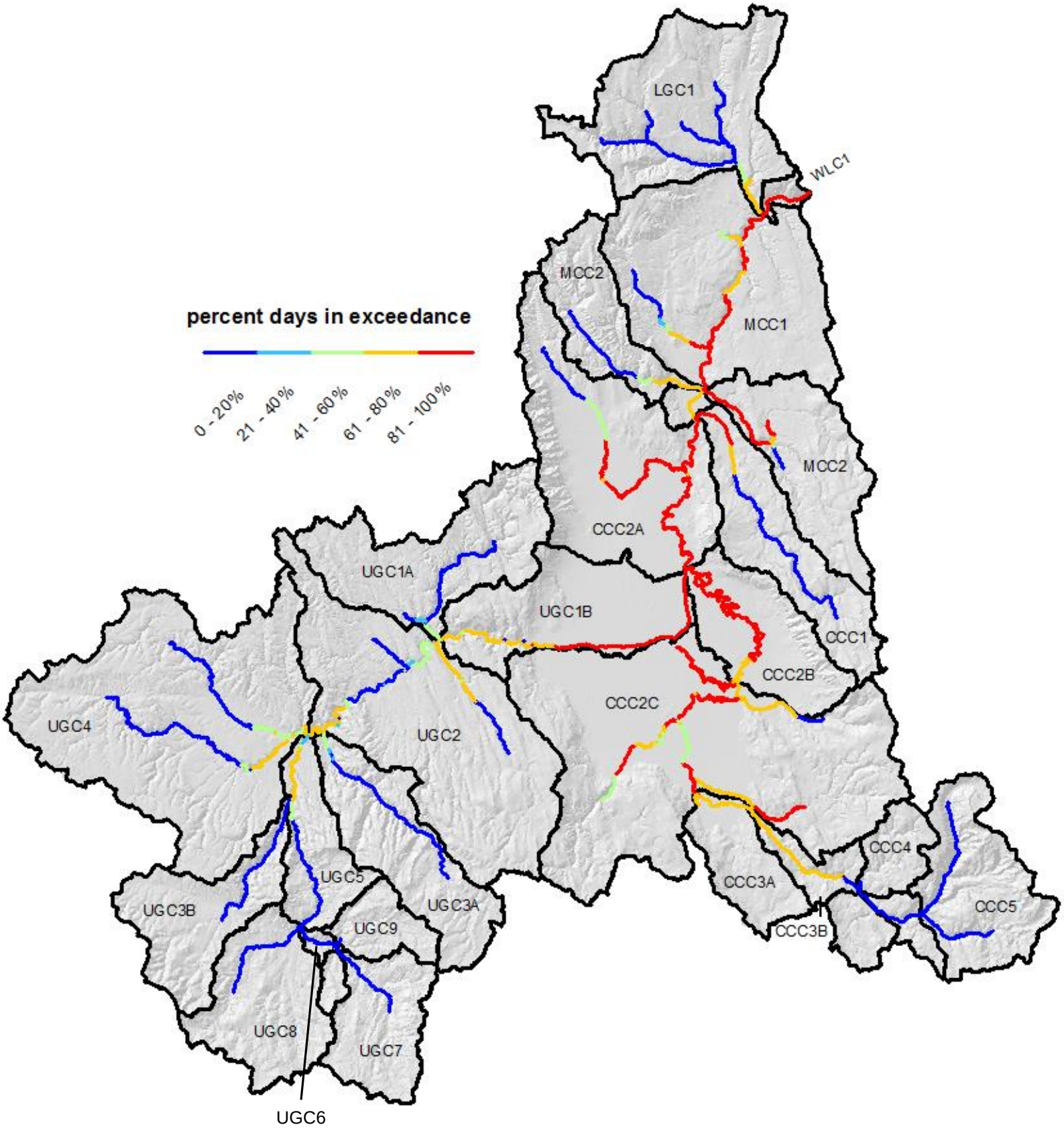
Upper Grande Ronde 2013

Percent summer days (20 July – 31 August) in exceedance of 20°C maximum stream temperature
Chinook extent



Upper Grande Ronde 2013

Percent summer days (20 July – 31 August) in exceedance of 22°C maximum stream temperature
Chinook extent



Upper Grande Ronde 2013

Percent summer days (20 July – 31 August) in exceedance of 22°C maximum stream temperature
Chinook extent

