01-processing.R

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library(tidyverse)

## ── Attaching packages ──────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────── tidyverse 1.2.1 ──

## ✓ ggplot2 3.2.1 ✓ purrr 0.3.3  
## ✓ tibble 2.1.3 ✓ dplyr 0.8.3  
## ✓ tidyr 1.0.0 ✓ stringr 1.4.0  
## ✓ readr 1.3.1 ✓ forcats 0.4.0

## ── Conflicts ─────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────── tidyverse\_conflicts() ──  
## x dplyr::filter() masks stats::filter()  
## x dplyr::lag() masks stats::lag()

library(skimr)  
library(janitor)

##   
## Attaching package: 'janitor'

## The following objects are masked from 'package:stats':  
##   
## chisq.test, fisher.test

# Use a manually edited version - got rid of entry errors (text)  
dfraw <- read\_csv("../data/full-data (copy).csv")

## Parsed with column specification:  
## cols(  
## .default = col\_double(),  
## cross\_ref.x = col\_character(),  
## location.x = col\_character(),  
## dip\_specific\_predator\_data = col\_character(),  
## detailled\_pics = col\_character(),  
## detailled\_veg\_data = col\_character(),  
## shade\_assessed\_in\_situ = col\_character(),  
## data\_entered\_by\_comment = col\_character(),  
## who\_assessed\_vegetation = col\_character(),  
## location.y = col\_character(),  
## dip\_point.y = col\_character(),  
## new\_averaged\_gps\_readings\_st = col\_character(),  
## northings\_recordings\_from\_field\_data\_sheet = col\_character(),  
## sample\_date = col\_character(),  
## operator = col\_character(),  
## wiNA\_speed = col\_character(),  
## wiNA\_direction = col\_character(),  
## laNAcover\_rough\_pasture\_rough\_pasture\_reed\_bed\_wet\_woodlaNA = col\_character(),  
## other\_life\_stock\_visible = col\_character(),  
## water\_body = col\_character(),  
## approx\_length\_m = col\_character()  
## # ... with 24 more columns  
## )

## See spec(...) for full column specifications.

## Warning: 19 parsing failures.  
## row col expected actual file  
## 1361 weather\_1\_sunny\_2\_sunny\_spells\_3\_overcast\_4\_rain no trailing characters to 4 '../data/full-data (copy).csv'  
## 1362 weather\_1\_sunny\_2\_sunny\_spells\_3\_overcast\_4\_rain no trailing characters to 4 '../data/full-data (copy).csv'  
## 1363 weather\_1\_sunny\_2\_sunny\_spells\_3\_overcast\_4\_rain no trailing characters to 4 '../data/full-data (copy).csv'  
## 1364 weather\_1\_sunny\_2\_sunny\_spells\_3\_overcast\_4\_rain no trailing characters to 4 '../data/full-data (copy).csv'  
## 1365 weather\_1\_sunny\_2\_sunny\_spells\_3\_overcast\_4\_rain no trailing characters to 4 '../data/full-data (copy).csv'  
## .... ................................................ ...................... ...... ..............................  
## See problems(...) for more details.

dfraw <- dfraw %>% clean\_names()  
  
# give everything a unique rowid  
dfraw <- dfraw %>% mutate(row = 1:nrow(dfraw))  
  
# convenience functions   
  
qhist <- function(df) {  
 df %>%  
 keep(is.numeric) %>%   
 gather() %>%   
 ggplot(aes(value)) +  
 facet\_wrap(~ key, scales = "free") +  
 geom\_histogram()  
}  
  
qdot <- function(df) {  
 df %>%  
 keep(is.numeric) %>%   
 gather() %>%   
 ggplot(aes(value)) +  
 facet\_wrap(~ key, scales = "free") +  
 geom\_dotplot()  
   
}

dfraw[dfraw == "nr"] <- NA  
dfraw[dfraw == "nd"] <- NA  
dfraw[dfraw == "n/a"] <- NA  
dfraw[dfraw == "no"] <- 0  
dfraw[dfraw == "yes"] <- 1

dfabun <- dfraw %>%   
 # Abundance of the mosquito larvae - taking the totals only  
 select(total = totals\_n\_larvae,  
 cx\_pipiens = totals\_n\_cx\_pipiens,  
 an\_maculipennis = totals\_n\_an\_maculipennis,  
 an\_claviger = totals\_n\_an\_claviger,  
 cs\_annulata = totals\_n\_cs\_annulata,  
 cs\_morsitans = totals\_n\_cs\_morsitans,  
 cs\_cantans = totals\_n\_oc\_annulipes\_cantans,  
 cs\_caspius = totals\_n\_oc\_caspius  
 )  
  
dfabun %>% skim()

Data summary

|  |  |
| --- | --- |
| Name | Piped data |
| Number of rows | 2482 |
| Number of columns | 8 |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Column type frequency: |  |
| numeric | 8 |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Group variables | None |

**Variable type: numeric**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| skim\_variable | n\_missing | complete\_rate | mean | sd | p0 | p25 | p50 | p75 | p100 | hist |
| total | 184 | 0.93 | 3.69 | 29.85 | 0 | 0 | 0 | 0 | 762 | ▇▁▁▁▁ |
| cx\_pipiens | 185 | 0.93 | 1.79 | 17.52 | 0 | 0 | 0 | 0 | 442 | ▇▁▁▁▁ |
| an\_maculipennis | 185 | 0.93 | 0.06 | 0.33 | 0 | 0 | 0 | 0 | 5 | ▇▁▁▁▁ |
| an\_claviger | 185 | 0.93 | 0.13 | 1.16 | 0 | 0 | 0 | 0 | 31 | ▇▁▁▁▁ |
| cs\_annulata | 185 | 0.93 | 1.67 | 17.69 | 0 | 0 | 0 | 0 | 524 | ▇▁▁▁▁ |
| cs\_morsitans | 185 | 0.93 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | ▁▁▇▁▁ |
| cs\_cantans | 185 | 0.93 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | ▁▁▇▁▁ |
| cs\_caspius | 185 | 0.93 | 0.00 | 0.04 | 0 | 0 | 0 | 0 | 2 | ▇▁▁▁▁ |

dfsite <- dfraw %>%   
 # We'll select the site level factors we care about along with rowname  
 select(row,  
 site = site\_x,  
 plot = plot\_x,  
 location = location\_x,  
 dip\_point = dip\_point\_x,  
 eastings\_gps = new\_averaged\_gps\_readings\_eastings,  
 northings\_gps = new\_averaged\_gps\_readings\_northings  
 )  
# vars to mutate  
varsite <- dfsite %>% select(everything(), -row) %>% colnames()  
# mutate the vars to factors  
dfsite <- dfsite %>% mutate\_at(.vars = vars(varsite), ~ as.factor(.))  
   
skim(dfsite)

Data summary

|  |  |
| --- | --- |
| Name | dfsite |
| Number of rows | 2482 |
| Number of columns | 7 |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Column type frequency: |  |
| factor | 6 |
| numeric | 1 |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Group variables | None |

**Variable type: factor**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| skim\_variable | n\_missing | complete\_rate | ordered | n\_unique | top\_counts |
| site | 0 | 1 | FALSE | 17 | 83: 210, 84: 162, 82: 144, 85: 144 |
| plot | 0 | 1 | FALSE | 5 | 2: 630, 3: 630, 1: 604, 4: 582 |
| location | 0 | 1 | FALSE | 20 | Wes: 288, Com: 210, Wal: 162, All: 144 |
| dip\_point | 0 | 1 | FALSE | 6 | 1: 414, 2: 414, 3: 414, 4: 414 |
| eastings\_gps | 4 | 1 | FALSE | 337 | 370: 30, 492: 24, 496: 20, 496: 20 |
| northings\_gps | 4 | 1 | FALSE | 331 | 408: 27, 253: 18, 334: 18, 357: 18 |

**Variable type: numeric**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| skim\_variable | n\_missing | complete\_rate | mean | sd | p0 | p25 | p50 | p75 | p100 | hist |
| row | 0 | 1 | 1241.5 | 716.64 | 1 | 621.25 | 1241.5 | 1861.75 | 2482 | ▇▇▇▇▇ |

dfseason <- dfraw %>%   
 # These factors are likely to be "random" effects  
 select(row,  
 year = year\_x,  
 season = season\_x,  
 ) %>%   
 mutate\_at(vars(everything(), -row), ~as.factor(.))  
  
skim(dfseason)

Data summary

|  |  |
| --- | --- |
| Name | dfseason |
| Number of rows | 2482 |
| Number of columns | 3 |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Column type frequency: |  |
| factor | 2 |
| numeric | 1 |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Group variables | None |

**Variable type: factor**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| skim\_variable | n\_missing | complete\_rate | ordered | n\_unique | top\_counts |
| year | 0 | 1 | FALSE | 3 | 201: 1284, 200: 802, 201: 396 |
| season | 0 | 1 | FALSE | 3 | 2: 868, 3: 816, 1: 798 |

**Variable type: numeric**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| skim\_variable | n\_missing | complete\_rate | mean | sd | p0 | p25 | p50 | p75 | p100 | hist |
| row | 0 | 1 | 1241.5 | 716.64 | 1 | 621.25 | 1241.5 | 1861.75 | 2482 | ▇▇▇▇▇ |

dfstruc <- dfraw %>%   
 # These are structural characteristics of the environment  
 select(row,  
 dry = rhyne\_dry\_x,  
 landcover = la\_n\_acover\_rough\_pasture\_rough\_pasture\_reed\_bed\_wet\_woodla\_na,  
 cleared = rhyne\_cleared,  
 width = average\_width\_m,  
 # length = approx\_length\_m, # Why is this such a long name.....  
 exposure = exposure\_1\_sun\_3\_shade\_2\_partial\_shade\_4\_open\_but\_emergent\_vegetation\_within\_rhyne\_5\_open\_but\_shaded\_by\_very\_high\_bank\_or\_dense\_overhanging\_bank\_vegetation,  
 management = water\_tier\_management\_x,  
 shaded = percentage\_water\_shaded  
 ) %>% # turn shaded to a percentage  
 mutate(shaded = shaded/100) %>%   
 # factors for variables  
 mutate\_at(vars(dry, landcover, cleared, exposure, management), ~ as.factor(.))  
  
skim(dfstruc)

Data summary

|  |  |
| --- | --- |
| Name | dfstruc |
| Number of rows | 2482 |
| Number of columns | 8 |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Column type frequency: |  |
| factor | 5 |
| numeric | 3 |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Group variables | None |

**Variable type: factor**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| skim\_variable | n\_missing | complete\_rate | ordered | n\_unique | top\_counts |
| dry | 3 | 1.00 | FALSE | 2 | 0: 2298, 1: 181 |
| landcover | 3 | 1.00 | FALSE | 3 | pas: 1297, rou: 1176, swa: 6 |
| cleared | 3 | 1.00 | FALSE | 2 | 0: 2264, 1: 215 |
| exposure | 297 | 0.88 | FALSE | 5 | 1: 1261, 4: 375, 2: 257, 3: 235 |
| management | 0 | 1.00 | FALSE | 2 | 3: 1314, 1: 1168 |

**Variable type: numeric**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| skim\_variable | n\_missing | complete\_rate | mean | sd | p0 | p25 | p50 | p75 | p100 | hist |
| row | 0 | 1.00 | 1241.50 | 716.64 | 1.0 | 621.25 | 1241.5 | 1861.75 | 2482 | ▇▇▇▇▇ |
| width | 38 | 0.98 | 2.43 | 1.08 | 0.8 | 1.90 | 2.2 | 2.90 | 9 | ▇▅▁▁▁ |
| shaded | 352 | 0.86 | 0.34 | 0.32 | 0.0 | 0.08 | 0.2 | 0.60 | 1 | ▇▂▁▂▂ |

# running `table` on variables that arent properly defined lets us see rogue values  
dfstruc %>% lapply(table)

## $row  
##   
## 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1036 1037 1038 1039 1040 1041 1042 1043 1044 1045 1046 1047 1048 1049 1050   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1051 1052 1053 1054 1055 1056 1057 1058 1059 1060 1061 1062 1063 1064 1065   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1066 1067 1068 1069 1070 1071 1072 1073 1074 1075 1076 1077 1078 1079 1080   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1081 1082 1083 1084 1085 1086 1087 1088 1089 1090 1091 1092 1093 1094 1095   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1096 1097 1098 1099 1100 1101 1102 1103 1104 1105 1106 1107 1108 1109 1110   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1111 1112 1113 1114 1115 1116 1117 1118 1119 1120 1121 1122 1123 1124 1125   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1126 1127 1128 1129 1130 1131 1132 1133 1134 1135 1136 1137 1138 1139 1140   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1141 1142 1143 1144 1145 1146 1147 1148 1149 1150 1151 1152 1153 1154 1155   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1156 1157 1158 1159 1160 1161 1162 1163 1164 1165 1166 1167 1168 1169 1170   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1171 1172 1173 1174 1175 1176 1177 1178 1179 1180 1181 1182 1183 1184 1185   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1186 1187 1188 1189 1190 1191 1192 1193 1194 1195 1196 1197 1198 1199 1200   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1201 1202 1203 1204 1205 1206 1207 1208 1209 1210 1211 1212 1213 1214 1215   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1216 1217 1218 1219 1220 1221 1222 1223 1224 1225 1226 1227 1228 1229 1230   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1231 1232 1233 1234 1235 1236 1237 1238 1239 1240 1241 1242 1243 1244 1245   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1246 1247 1248 1249 1250 1251 1252 1253 1254 1255 1256 1257 1258 1259 1260   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1261 1262 1263 1264 1265 1266 1267 1268 1269 1270 1271 1272 1273 1274 1275   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1276 1277 1278 1279 1280 1281 1282 1283 1284 1285 1286 1287 1288 1289 1290   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1291 1292 1293 1294 1295 1296 1297 1298 1299 1300 1301 1302 1303 1304 1305   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1306 1307 1308 1309 1310 1311 1312 1313 1314 1315 1316 1317 1318 1319 1320   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1321 1322 1323 1324 1325 1326 1327 1328 1329 1330 1331 1332 1333 1334 1335   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1336 1337 1338 1339 1340 1341 1342 1343 1344 1345 1346 1347 1348 1349 1350   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1351 1352 1353 1354 1355 1356 1357 1358 1359 1360 1361 1362 1363 1364 1365   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1366 1367 1368 1369 1370 1371 1372 1373 1374 1375 1376 1377 1378 1379 1380   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1381 1382 1383 1384 1385 1386 1387 1388 1389 1390 1391 1392 1393 1394 1395   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1396 1397 1398 1399 1400 1401 1402 1403 1404 1405 1406 1407 1408 1409 1410   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1411 1412 1413 1414 1415 1416 1417 1418 1419 1420 1421 1422 1423 1424 1425   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1426 1427 1428 1429 1430 1431 1432 1433 1434 1435 1436 1437 1438 1439 1440   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1441 1442 1443 1444 1445 1446 1447 1448 1449 1450 1451 1452 1453 1454 1455   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1456 1457 1458 1459 1460 1461 1462 1463 1464 1465 1466 1467 1468 1469 1470   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1471 1472 1473 1474 1475 1476 1477 1478 1479 1480 1481 1482 1483 1484 1485   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1486 1487 1488 1489 1490 1491 1492 1493 1494 1495 1496 1497 1498 1499 1500   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1501 1502 1503 1504 1505 1506 1507 1508 1509 1510 1511 1512 1513 1514 1515   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1516 1517 1518 1519 1520 1521 1522 1523 1524 1525 1526 1527 1528 1529 1530   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1531 1532 1533 1534 1535 1536 1537 1538 1539 1540 1541 1542 1543 1544 1545   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1546 1547 1548 1549 1550 1551 1552 1553 1554 1555 1556 1557 1558 1559 1560   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1561 1562 1563 1564 1565 1566 1567 1568 1569 1570 1571 1572 1573 1574 1575   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1576 1577 1578 1579 1580 1581 1582 1583 1584 1585 1586 1587 1588 1589 1590   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1591 1592 1593 1594 1595 1596 1597 1598 1599 1600 1601 1602 1603 1604 1605   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1606 1607 1608 1609 1610 1611 1612 1613 1614 1615 1616 1617 1618 1619 1620   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1621 1622 1623 1624 1625 1626 1627 1628 1629 1630 1631 1632 1633 1634 1635   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1636 1637 1638 1639 1640 1641 1642 1643 1644 1645 1646 1647 1648 1649 1650   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1651 1652 1653 1654 1655 1656 1657 1658 1659 1660 1661 1662 1663 1664 1665   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1666 1667 1668 1669 1670 1671 1672 1673 1674 1675 1676 1677 1678 1679 1680   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1681 1682 1683 1684 1685 1686 1687 1688 1689 1690 1691 1692 1693 1694 1695   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1696 1697 1698 1699 1700 1701 1702 1703 1704 1705 1706 1707 1708 1709 1710   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1711 1712 1713 1714 1715 1716 1717 1718 1719 1720 1721 1722 1723 1724 1725   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1726 1727 1728 1729 1730 1731 1732 1733 1734 1735 1736 1737 1738 1739 1740   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1741 1742 1743 1744 1745 1746 1747 1748 1749 1750 1751 1752 1753 1754 1755   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1756 1757 1758 1759 1760 1761 1762 1763 1764 1765 1766 1767 1768 1769 1770   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1771 1772 1773 1774 1775 1776 1777 1778 1779 1780 1781 1782 1783 1784 1785   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1786 1787 1788 1789 1790 1791 1792 1793 1794 1795 1796 1797 1798 1799 1800   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1801 1802 1803 1804 1805 1806 1807 1808 1809 1810 1811 1812 1813 1814 1815   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1816 1817 1818 1819 1820 1821 1822 1823 1824 1825 1826 1827 1828 1829 1830   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1831 1832 1833 1834 1835 1836 1837 1838 1839 1840 1841 1842 1843 1844 1845   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1846 1847 1848 1849 1850 1851 1852 1853 1854 1855 1856 1857 1858 1859 1860   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1861 1862 1863 1864 1865 1866 1867 1868 1869 1870 1871 1872 1873 1874 1875   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 2325   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2326 2327 2328 2329 2330 2331 2332 2333 2334 2335 2336 2337 2338 2339 2340   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2341 2342 2343 2344 2345 2346 2347 2348 2349 2350 2351 2352 2353 2354 2355   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2356 2357 2358 2359 2360 2361 2362 2363 2364 2365 2366 2367 2368 2369 2370   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2371 2372 2373 2374 2375 2376 2377 2378 2379 2380 2381 2382 2383 2384 2385   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2386 2387 2388 2389 2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2401 2402 2403 2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2416 2417 2418 2419 2420 2421 2422 2423 2424 2425 2426 2427 2428 2429 2430   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2431 2432 2433 2434 2435 2436 2437 2438 2439 2440 2441 2442 2443 2444 2445   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2446 2447 2448 2449 2450 2451 2452 2453 2454 2455 2456 2457 2458 2459 2460   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2461 2462 2463 2464 2465 2466 2467 2468 2469 2470 2471 2472 2473 2474 2475   
## 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   
## 2476 2477 2478 2479 2480 2481 2482   
## 1 1 1 1 1 1 1   
##   
## $dry  
##   
## 0 1   
## 2298 181   
##   
## $landcover  
##   
## pasture rough pasture swamp   
## 1297 1176 6   
##   
## $cleared  
##   
## 0 1   
## 2264 215   
##   
## $width  
##   
## 0.8 0.95 1 1.1 1.2 1.3 1.4 1.5 1.55 1.6 1.7 1.75 1.8 1.9 1.95   
## 18 12 52 58 60 18 6 90 12 72 78 6 126 30 6   
## 2 2.1 2.15 2.2 2.25 2.3 2.4 2.5 2.56 2.6 2.7 2.8 2.9 3 3.1   
## 372 72 6 156 6 138 30 228 12 18 36 72 48 324 24   
## 3.2 3.3 3.5 3.8 4 4.7 4.8 5 6 7 9   
## 18 6 60 6 60 6 12 42 6 24 18   
##   
## $exposure  
##   
## 1 2 3 4 5   
## 1261 257 235 375 57   
##   
## $management  
##   
## 1 3   
## 1168 1314   
##   
## $shaded  
##   
## 0 0.01 0.02 0.025555555 0.03 0.05   
## 201 11 1 76 2 223   
## 0.075 0.1 0.125 0.15 0.2 0.225   
## 20 267 5 143 199 4   
## 0.25 0.3 0.35 0.37 0.4 0.45   
## 87 98 40 1 95 12   
## 0.5 0.55 0.6 0.65 0.7 0.75   
## 105 1 68 3 58 9   
## 0.8 0.85 0.9 0.95 0.97 0.98   
## 126 22 81 87 1 11   
## 1   
## 73

dfchem <- dfraw %>%   
 # water chemistry parameters. Important for macroinverts  
 select(row,  
 wtemp = water\_temperature\_c,  
 turbidity,  
 salinity,  
 do = dissolved\_oxygen,  
 ph = p\_h\_probe  
 )   
  
dfchem %>% skim()

Data summary

|  |  |
| --- | --- |
| Name | Piped data |
| Number of rows | 2482 |
| Number of columns | 6 |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Column type frequency: |  |
| numeric | 6 |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Group variables | None |

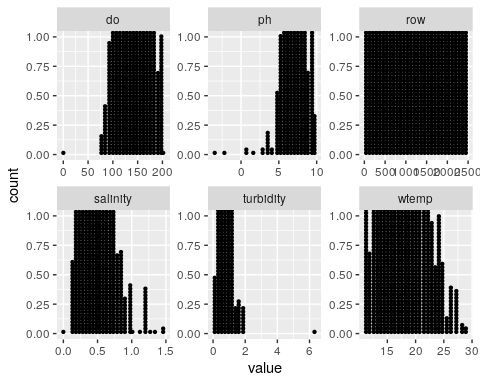
**Variable type: numeric**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| skim\_variable | n\_missing | complete\_rate | mean | sd | p0 | p25 | p50 | p75 | p100 | hist |
| row | 0 | 1.00 | 1241.50 | 716.64 | 1.00 | 621.25 | 1241.50 | 1861.75 | 2482.00 | ▇▇▇▇▇ |
| wtemp | 760 | 0.69 | 17.61 | 3.47 | 10.94 | 14.97 | 17.53 | 20.04 | 29.00 | ▅▇▆▂▁ |
| turbidity | 849 | 0.66 | 0.59 | 0.29 | 0.00 | 0.43 | 0.52 | 0.67 | 6.31 | ▇▁▁▁▁ |
| salinity | 824 | 0.67 | 0.44 | 0.19 | 0.00 | 0.32 | 0.39 | 0.51 | 1.46 | ▂▇▂▁▁ |
| do | 824 | 0.67 | 141.02 | 26.25 | 0.15 | 121.40 | 138.63 | 159.35 | 201.50 | ▁▁▃▇▃ |
| ph | 765 | 0.69 | 7.00 | 1.04 | -3.48 | 6.47 | 7.00 | 7.50 | 9.75 | ▁▁▁▇▇ |

# some outliers  
qdot(dfchem)

## `stat\_bindot()` using `bins = 30`. Pick better value with `binwidth`.

## Warning: Removed 4022 rows containing non-finite values (stat\_bindot).



dfchem <- # fixed outliers  
 dfchem %>% mutate(  
 # unreasonable to be higher than this  
 turbidity = ifelse(turbidity > 3, NA, turbidity),  
 # definiteley not higher than 40  
 wtemp = ifelse(wtemp > 40, NA, wtemp),  
 # some negative ph values in dataset  
 ph = ifelse(ph < 0, NA, ph),  
 # do unlikely to be lower than this  
 do = ifelse(do < 50, NA, do)  
 )

dfcoocurr <- dfraw %>%   
 # cooccurring species  
 select(row,  
 buttercup:ladies\_frock) %>%   
 # mutate to factors  
 mutate\_at(vars(everything(), -row), ~ as.factor(.))  
  
# Check factor levels - ones with just one factor level may as well be removed  
faclvl <- sapply(dfcoocurr, levels) %>% sapply(length)  
faclvl2 <- names(faclvl[faclvl == 1])  
  
# Deselect these  
dfcoocurr <- dfcoocurr %>%   
 select(-faclvl2)

dftidy\_wide <- bind\_cols(dfabun, dfsite, dfstruc,  
 dfcoocurr, dfchem) %>%   
 # Check they all line up right  
 # dftidy %>% select(starts\_with("row")) # Yes  
 select(-c("row1", "row2", "row3"))

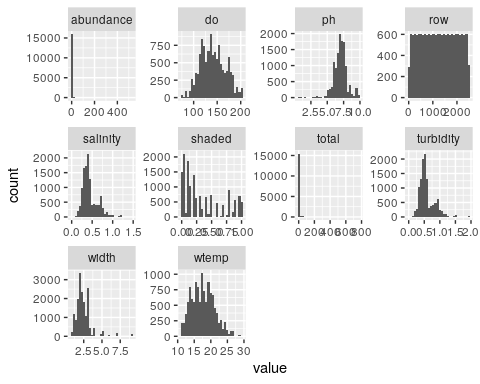
dftidy\_long <- dftidy\_wide %>%   
 pivot\_longer(cols = colnames(dfabun)[-1],   
 names\_to = "species",   
 values\_to = "abundance")

dfaggregated <- dftidy\_long %>%   
 select(-species, -abundance) %>%   
 distinct()

qhist(dftidy\_long)

## `stat\_bin()` using `bins = 30`. Pick better value with `binwidth`.

## Warning: Removed 33495 rows containing non-finite values (stat\_bin).



# save.image("rdat/01-processing.RData")