|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **RM\_log\_file\_example.docx** | | | | | | | | | | | | | | | | | | | | | | | | | |
| [Readme log file providing a template for other log file format and content. This file is placed in the root directory for the project (see data storage directories). For illustrative purposes, the sections were populated using actual notes from a previous project].  This file documents exploratory research related to EDEN DEM development.  Grey Text indicates mistakes retained for future reference but not directly included in the current product. | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Overall Goal/This activity’s objective(s)** | | | | | | | | | | | | | | | | | | | | | | | | | |
| [This is where the overall goal of the greater project, as well as the activity documented in this file are briefly described. Directly below I provide an example from a previously conducted project/activity. Replace this with your own].  The overall goal of the project is to produce a regional ground surface (i.e., below water surface) elevation model for the Florida Everglades that can be used in Everglades Depth Estimation (EDEN) water depth processing. The objective for the activity documented here is to explore relationships among surface reflectance as well as other metrics derived from Landsat data with elevations measured via the Airborne Height Finder. In this case, we’re using a single January image from 2005. | | | | | | | | | | | | | | | | | | | | | | | | | |
| **data storage directories** | | | | | | | | | | | | | | | | | | | | | | | | | |
| [The directory structure for the project is carefully documented here. Replace this with your own directory structure – I’ll provide the top level directories to you].  **\SFL\Elev\_Interp This is the base directory on the LCDEP AE1 drive (it includes this log file)**  **\SFL\Elev\_Interp\0\_MXDs This subdirectory contains the ESRI ArcMAP project files.**  **\SFL\ Elev\_Interp\ANCILLARY This subdirectory contains ancillary geographic data files such as study area boundary vectors, digital elevation**  **models, soils, etc.**  **\SFL\Elev\_Interp\GRAPHICS This subdirectory contains all publication quality graphics from the work**  **\SFL\ Elev\_Interp\R This subdirectory contains all components of the R software-based analysis with subdirectories as appropriate**  **..\Inputs This subdirectory contains R input (csv) and database files**  **..\Outputs This subdirectory contains R output text files**  **..\Scripts This subdirectory contains R scripts**  **\SFL\ Elev\_Interp\RS This subdirectory contains the remote sensing inputs to the analysis (by subdirectory)**  **\SFL\ Elev\_Interp\LSRP This subdirectory contains the Landsat Surface Reflectance Inputs remote sensing inputs** | | | | | | | | | | | | | | | | | | | | | | | | | |
| **file naming conventions** | | | | | | | | | | | | | | | | | | | | | | | | | |
| [Provide a ‘key’ to file naming conventions here. This example is very detailed (Annie was wonderfully detail oriented). The key is that the reader can decipher your thinking when looking at lists of files.]  a, b, c, d, etc or 1,2,3, etc. = are contextual - when following a band number or other naming element, indicates the file's place in a sequence of similar antecedent and followup files  b = when preceding a number (e.g., b1, b2, b3, etc.) indicates band numbers within an image  CART = files and folders related to Classification and Regression Trees, numbered to differentiate trees developed and validated with different sets of references  dn = DN values, as supplied by Landsat, included in rasters and shapefiles developed from DN data (as opposed to top of the atmosphere reflectance, QB radiance, or atmospherically corrected data)  env = extension indicating an ENVI raster or mask file. In this log it stands for both the .env raster and the .hdr file associated with it.  evf = extension indicating ENVI vector file  fp = rasters with floating point data storage  Hawth's Tools = open source third party toolboxes developed for working wth community data in Arc software  marsh = files or stats employing the complete mask to work with marsh-only data  mask = raster composed of only 1s and 0s, used to limit operations performed on other rasters to areas of interest  MDS = multidimensional scaling = graphs showing multivariate class distances among bands  N\_nnUTM.env = raster converted to ENVI format from an NLAPs file. File is in original registration, which involved nearest neighbor resampling  NDVI = normalized difference vegetation index, which is computed as (NIR-R)/(NIR+R)  oob = out of box error, computed by the random forest algorithm from data removed during bootstrapping  PC or PCA = Principle Components reduction of the QuickBird image and band ratios. When followed by a number, it indicates one of 7 PC bands created from the original QuickBird bands as well derived band ratios and NDVI.  prelim, precursor, or initial = antecedent files (used to create later files)  pts = points – when followed with a number, used to distinguished reference points created for different classifications  rf = random forest classifier / classifications  roi = region of interest – also the file extension for ENVI region of interest files  RuleGen = third party open source add-on for ENVI that develops CART decision trees  rUTM = indicates that the raster (and shapefiles developed with it) have been re-registered by someone in the LCDEP working group. In this log, only one file has this indicator, because it was developed for the CC\_2007\_09\_29\_QB image, which was reregistered to the 2003 image that this log file addresses  shp = extension that stands as a proxy for all files involved in an Arc shape file  sta = extension indicating ENVI stats file  T\_ccUTM.env = raster converted to ENVI format from a Landsat Archive TIFF, downloaded from GloVis. File is in original registration, which employed cubic convolution resampling  TIFF.tif = indicates a TIFF raster format  train = training reference data  UTM = indicates an image in the original Landsat Archive registration, in zone 17 UTM projected coordinates on the WGS84 datum  val = validation reference data  x = as a prefix, indicates files or folders that were abandoned and should not be used in future work  "x" = is a naming place holder variable specific to a processing step and identified in the adjacent log text  SFL\_YYYY\_MM\_DD\_TM5 = file prefix indicating acquisition date for a Landsat Thematic Mapper image used in South Florida projects/products  SFL\_YYYY\_MM\_DD\_TM7 = file prefix indicating acquisition date for an Enhanced Thematic Mapper image used in South Florida projects/products  YYYY\_MM\_DD = if it follows the study area (SFL), as described above, it indicates the date of image acquisition for both the raster and for shapefiles that refer to the raster. If it occurs at the end of a folder name, it indicates the date information in the folder was last updated | | | | | | | | | | | | | | | | | | | | | | | | | |
| **contributors** | | | | | | | | | | | | | | | | | | | | | | | | | |
| [List everyone who has made edits to this file/participated in conversation within it].  Text colors in this log indicate the identity of the contributor.  Annie Elmore  John Jones | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Processing [Here’s where the daily log of processing begins. Try to make this easily readable. Use screen shots to convey results. Add commentary/interpretations. I’ll insert questions and comments here as well. Put ‘dead ends’ in grey text, but don’t delete them. Put show stopping problems in yellow text. Put significant results in red text].** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 October 2009 | | | | | | | | | | | | | |  | | | | | | |  | | | | |
| **Single Date Regression - January** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Just to revist what bands are already available: | | |  | | | | | | | | | | | | | | | | | | | | | | |
| SFL\_2005\_01\_25\_TM5\_dn\_ui\_rUTM.env  SFL\_EDEN\_TM\_ROI\_mask.env | | | | | | | looking for orthogonal information, I ran a PC transformation on these 13 bands, taking stats from area under ROI created with the ROI mask. | | | | | | | | | | | | | SFL\_2005\_01\_25\_TM5\_dn\_PCA\_fp\_rUTM.env | | | | | |
| Basic Stats Min Max Mean Stdev Num Eigenvalue  Band 1 -19479.755859 13751.120117 0.000000 2889.094497 1 8346867.009726  Band 2 -37505.843750 13545.149414 -0.000000 2143.116444 2 4592948.092873  Band 3 -12390.645508 36430.359375 -0.000000 1120.095991 3 1254615.029599  Band 4 -23419.263672 1333.490601 -0.000000 994.236056 4 988505.335883  Band 5 -7696.162598 5295.604492 -0.000000 358.744472 5 128697.596191  Band 6 -34720.605469 34620.699219 -0.000000 295.843245 6 87523.225869  Band 7 -4835.375000 15904.158203 0.000000 187.683122 7 35224.954275  Band 8 -23144.556641 2682.665039 -0.000000 134.577070 8 18110.987758  Band 9 -895.514771 42759.757813 -0.000000 105.981436 9 11232.064698  Band 10 -3765.159180 1641.786987 0.000000 78.838102 10 6215.446400  Band 11 -46191.453125 160.536240 0.000000 28.598131 11 817.853101  Band 12 -1479.314941 200.558228 0.000000 14.845958 12 220.402466  Band 13 -0.355979 0.413816 -0.000000 0.204140 13 0.041673 | | | | | | | | | | | | | | | | | | | | | | |  | | |
| SFL\_2005\_01\_25\_TM5\_dn\_PCA\_fp\_rUTM.env | | | | | | | | | | added minima, rounded to 6 sig figs, to each band and multiplied by factors of 10 to get similar mean sig figs, and converted to unsigned long integer storage (ranges were too large for unsigned integers) | | | | | | | | | SFL\_2005\_01\_25\_TM5\_dn\_PCAs\_uL\_rUTM.env | | | | | | |
| Here's how the masked stats look:  Basic Stats Min Max Mean Stdev Num Eigenvalue  Band 1 0.044922 33230.921875 19479.800781 2889.094496 1 148538594.931260  Band 2 -0.042969 51050.949219 37505.800781 2143.116444 2 110921155.655830  Band 3 -0.045898 48820.960938 12390.599609 1120.095991 3 12868077.454738  Band 4 0.037109 24752.791016 23419.300781 994.236056 4 5913797.222934  Band 5 -0.024414 129917.648438 76961.601563 3587.444720 5 3527822.303526  Band 6 -0.003906 69341.296875 34720.601563 295.843245 6 2224040.315708  Band 7 0.048828 207395.390625 48353.798827 1876.831219 7 988962.456732  Band 8 0.042969 25827.265625 23144.599610 134.577070 8 621576.882398  Band 9 0.024414 4365527.500000 89551.501464 10598.143639 9 91267.944466  Band 10 0.007324 54069.468750 37651.599121 788.381024 10 22570.081334  Band 11 0.046875 46352.035156 46191.500001 28.598131 11 22040.153864  Band 12 -0.048828 16798.683594 14793.100586 148.459579 12 817.861110  Band 13 3.559790 655323.562500 43015.442678 11878.335204 13 0.000000 | | | | | | | | | | | | | | | | | | | | | | | | | b9 NOTE: all but 53 pixels fall between 0 and 154077. Those pixels fall between 4298048 and 4365528. They all appear to be man-made features  b13 NOTE: all but 53 pixels fall between 0 and 110508. They appear to be the exact same pixels as those in b9 |
| SFL\_2005\_elev\_image\_PCA\_UTMs.env  SFL\_2005\_01\_25\_TM5\_dn\_ui\_rUTM.env  SFL\_2005\_01\_25\_TM5\_dn\_PCAs\_uL\_rUTM.env | | | | | | | | | | | retrieved the X and Y coordinate bands from the multi-date image and added them to the Jan 13 band image and the PCA | | | | | | | SFL\_2005\_01\_25\_TM5\_elev\_image\_rUTM.env  SFL\_2005\_01\_25\_TM5\_elev\_image\_rUTM\_TIFF.tif | | | | | | | |
| So here are the working bands: | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Jan point intersections** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 October 2009 | | | | | | | | | | | | | | | | | | | | | | | | | |
| I'm going to start by running the same points I ran in the multi-date evaluation, so we can get an apples to apples comparison of performance. Then I think I'll try running a bunch of equidistant points, so I can catch areas that were covered with clouds in the other analysis. | | | | | | | | | | | | | | | | | | | | | | | | | |
| SFL\_elevation\_PCA\_val.shp | | | | | | exported the validation points to new name.  deleted all the spectral attributes  used Hawth's tools to add the PCA spectral attributes | | | | | | | | | | | | | | | | SFL\_elevation\_Jan\_val.shp | | | |
| SFL\_elevation\_PCA\_train.shp | | | | | | exported the training points to new name.  deleted all the spectral attributes  used Hawth's tools to add the PCA spectral attributes | | | | | | | | | | | | | | | | SFL\_elevation\_Jan\_train.shp | | | |
| annoyance. While I used the whole training dataset for conditional inference forests, I had to reduce the number of obs by 20% when I ran the single party tree. That means that to compare the effectiveness of the single Jan date to the multiple date analysis I'm going to have to hand-cull exactly the same sample points that were randomly removed the first time around. o bother. I should have done it in Arc instead of Excel. Point to remember in future. | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Jan point intersections** | | | | | | | | | | | | | | | | | | | | | | | | | |
| SFL\_elevation\_Jan\_train.dbf | | | | removed all but HAED\_ID, elevation, band vectors, saved to csv format,improved headers. | | | | | | | | | | | | | | | | | | | SFL\_elevation\_Jan\_train.csv | | |
| while cforest is the best way to pick variables, I don't see a way to figure out the optimal number of variables to try at each split in cforest. So I'm going to rely on random forest for that information | | | | | | | | | | | | | | | | | | | | | | | | | |
| SFL\_elevation\_Jan\_train.csv  SFL\_JAN\_script\_rf\_elevation\_PCA.doc | | | | | | | hmmm… determining the best mtry suggests that the more variables, the better. However, if I do that, I'll lose the controlled randomization benefit of rf and cforest and be left with bagging.  I think I'll try an mtry of 18 and see if that gets us anywhere with optimal variable selection | | | | | | | | | | | |  | | | | | | |
| SFL\_elevation\_Jan\_train.csv  SFL\_JAN\_script\_cforest\_elevation\_PCA.doc | | | | | | | moving over to party, let's try running with the default mtry=5 first, and then trying mtry = 18, just to see if it changes variable rankings. | | | | | | | | | | | |  | | | | | | |
| mtry = 5   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Band | mean incrs accuracy | Description |  | Band | mean incrs accuracy | Description | | b1 | 1.7181 | UTM Y |  | b6 | 0.0215 | TM5 b4 reflected IR | | b2 | 0.4807 | UTM X |  | b26 | 0.0212 | PCA11 | | b3 | 0.1092 | TM5 b1 blue-green |  | b28 | 0.0202 | PCA13 | | b18 | 0.0591 | PCA3 |  | b16 | 0.0198 | PCA1 | | b4 | 0.0554 | TM5 b2 green |  | b19 | 0.0192 | PCA4 | | b22 | 0.0529 | PCA7 |  | b7 | 0.0189 | TM5 b5 reflected IR | | b8 | 0.0493 | TM5 b6 thermal IR |  | b14 | 0.0150 | tassled cap greenness | | b13 | 0.0468 | tassled cap brightness |  | b21 | 0.0096 | PCA6 | | b17 | 0.0276 | PCA2 |  | b11 | 0.0076 | NDVI texture variance | | b27 | 0.0260 | PCA12 |  | b20 | 0.0039 | PCA5 | | b9 | 0.0246 | TM5 b7 reflected IR |  | b12 | 0.0038 | NDVI texture entropy | | b15 | 0.0245 | tassled cap b3 |  | b24 | 0.0026 | PCA9 | | b5 | 0.0238 | TM5 b3 red |  | b23 | 0.0015 | PCA8 | | b10 | 0.0220 | NDVI |  | b25 | 0.0011 | PCA10 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| mtry = 18   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Band | mean incrs accuracy | Description |  | Band | mean incrs accuracy | Description | | b1 | 1.5330 | UTM Y |  | b16 | 0.0204 | PCA1 | | b2 | 0.5434 | UTM X |  | b28 | 0.0198 | PCA13 | | b3 | 0.1105 | TM5 b1 blue-green |  | b7 | 0.0194 | TM5 b5 reflected IR | | b8 | 0.0792 | TM5 b6 thermal IR |  | b14 | 0.0189 | tassled cap greenness | | b4 | 0.0666 | TM5 b2 green |  | b10 | 0.0180 | NDVI | | b18 | 0.0658 | PCA3 |  | b19 | 0.0176 | PCA4 | | b22 | 0.0425 | PCA7 |  | b5 | 0.0143 | TM5 b3 red | | b13 | 0.0369 | tassled cap brightness |  | b21 | 0.0075 | PCA6 | | b17 | 0.0337 | PCA2 |  | b11 | 0.0070 | NDVI texture variance | | b27 | 0.0274 | PCA12 |  | b12 | 0.0058 | NDVI texture entropy | | b15 | 0.0267 | tassled cap b3 |  | b24 | 0.0042 | PCA9 | | b6 | 0.0241 | TM5 b4 reflected IR |  | b20 | 0.0038 | PCA5 | | b9 | 0.0232 | TM5 b7 reflected IR |  | b25 | 0.0021 | PCA10 | | b26 | 0.0205 | PCA11 |  | b23 | 0.0018 | PCA8 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| so, while there's some agreement (light green) there is also a bit of shuffling. Bottom line, though, is that even though they shift about within the block, if you break them up in rough thirds, the top third are the same group, the middle third are the same group, and the lower third are the same group. | | | | | | | | | | | | | | | | | | | | | | | | | |
| **removing variables and testing forest accuracies** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Since I don't know how to get mean square residuals for c-forests, I'm going to rely on random forests for accuracy assessments while dropping lowest c-forest variables in order. I have just reposted the question to Nabble. Hopefully somebody will have a cforest answer for me. | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 October 2009 | | | | | | | | | | | | | | | | | | | | | | | | | |
| I got about a third of the way through this yesterday, but today realized, after almost completing it that I had an error in the code (duplicate variables), so I'm starting over.  using mtry = 5 | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Band**  **removed**  none  23  25  20  24  12  11  21  5  19  10  14  7  28 | **Total #**  **Bands**  28  27  26  25  24  23  22  21  20  19  18  17  16  15 | **% Variance**  **Explained**  96.25  96.53  96.71  96.74  96.98  97.19  97.42  97.29  97.52  97.7  97.91  98.69  98.14  98.29 | | | **Mean of**  **Squared residuals**  0.06364977  0.05893707  0.05589342  0.05547794  0.05128163  0.04783301  0.04392442  0.04597788  0.04206971  0.03908345  0.03543895  0.02225315  0.03162732  0.02906170 | | | | | | | **Band**  **removed**  16  26  9  6  15  27  17  13  22  18  4  8  2  1 | **Total #**  **Bands**  14  13  12  11  10  9  8  7  6  5 mtry=3  4 mtry=2  3 mtry=1  2 mtry=1  1 mtry=1 | | **% Variance**  **Explained**  98.39  98.43  98.54  98.66  98.66  98.77  98.82  98.87  98.9  98.9  98.92  98.1  91.42  89.01 | **Mean of**  **Squared residuals**  0.02733503  0.02660567  0.0248714  0.0227707  0.02273551  0.02082248  0.02012006  0.01925880  0.01862129  0.01861797  0.01835694  0.0322641  0.1457484  0.1868078 | | | | | | | | well this seems pretty freaky to me. | |
| longitude alone can get you to 89%  longitude and latitude can get you to 91%  lat/longs and b8 (TM5 b6 thermal) can get you to 98%  lat/longs, b8 (TM5 b6 thermal), and TM5 b2 (green) can get you to almost 99%  The strong thermal component might be getting at floc and moisture content.  Green… I can't guess at where that's helping us out yet.  you can add PCA 3 and PCA7 but you evidently don't need to.  Where are NDVI variables, or even NIR or red?  I realized that I forgot to get the PC band weightings before I wrote over the stats file used in the transformation, so I redid the PCA to get the band weightings:    So PCA 3 is:  AKA: TC band 3 TC bright b4 IR blue-green red green NDVI b5 IR NDVI txV NDVI TxE b7 IR TC green thermal  and PCA7 is:  AKA Blue red TC band 3 b7 IR green NDVI b4 IR TC bright NDVI txV TC green NDVI TxE b5 IR thermal  pretty interesting. Still no NDVI.  But some IR and TC brightness comes up and TC band 3 is prominent.  So while NDVI tx were used in the multi-season imagery, they weren't in January. Duh. Probably nothing deciduous was out, even in SFL… How much of their marsh veg is dead in the winter, anyway?  TC brightness is getting at soil variations  TC band 3 is getting at wetness  I think I'll try running this without the two PC bands and see where it gets us. If we want to add them in a later evaluation, then we'll have something to compare our results too. | | | | | | | | | | | | | | | | | | | | | | | | | |
| **conditional inference trees** | | | | | | | | | | | | | | | | | | | | | | | | | |
| SFL\_elevation\_Jan\_train.csv  SFL\_JAN\_script\_ctree\_elevation\_PCA.doc | | | | | | | the unrestricted tree had 829 nodes  the univariate alpha 0.05 tree had 295 nodes  the Bonferroni alpha 0.05 tree had 231 nodes | | | | | | | | | | SFL\_2005\_01\_25\_4-band\_ct.pdf  SFL\_2005\_01\_25\_4-band\_ct\_univ.pdf  SFL\_2005\_01\_25\_4-band\_ct\_bonf.pdf  SFL\_2005\_01\_25\_4-band\_ct\_bonf\_means.pdf  SFL\_2005\_01\_25\_4-band\_ct\_bonf\_term\_distrib.pdf | | | | | | | | |
| **ENVI decision trees** | | | | | | | | | | | | | | | | | | | | | | | | | |
| SFL\_2005\_01\_25\_4-band\_ct\_bonf\_means.pdf  SFL\_JAN\_4-band\_ctree\_structure.doc | | | | | | | | | started creating the ENVI decision tree | | | | | | | | SFL\_2005\_01\_25\_4-band\_ct\_bonf\_tree.txt | | | | | | | | |
| 8 October 2009 | | | | | | | | | | | | | | | | | | | | | | | | | |
| finished tree construction | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 October 2009 | | | | | | | | | | | | | | | | | | | | | | | | | |
| proofed and corrected tree | | | | | | | | | | | | | | | | | | | | | | | | | |
| SFL\_2005\_01\_25\_TM5\_elev\_image\_rUTM.env  SFL\_2005\_01\_25\_4-band\_ct\_bonf\_tree.txt  SFL\_EDEN\_TM\_ROI\_mask.env | | | | | | | | | | ran the decision tree and applied the mask  looks less detailed than the multi-date version | | | | | | | SFL\_2005\_01\_25\_4-band\_ct\_bonf.env  SFL\_2005\_01\_25\_4-band\_ct\_bonfM.env | | | | | | | | |
| SFL\_2005\_01\_25\_4-band\_ct\_bonfM.env  SFL\_EDEN\_TM\_ROI\_mask.env | | | | | | | | | | creating a TIFF of the masked classification yields a color representation – no class values for some reason.  So I multiplied the image with the mask, using band math, output to memory and converted to TIFF. | | | | | | | SFL\_2005\_01\_25\_4-band\_ct\_bonfM\_TIFF.tif | | | | | | | | |
| SFL\_2005\_01\_25\_4-band\_ct\_bonfM\_TIFF.tif  SFL\_elevation\_Jan\_val.shp | | | | | | | | intersected points with raster values | | | | | | | | | SFL\_elevation\_Jan\_val.shp | | | | | | | | |
| SFL\_elevation\_Jan\_val.dbf  SFL\_2005\_01\_25\_4-band\_ct\_bonf\_tree.doc | | | | | | | removed all but HAED\_ID, class, and measured elevation, from the spreadsheet. Copied the class column and started replacing class values with predicted elevations, saved to .xls format. | | | | | | | | | | SFL\_2005\_validation\_Jan\_RMSE.xls | | | | | | | | |
| 14 October 2009 | | | | | | | | | | | | | | | | | | | | | | | | | |
| SFL\_2005\_validation\_Jan\_RMSE.xls  SFL\_2005\_01\_25\_4-band\_ct\_bonf\_tree.doc | | | | | | | finished replacing class values with predicted elevations, calculated RMSE. and added to RMSE spreadsheet for comparison with multi-date analysis. | | | | | | | | | | SFL\_2005\_validation\_Jan\_RMSE.xls | | | | | | | | |
| Here's the comparison: | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | | | | | | |  | | | | | | | | | |  | | | | | | | | |
|  | | | | | | |  | | | | | | | | | |  | | | | | | | | |