GIS Process for TAP

I. Created new roads layer to begin process fresh
   a. Done with Kim Forkner
   b. Combined current SDE layer with current INFRA MVUM table values
   c. Manual search of SDE/INFRA technical errors revealed a few more roads to add (ex: 03S38J which had no CN in SDE)
   d. Add additional roads to TAP from U-Routes in accordance with information from Erin Noesser's spreadsheet of recent NEPA changes not yet reflected in SDE "Tap_Roads_new20141024"
   e. Preserved this data layer as "TAP_Final_AMoore" in database

II. Removal of roads from the analysis layer: Not all roads will be analyzed in TAP, so I created a new feature dataset within the geodatabase to house these polylines.
   a. Created **new feature dataset** within the TAP.gdb called **"Roads_Removed_From_Tap"** to store feature classes of roads not analyzed
   b. Created a **new field** called **"Decision"** to indicate which planning process the route segment in question was last analyzed under
   c. Selected federal and state highways using the "system" field where "system=SH or system=US", created a new featureclass **"highways"** to store in "Roads_Removed_From_Tap" and deleted these roads out of the TAP analysis layer
   d. Selected BLM roads using same process, created **"BLM_Lands"** feature class to store in the roads removed feature dataset and deleted these roads out of the TAP analysis layer
   e. Selected county roads NOT within the forest boundary and added them to **"BLM_Lands",** deleting them out of the TAP analysis layer
   f. Selected RAP roads that had NO new specialist input and removed them from the analysis layer to **"RAP_Roads_already_evaluated"** in the roads removed feature dataset. Attributed remaining RAP roads with why they remained in the "Decision" field.
   g. Selected roads already evaluated in a prior NEPA decision (Travel Management 09', Mono Craters, UOBCR, Wilderness Restoration, Sierra Front, Mono Mills) and removed them to a new feature class **"Prior Decisions"**, deleting them out of TAP analysis layer. BUT leaving roads if they have a potential issue as seen in the RYG/TSI analysis.

III. Run topology to remove overlaps and multi-part features
   a. Created new layer "TAP_Final_AMoore_topoledits" to preserve 2nd iteration
   b. Found and fixed 171 overlaps and 2 multi-part features
   c. Interesting note: when merging the SDE spatial data with INFRA tabular data, tiny overlaps appear to occur in places, mostly at jurisdictional lines.

IV. <u>Incorporate TSI and OHV Monitoring data into TAP database</u>

a. Created a layer combining data from the Red/Yellow/Green monitoring database and the TSI database using table join. "TSI_RYG_Join"
b. Removed all roads NOT being analyzed in TAP
c. Used combination of RYG status and TSI issues to populate a new field: "Route Status" or "Rte_Status" using the following criteria
    i. No TSI issue, but has RYG rating: "status=red (or green or yellow)"
    ii. If TSI and RYG agree that the route doesn't exist: "Non-Existant"
    iii. If TSI recommends closing: "Recommend close, status=red(or yellow or green)"
    iv. If TSI says overgrown but no RYG rating: "Potentially Non-Existant"
d. Joined table to most current TAP layer (topoledits) and exported to new featureclass: "TAP_Final_AMoore_topoledits_join_TSIRYG"
e. Anna Fryjoff-Hung analyzed the routes attributed "Non-Existant" and "Potentially Non-Existant" by comparing them to aerial imagery
    i. New field created: "Existing" populated using following criteria
        1. **"Clearly Existing"** = a clearly used road with no indication that the route is gone
        2. **"Clearly Overgrown"** = a route with signs of brush in the wheel tracks and likely difficult to find on the ground, although still visible from aerial imagery
        3. **"Unable to Determine"** = a route with unknown status because aerial imagery was insufficient for evaluation (shadows, timber, etc…)
        4. **"Unsure"** = a route where condition is questionable and could go either way
        5. **"Does Not Exist"** = a route that clearly does not exist on aerial imagery, and status is confirmed by a comment in either TSI or RYG databases

V. <u>Evaluating and documenting jurisdictional issues</u>

a. Started with a dataset created by Kim/Scott "TAP_ROW_countycompare"
b. Exported this to a new dataset "TAP_ROW_Countycompare_AMoore_use" to preserve the original layer
c. Created new field called "Instrument"
d. Followed Erin's workflow to make a blanket (succinct) statement about the issue surrounding each road:
    i. Format: "who needs the instrument_what type of instrument is needed" *(ex: FS_instrument needed* ***or*** *County-current instrument)*
    ii. "**xxx_instrument needed"** = a value of "Grant Record Needed" in the "ROW" field and value of "no" or "shownFS" in the "Confirm_CT" field
    iii. **"xxx_out of date instrument"** = a value in the "Grantee" field and a value of "other"or "yes" in the "Confirm_Ct" field, and "grand record needed" in the "ROW" field

iv. **"xxx_current instrument"** = a value in the "Grantee" field, a value of "yes" in the "Confirm_Ct" field, and usually a value in the "A Easement Date" field

e. Merged the resulting dataset with the TAP data
   i. Could not use spatial join, since lines did not exactly match
   ii. Needed to use a tool like "Union", but that tool is not available for polylines
   iii. Solution: Used a combination of Intersect/Erase/Merge tools to bring values over to the TAP database.

VI. <u>Cleanup database before incorporation of specialist's input</u>
   a. To preserve record, exported most current dataset with topology edits, route status information, and jurisdiction information to a new featureclass: "TAP_Final_Amoore_topoledits_joinTSIRYG_ROW"
   b. Inspected segments of road for having matching attributes and merged those segments. Most common reason for split was at a new map quad boundary.
   c. Inspected tiny segments (less than one hundredth of a mile) that could be merged with larger segments.
   d. This reduced number of routes by 575 segments

VII. <u>Consolidate/Reconcile prior specialist input fields</u>
   a. Select by location to reveal differences in the layers: TapMaster had 5 more records than SpatialJoinMarty. All 5 appeared to have no spatial location (they did not appear/exist on a map when "zoomed to"). Deleted these records.
   b. Used Erin Noesser's Excel spreadsheet comparing "TapMaster" & "Spatial Join Marty" to determine which fields were needed/duplicated/most current, and came up with one layer for joining to TAP: "TapMaster_MartySpatial_Join"
   c. Reconcile Sue W's layer with my new layer
      i. They are totally differenet
      ii. Did spatial join and cleaned discrepencies by hand to create: "TapMaster_SpatialMarty_SueWKGN_Join"
   d. Select by location to remove lines in my new layer that are NOT in "TAP_Final_AMoore_topoledits_JoinTSIRYG_ROW". Had to remove some stragglers by hand.
   e. Make sure the two final layers (TapMaster_SpatialMarty_SueWKGN_Join and TAP_Final_AMoore_topoledits_JoinTSIRYG_ROW) are exactly the same (lines exactly coincident)before performing a final merge
   f. Create topology:
      i. Rule = "Must be covered by featureclass off"
      ii. This identifies segments where the two layers do not overlap perfectly
      iii. 225 errors identified.
   g. Intersect the final layers
      i. TAPMaster_SpatialMarty_SueWKGN_Join" = 2140 segments
      ii. TAP_Final_AMoore_topoledits_JoinTSIRYG_ROW" = 2639 segments

iii. Resulting intersection = 2909 segments

VIII. <u>Reorganize fields in attribute table to better calculate risks vs. benefits</u>

a. Ex:
   i. old field called "ROS" had both positive and negative numbers
   ii. broke into TWO separate fields: "ROS_Risk" and "ROS_Benefit"
b. This method helps to enable separate calculation of risks vs benefits.

IX. <u>Perform analysis and incorporate Todd Ellsworth's hydrology data. Used separate featureclass "TEllsworth_Edits" to perform the following steps.</u>

a. Watershed Risk:
   i. Used "dissolve" tool on "watersheds_rated_by_ENoesser" to dissolve adjoining areas of the same score. Now called "Watersheds_riskrating_dissolve"
   ii. Used "select by location" tool to identify route segments in "0" rated watersheds. With selection made, used field calculator to populate the "watershed risk" field with "0"
   iii. Repeated above steps for route segments in "1" rated watersheds. But this time doing a quick check by hand to identify duplicates. Duplicates were assigned a rating based on which watershed rating area the majority of the route resided in.
   iv. Repeated above steps for route segments in "2" rated watersheds.
b. Hydrology Risk
   i. Identify perennial stream crossings per route segment
      1. Used "intersect" tool with setting of "output=points" to create "perennial_stream_intersections" point layer. (Removed canals/ditches, pipelines, and artificial paths from the perennial stream dataset)
      2. Performed spatial join to TAP editing layer in order to get a field indicating how many points (sum) are on a line segment. Called this new featureclass "perennial_xings)TAP_intersections". New field called P_Stream_Xing
      3. Created new field "PStream_Xing_Risk" to house the perennial stream crossings risk rating. Used "select by attributes" tool to select route segments where "P_Stream_Xing"="0" and populated "PStream_Xing_Risk" with "0". Repeated same steps for stream crossings of 1-2 (risk rating = 1) and crossings of 3 or more (risk rating 2)
   ii. Assigned risk rating to OHV Monitored "RYG" roads
      1. Used "spatial join" tool to combine OHV Red/Yellow/Green ratings from the OHV_Monitoring geodatabase.
      2. Created a new field "RYG_Risk" and used the "select by attributes" tool to identify route segments with certain ratings and used the field calculator to assign appropriate risk rating. Yellow rated roads assigned a risk rating value of "1" and red rated roads assigned a risk rating value

iii. Combined Perennial stream crossing risk rating with RYG risk rating for final overall Hydrology Risk Rating
    1. Created new field “Hydro_combo_risk”
    2. Used field calculator to “sum” the first two fields (from above) resulting in values of 0-4.
    3. Created new field “Hydrology_Risk” and used the “select by attributes” tool to identify “hydro_combo_risk” scores of “0” and used the field calculator to assign a score of “0” in “Hydrology_Risk”.
    4. Repeated above steps for values of 1-2 (risk rating of -1) and 3-4 (risk rating of -2)

c. Riparian Risk
    i. Develop risk rating for routes within 25ft of perennial streams
        1. Used “buffer wizard” to buffer all perennial streams by 25’ (on either side). Used NHD stream layer for this analysis
        2. Used tool “tabulate intersection” to create a field saying how many ft are within the 25’ buffer AND a field saying what percentage is within the buffer area. “length” and “percentage” respectively.
        3. Create new field “PStream_rating” and used “select by attributes” tool to identify values of 0-10% to assign risk rating of “0”
        4. Repeat for values of 10-50% (risk rating of “1”) and >50% (risk rating of “2”)
    ii. Develop risk rating for routes within 25ft of wet and moist meadows
        1. Used same procedure as above with “wet_moist_meadows” shapefile. Used same percentage classes equivalent to same risk rating.
    iii. Combined above risk ratings (for perennial stream values and wet/moist meadow values”
        1. Create new field “Riparian_combo_risk” and used field calculator to sum risk values from above fields
        2. Create new field “Riparian_Risk” and used field calculator to populate based on combo value (combo value of “0”= Riparian Risk of “0”, Combo value of “1-2” = Riparian Risk of “-1”, and combo value of “3-4” = Riparian Risk of “-2”

d. Used “Spatial Join” tool to bring the three new fields “Watershed_Risk”, “Hydrology_Risk”, and “Riparian_Risk” into the most current version of TAP database

X. <u>Perform analysis and incorporate Heritage Risk ratings.</u>
    a. Identify Heritage Resource Risks
        i. Use “select by location” to select route segments within 20 meters of a heritage site. Populate “HR_Risk” field with “-2”
        ii. Identify road segments less than 90% surveyed and populate “HR_Risk” field with “-1”

b. Use “spatial join” tool to bring new “HR_risk” field into most current version of TAP database.

XI. Incorporate grazing risk edits

a. “Grazing_Risk” field revised by ENoesser
b. Attempted to use “spatial join” with no success. Created new, geodatabase “Tap_Repairs” and brought in most current version of TAP featureclass. Used this method as a bandaid until conclusion of spatial join needs.

XII. Removed “private” and “local” roads

a. As decided in TAP meeting, we will want to show these roads but not rate them as they have no “maintenance level” assigned in INFRA
b. Used “select by attributes” tool to identify routes where “Jurisdiction” = “P-Private” or “S-State” or “SL-State Lands” or “L-Local” or “NPS-National Park Service”
c. Created new layer from selected features, exported data to a new featureclass “Private_Local_State_roads” in the “Roads_Removed_From_TAP” feature dataset
d. Deleted those roads from the master TAP featureclass
e. 2339 route segments removed

XIII. Identify additional jurisdiction issues

a. Looked through the table and put a “?” in the “instrument” field where the field of “primary maintainer” differs from the fields of “Jurisdiction” and “System”

XIV. Identification of 34 routes that did NOT appear in the original TAP dataset (2010).

a. Create a shapefile of only these routes and emailed to specialists LSims, Perfloff, and SWeiss
b. Once shapefiles were returned with updated ratings fields, updated the risk fields in the master TAP featureclass by hand because there weren’t many changes, and the spatial join tool was malfunctioning.
c. Populated ROS, IRA, and Wilderness risk fields by hand using the “select by location” tool with the appropriate layer.

XV. Changes to the ROS_Risk field

a. Originally the ROS field had both risks and opportunities, but there should only be a “risks” field, so I removed the “ROS_opportunites” field.
b. Modified/Roaded category now addressed and grouped with values for “Rural” and given a risk value of “0” regardless of maintenance level
c. Natural/Roaded routes with a maintenance level of “5” were changed from a value of “-1” to a value of “0” using the “select by attributes” tool and the field calculator

XVI. Re-evaluate the need for RAP roads remaining in TAP because of new heritage info

a. At the beginning of this process, roads evaluated in RAP were removed unless given a value of "NHS" or "new heritage survey". However, new archeologist says that these roads identified as "NHS" should only remain included in the TAP featureclass if a heritage risk of -1 or -2 was identified.
b. Used "select by attributes" tool to identify features where "Decision" = "RAP-NHS" and "HR_Risk" = "0" and create a new layer from selected features.
c. Export these features to a new featureclass "RAP_Roads_nonewheritage" in the feature dataset "Roads_Removed_From_TAP" and deleted the selected features from the master TAP featureclass
d. 2306 routes removed

XVII. Recreation Analysis

a. SUP
    i. Consult "rec sites" layers, NF Map, USGS layer, SCE layer
        - Hotel/lodge/resort = +2
        - Marina = +2
        - Ski area = +2
        - Store = +2
        - Private CG = +2
        - Pack station = +2
        - Rec residence = +2
        - Org site = +2
        - USGS site = +2
        - SCE route = +2
b. Developed Rec field
    i. Consult rec sites layers, NF map, CTUC map
        - Boating site = +2
        - CG = +2
        - Fishing site = +2
        - Picnic site = +2
        - Swimming site = +2
        - OHV staging area = +2
        - Hotel/lodge/resort = +2
        - Marina = +2
        - Observation site/lookout = +2
        - Ski area = +2
        - TH = +2
        - Day use polygon = +2
c. Dispersed Rec field

i. Consult rec site layer, NF map, CTUC maps, motor touring books, OHV_Loops layer
    - Roads accessing a trail (motorized or nonmotorized) = +1
    - Flats = +1
    - Documentary site = +1
    - Dispersed camping = +1
    - Day use area = +1 or +2 (see chart)
    - Rat of T1 or T5 = +2
    - Rat of T2, T3, T4, T9 = +1

** When scoring routes for developed rec, score was given to main access route, all the way back to nearest ML3 route (or larger)

Attribute Table Fields

- ID = current road number
- Jurisdiction = who owns the ground
- System = who owns the road
- Maintainer = who is primarily responsible for maintaining the road
- Maint_Lvl = operator maintenance level
- Surface
- Symbol
- Decision = what (if any) NEPA process was the route last evaluated through
- Instrument = what (if any) determination was made about what legal instrument might need to be in place for managing the road
- Rte_Status = any information about the condition or existence of the road on the ground
- Existing = indication of likelihood that a road exists on the ground
- TBiota_Risk = Terrestrial Biota Risk
- ABiota_Risk = Aquatic Biota Risk
- Fire_Benefit
- ForestP_Benefit = Forest Products Benefit
- ForestH_Benefit = Forest Health Benefit
- Mineral_Benefit
- InvPlant_Risk = Invasive Plant Risk
- IncPlant_ND = Invasive Plant No Data
- RPlant_Risk = Rare Plant Risk
- RPlant_ND = Rare Plant No Data
- Rd_Op_Risk = Road Operations Risk
- Wild_Risk = Wilderness Resources Risk

- Watershed_Risk
- Hydro_Risk = Hydrology Risk
- Riparian_Risk
- HR_Risk = Heritage Resources Risk
- Tribal_Benefit
- Tribal Risks
- Graze_Benefits = Grazing Benefits
- Disp_Rec_Ben = Dispersed Recreation Benefit
- Dev_Rec_Ben = Developed Recreation Benefit
- ROS_Risk = Recreation Opportunity Spectrum Risk
- ROS_ND = Recreation Opportunity Spectrum No Data
- IRA_Risk = Inventoried Roadless Area Risk
- RNA_SIA_Risk = Resource Natural Area and Special Interest Areas Risk
- SUP_Benefit = Special Use Permit Benefit
- AdminFac_Ben = Administrative Facilities Benefit
- RdDevBNenefit = Road Development Benefit
- Benefits Total (Calculated using the field calculator to sum all above “benefit” fields)
- Risk_Total (Calculated using the field calculator to sum all above “risk” fields)
- Private_Benefit (assessed by ENoesser to identify roads providing only access to private land)
- MatrixCategory (Assigned a value of 1-9 based on the combination of benefit and risk totals)
- Needed (a value of “needed” or “not needed” was assigned)
- Justification (description of why route was given the previous/above value of needed or not needed based on matric category and other site specific information)
- Review (notes on site specific information and issues/questions)
- SocialCulturalRisk = summation of risk fields: Road Operations Risk, ROS Risk, Heritage Resource Risks, and Tribal Risk
- SpecialStatusAreas = summation of risk fields: IRA Risk, Wilderness Resources Risk, RNA and SIA Area Risk
- BiologicalRisks = Summation of risk fields: Invasive Plant Risk, Rare Plants Risk, Terrestrial Wildlife Risk, Aquatic Wildlife Risk
- WatershedRisks = summation of risk fields: Hydrology Risk, Watershed Risk, Riparian Vegetation Risk
- SocialCulturalBenefit = summation of benefit fields: Road Development Benefit, Dispersed Rec Benefit, Developed Rec Benefit, Tribal Benefits
- CommodityBenefit = a summation of the benefit fields: Grazing Benefits, Minerals Benefits, Forest Products Benefits
- SpecialAccessBenefit = a summation of the benefit fields: Administrative Facilities Benefit, Private Lands Access, Special Use Benefit (SUPs)

- ResourceProtectionBenefit = summation of the benefit fields: Forest Health Benefits, Aquatic Wildlife Benefit, Fire and Fuels Benefit