Network Design – Working Lands Assets

Includes canals, prime farmland soils, agricultural easements, irrigated agricultural land, state trust grazing leases and other cropland.

Project Goals for the Wasatch Front Regional Working Lands Green Infrastructure:
A. Protect the working lands of the Wasatch Front, including the forests, orchards, rangelands, and agricultural lands to provide a source of economic support and maintain the rural character.

WORKING LANDS NETWORK CRITERIA		
CORES	**SIGNIFICANCE/EXPLANATION**	**FURTHER RESEARCH**
1. Protected lands with working land assets within them	Protected lands have a higher likelihood of providing permanent GI services. Inclusion of protected lands is well-documented[1]. Includes county-based Agricultural Protection Areas (Tooele, Davis, and Weber County), and agricultural-related conservation easements (AGRC).	*Davis County APA areas are not available at this time.*
2. Working lands (agricultural production) on prime farmland soil	Working lands in the US are rapidly disappearing[2]; thus, agricultural lands on prime farmland soil, as determined by NRCS, should be prioritized. Ag land data is derived from AGRC (dominant vegetation), National Land Cover Dataset (cultivated land) & GAP (cultivated land).	*Incorporate NRCS participants in programs in future planning efforts (those that have long-term or permanent easements through NRCS programs, e.g. EQIP, WHIP, etc., if volunteered by participants).*
3. Ranching and grazing lands	Includes active state trust grazing leases, those lands identified as pasture/hay lands under the National Land Cover dataset, and active BLM grazing allotments.	*Determine grazing leases within federal lands and private lands by parcel for future mapping efforts.*
Exclusion Factors:		
1. Future and existing roads that cut through - remove with buffer	Roads affect water quality and cause erosion, affecting the quality of working lands (conversation with NRCS, 10.18.10). Most studies focus on ecological effects, but sedimentation and pollution issues have been documented at 40 m (Forman 1995).	*Include roads that have a management plan in place to attenuate erosion in future mapping efforts.*
2. Unmanaged/unused working lands	Existing agricultural lands left fallow should not be included in core areas (but should be listed as hubs)	*Not currently mapped. Data does not currently exist – include in future efforts.*
3. Working lands next to noxious weeds	Noxious weeds have a detrimental effect on high quality farmlands. Data from AGRC.	*Future research efforts should determine an appropriate buffer size.*
4. Saline soils	Exclude saline soils due to hindrance on productivity (NRCS 10.18.10).	

5. T&E Species areas	Remove areas with T&E species within them to protect their habitat.	*Not currently mapped. Incorporate this exclusion when data become available.*
6. Remove working lands in proximity to core hydrology areas, esp. streams (for water quality protection).	Remove based on hydrology core areas; similar buffers used in the hydrology criteria. Data from AGRC.	
HUBS	**SIGNIFICANCE/EXPLANATION**	**FURTHER RESEARCH**
1. All soils of statewide importance – prime, prime if irrigated, soils of statewide and local importance	Prime farmland soils should be protected for working lands purposes, even though they may not have working lands on them at present. Data from AGRC.	
2. Other working lands	Other working lands not identified in the core areas, i.e. working lands not on prime farmland soil, non-irrigated agricultural lands.	*Identify under-utilized/unmanaged agricultural lands to include within the study area in future efforts.*
3. Related land-covers adjacent to working lands, e.g. grasslands, forests, and other land covers that support ecological services provided by the working lands systems, i.e. pollination, biodiversity, etc.	Grasslands and other land covers support ecosystem services, e.g. water quality, pollination, biodiversity that assist working lands in functioning. Forests provide soil stability and agro-forestry related services (see DFFSL 2010). Data derived from the National Land Cover Dataset.	
Exclusion Factors:		
1. Aquifer discharge areas	Working lands adjacent to an aquifer discharge area can have a negative impact on water quality (NRCS 10.18.10). Data from AGRC.	
2. Those forest lands within the Wildland Urban Interface	Higher fire frequency, due to urban encroachment, will lower the eventual value of these forests to providing ecosystem services to working lands. Data from UDFFSL.	
CORRIDORS	**SIGNIFICANCE/EXPLANATION**	**FURTHER RESEARCH**
1. Irrigation canals	Canals support working land productivity within the Wasatch Front. Data from AGRC.	*Determine an appropriate buffer for water quality for canals based on purpose (irrigation, distribution of water, etc). Evaluate how many places canals return flows to streams and water quality.*
2. Major roads	Roads support transportation of products. Data from AGRC.	

[1]See Utah DFFSL 2010 Statewide Assessment document available at http://www.ffsl.utah.gov/stateassessment.php.

[2] American Farmland Trust (2005). Rocky Mountain Agricultural Landowners: Guide to Conservation and Sustainability. http://www.farmlandinfo.org/documents/30427/FINAL_Rocky_Mountain_Guide.pdf

Forman, Richard T.T. 1995. Land Mosaics: The ecology of landscapes and regions. Cambridge University Press: New York, NY.

Working Land Asset Network Criteria – Design Process

Working Land Cores

1. Create a new toolbox in ArcCatalog for Working Lands modeling – WorkingLandsAssets
2. Create cores
    A. #1 Core Criteria – protected lands with working lands assets within them
        i. Merge together county-based Agricultural Protection Areas and ag-related conservation easements → workinglands_protectedareas
        ii. Convert to raster → wkingprotect
        iii. Reclassify to 0 and 1 for analysis → ***RcWkingprot***
    B. #2 Core Criteria – Agricultural lands on prime farmland soil
        i. Merge cultivated land from AGRC dominant vegetation layer (AGRC_cultivatedland_Multipart), cultivated land from the National Land Cover Dataset (landcover_cultivated_land), and agricultural land from SWreGAP data (GAP_agriculture) → all_cultivated_land
        ii. Intersect all_cultivated_land with NRCS Prime_and_Unique_Farmland → cultivatedland_on_primefarmland
        iii. Convert to raster → aglandprime1
        iv. Reclassify to 0 and 1 for analysis → ***rc_ag_prime1***
    C. #3 Core Criteria – Ranching and grazing lands
        i. Select pasture and hay lands from National Land Cover Dataset →NLCD_PastureHayLands_multipart
        ii. Merge above layer with SITLA_Graze_Leases, Grazingallotments_BLM_activestatus, and Nevada_allotments → grazing_ranching_lands1
        iii. Convert to raster → grazingranch4
        iv. Reclassify → ***rc_ranchland1***
3. Merge cores together
    A. Using single map algebra output, add each of the above 3 reclassified rasters together → wkngcores4
    B. Reclassify so that only 0 or 1 value are present→***rcwkingcores3***
4. Create core exclusion layers
    A. #1 Core Exclusion Factor – future and existing roads with 40 meter buffer
        i. Clip major road data to project boundary (MajorRoads_buffer10km), merge with proposed road areas (Highway_newconstruction)→merged_roads
        ii. Buffer merged_roads by 40 meters → MergedRoads_40mbuff1
        iii. Convert to raster → roads_40mbuf1
        iv. Reclassify 1 values to 0 and NoData to 1 → ***rc_roads40m***
    B. #3 Core Exclusion Factor – working lands next to noxious weeds
        i. Clip noxious weeds layer from AGRC to project boundary →noxiousweeds_AGRC
        ii. Select noxious weeds from dominant vegetation shapefile (from AGRC, include cheatgrass, which is not on the noxious weed list but has significant ecological and productivity ramifications)→noxiousweeds_cheatgrass
        iii. Merge the above two noxious weeds layers →noxiousweeds_all
        iv. Convert the noxiousweeds_all layer to raster → noxiousweeds1
        v. Reclassify 1 values to 0 and NoData to 1 → ***rc_noxweeds1***

C. #4 Core Exclusion Factor – saline soils
   i. Dissolve all soils layer by name →allsoils_dissolve
   ii. Select those soil layers that are saline (MUKEY= 482121,482149, 482166, 482167, 482169, 482181, 482186, 482881, 482888, 482889, 483285, 482899, 483308, 483310, 483322, 483335, 482549, 503899, 483395) →soils_saline
   iii. Convert saline soils to raster for analysis → salinesoils1
   iv. Reclassify 1 values to 0 and NoData to 1 → ***rcsalinesoil1***

D. #5 Core Exclusion Factor – working lands adjacent to hydrological cores
   i. Add core hydrology areas (hydro_cores24) to the map
   ii. Reclassify 1 values to 0 and 0 values to 1 → ***rc_hydrocores***

E. Using single output map algebra, multiply all of the exclusion layers together → ***wkcoreexfact***

5. Complete core analysis
   A. Using single output map algebra, multiply the rcwkingcores2 layer with the wkcoreexfact layer → ***wkingcores5***

Working Land Hubs

1. Create hubs
   A. #1 Hub Criteria – all soils of statewide importance
      i. Clip all important soils layer to the project boundary → Soils_allimportant
      ii. Convert to raster →importantsoils
      iii. Reclassify to 0 and 1 for analysis → ***rc_importsoil***
   B. #2 Hub Criteria – other working lands
      i. Convert all_cultivated_land feature to raster → all_cult_land
      ii. Reclassify to 0 and 1 → rc_allagland
      iii. Using single output map algebra, add together rc_allagland and rc_ranchland2 reclassified rasters → allwkngland3
      iv. Reclassify to 0 and 1 → ***rcallwknglnd2***
   C. #3 Hub Criteria – related land covers
      i. Merge related land covers together into a single layer (same land cover types as in hydrology) → hydro_landcover
      ii. Use the single part to multipart tool to "undissolve" all of the land cover areas into individual parts (polygons) →hydro_landcover_multipart
      iii. Use the Euclidean distance tool to calculate distance from the working land cores layer (wkngcores1)→tmpwkngcordis
      iv. Reclassify the Distance layer to have 0-30 values as 1, and all other values to NoData→wkngcor30mbuf
      v. Export this layer to .gdb file→wkngcores_30mbuf
      vi. Select by location all of those polygons within the hydro_landcover_multipart that intersect the wngcores_30mbuf→wkng_landcover_adj30m
      vii. Buffer the working cores layer by 300 m →wkngcores_300mbuf
      viii. Intersect the wkng_landcover_adj30m with the wkngcores_300mbuf to select all land cover areas adjacent to the cores→wkngcover_adjacenttocores2
      ix. Convert each the above layers to raster (output = wkngcoveradj); reclassify for analysis: rcwkngcoveradj;

x. Remove WUI areas from this layer (as per hub exclusion factor #3)
    1. Clip WUI areas to project boundary→WUI_areas
    2. Convert to raster and reclassify to only include areas that should be included within the analysis→wui_areas and rcwui_incl;
    3. Conduct single output map algebra multiplying rc_wui_incl to rcwkngcoveradj to only select those land cover areas not in the WUI→ ***rcwkngcovadj1***

2. Merge hubs together
    A. Using single output map algebra, merge the rcimportsoils, rc_allwkngland, and rcwkngcovadj1→wkng_hubs2
    B. Reclassify so that only 0 or 1 values are present→***rc_wknghubs2***
3. Create exclusion layers
    A. #1 Hub Exclusion Factor – aquifer discharge areas
        i. Clip aquifer discharge areas to project boundary → dischargeareas_projectboundary
        ii. Convert to raster → dischargearea
        iii. Reclassify for analysis→rcdischargearea
        iv. Reclassify 1 values to 0 and 0 to 1 (to exclude these areas in the final analysis)→discharge_incl
    B. #2 Hub Exclusion Factor – wildland urban interface
        i. Convert Wildland Urban Interface file to raster → WUI_area
        ii. Reclassify 1 values to 0 and NoData to 1 → rc_wui_incl
    C. Using single output map algebra, multiply the discharge_incl layer and the rc_wui_incl layer together → ***wkhubexfact***
4. Complete hub analysis
    A. Using single output map algebra, multiply the final hubs layer (rc_wknghubs2) with the hub exclusion factor layer (wkhubexfact) → ***wkng_hubs3***

Working Land Corridors

Irrigation canals and major roads serve as corridors supporting the working lands within the Wasatch Front. A least cost path analysis was deemed an unsuitable process for working lands corridor design, as plant pollination and particle movement corridors cannot be defined by least cost paths.

Final Shapefiles for Agencies & Organizations

Merged Cores	Working_Lands_Cores
Merged Hubs	Working_Lands_Hubs
Merged Corridors	Working_Lands_Corridors

Note – merged files have been dissolved by layer – data is extremely simplified.

Core #1 – Protected lands with working lands assets	Protected_Working_Lands
Core #2 – Working lands on prime farmland soil	CultivatedLands_PrimeFarmlandSoil
Core #3 – Grazing and ranchlands	Grazing_Ranching_Lands
Core Exclusion #1 – Future & exiting roads	Roads_40mbuffer
Core Exclusion #2 – Unused/unmanaged working lands	Not mapped
Core Exclusion #3 – Noxious weeds	Noxious_Weeds
Core Exclusion #4 – Saline soils	Saline_Soils
Core Exclusion #5 – Threatened & endangered species areas	Not mapped
Core Exclusion #6 – Working lands in proximity to hydrology cores	Hydro_Cores
Hub #1 – Soils of statewide importance	Soils_Statewide_Importance
Hub #2 – Other working lands	All_Cultivated_Land
Hub #3 – Related landcovers adjacent to working lands	Adjacent_Supporting_Landcover
Hub Exclusion #1 – Aquifer discharge areas	Aquifer_Discharge_Areas
Hub Exclusion #2 – Forests within the Wildland-Urban Interface	Wildland_Urban_Interface
Corridor #1 – Irrigation canals	Irrigation_Canals
Corridor #2 – Major roads	Major_Roads