A Prioritization of Land Parcels for Conservation in the Matanuska-Susitna Borough

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1. Introduction

The Matanuska-Susitna Borough (MSB), located in Southcentral Alaska, contains more than 25,000 square miles (Figure 1). Within its boundaries, the landscape varies widely, transitioning from coastal estuaries at sea level to mountains in the Alaska Range and the Chugach Mountains as well as the entire Talkeetna and Clearwater Ranges (Matanuska-Susitna Borough 2003). The MSB also encompasses three major river drainages, the Susitna, Matanuska and Knik rivers, all of which drain into the upper Cook Inlet and provide habitat for healthy fisheries and diverse wildlife populations (Matanuska-Susitna Borough 2009). This wide range in environments and elevation, coupled with the vast size of the borough, means that there are a large spectrum of habitat types found here.

This rich landscape not only provides habitat for a multitude of wildlife, but has also enticed thousands of people to call the Matanuska-Susitna Borough home. In the 1960's, the population of the entire MSB was just over 5,000 people. By 1980, this number had increased to 17,816 (Matanuska-Susitna Borough 2003). The MSB population has continued to grow, and now, as of the 2009 census, the Borough population is 88,379 people (US Census Bureau), a 49% increase from the 59,322 people who lived there in 2000. This growth has made the MSB the fastest growing region in the state of Alaska, with an average population increase of 4% per year, as compared to 1% for the state overall (Matanuska-Susitna Borough 2009). This growth can be largely attributed to the borough's proximity to Anchorage. From the Mat-Su borough's population center, it's only a 50 minute drive to downtown Anchorage. Additionally, both of Alaska's major highways, the George Parks Highway and the Glenn Highway travel through the MSB. With these major transportation corridors and a growing population, has come a wave of new development. While development and growth is vital to the economy and the MSB communities, it is also vital that the Mat-Su Borough engage in smart and planned growth.

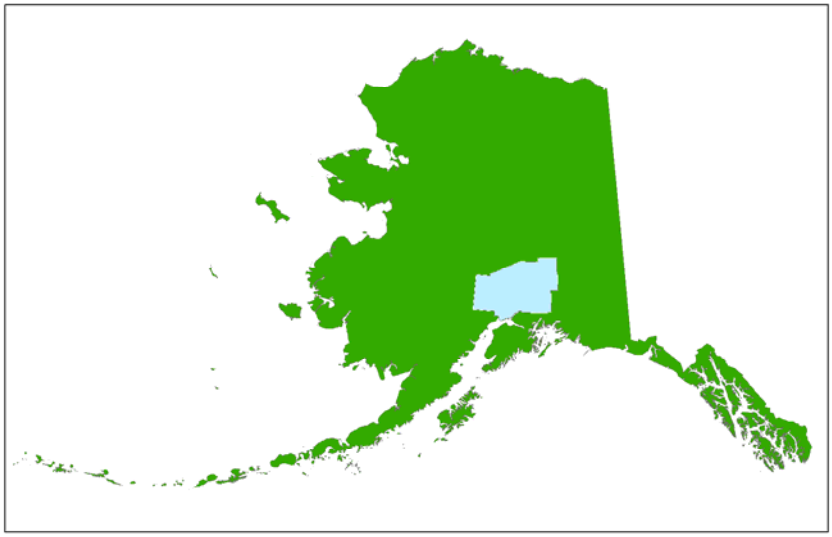


Figure 1. The Matanuska-Susitna Borough in Relation to the Entire State of Alaska

Threats to water quality in the Matanuska and Susitna Watersheds have been increasing in the past decade. While there are many causes, threats to water quality are largely the result of population growth and increasing development, along with a lack of planning and regulatory framework to guide this development (Matanuska-Susitna Borough 2009). To address this problem, this prioritization was undertaken with the Matanuska-Susitna Borough as part of an EPA West Coast Estuaries Initiative water quality protection project, focusing on green infrastructure, low impact development and stormwater management. By focusing efforts on areas with the highest conservation values, this prioritization can help the MSB staff and various Planning Boards meet these goals.

This prioritization is being carried about by the Great Land Trust (GLT). GLT is a private, non-profit land conservation organization that works with willing landowners and other partners to conserve Southcentral Alaska's lands and waterways. The trust permanently and directly conserves lands and waterways essential to the quality of life and economic health of Alaska's communities. While GLT has been working in Anchorage and the Matanuska-Susitna Borough since 1995, the organization has recently expanded its operations to include an additional staff person and opened a new field office in Palmer to address the growing development in this region. In addition to the funding received through the EPA West Coast Estuaries Initiative, this project was also funded in part by the U.S. Fish and Wildlife Region 7 Coastal Program – Southcentral under cooperative agreement 70181AJ007. Last summer, GLT conducted a more focused prioritization encompassing only parcels within 5 miles of Knik Arm (Teale 2009). This 2010 project expands this analysis to the entire MSB, and GLT will use this parcel prioritization project as a strategic conservation planning tool to identify and prioritize lands for strategic habitat conservation in the Matanuska-Susitna Borough. The results of this project will be used to focus and guide GLT's work in the MSB over the coming years.

In addition to GLT and the MSB, the results of this project will be useful to a number of other organizations for a variety of uses outside of direct land conservation. The results could be used to determine suitability for development, locate high quality fishing areas, and aid in wetland permitting, as well as many other functions. The prioritization highlights not only the ecological values of particular land parcels, but also community values, such as clean water, good fisheries habitat, and proximity to community infrastructure, as well.

It is important to note that the criteria chosen for this prioritization are heavily weighted towards wetlands, waterways and salmon. Therefore, it is possible to under-represent other factors commonly thought of as having a high conservation value, such as boreal forest, bear denning sites, or farmland. The criteria that were chosen, however, include important attributes that coincide with many un-mapped features. For example, although bear habitat was not specifically considered, criteria used in this prioritization indirectly prioritize areas important to bears. Wetlands can provide foraging habitat, and the stream presence and anadromous fish diversity criteria both indirectly consider for bear prey availability. Overall, this prioritization includes many criteria, which in turn correlate with many other factors that are not explicitly included, and is the GLT's best approximation of the conservation value of the lands parcels throughout the MSB given the best available data.

2. Methods

ArcGIS, a Geographic Information System (GIS), was the primary tool used to complete the Mat-Su Borough parcel prioritization analysis. The creation of data and maps for this prioritization project was a three month process, involving guidance from several steering committee meetings, involving participants from EPA, MSB, USFWS, ADF&G, TNC and GLT. The steps taken to complete this project are outlined below.

2.1 Data Collection

Due to the wide variety of conservation criteria used in this prioritization, data were collected from an array of sources. The sources for the data used in this analysis are outlined in Table 1.

Table 1. Mat-Su Borough Prioritization Data Sources

Data Source	Data Layers
Matanuska-Susitna Borough (MSB)	1. Parcels 2. MSB Boundaries 3. Town parks 4. Public Facilities (schools and recreational facilities) 5. Wetland Mitigation Banks 6. Core Area and Point MacKenzie Green Infrastructure Mapping.
The Nature Conservancy (TNC)	1. AWCA 303d listed water bodies 2. Conservation Management Status layer 3. Subwatershed Vulnerability layer
National Wetlands Index (NWI)	1. NWI MSB Wetland Quads
MSB Wetlands Mapping Project (06-09)	1. MSB Wetlands
National Resources Conservation Service (NRCS)	1. Administrative boundaries (protected areas) 2. Soils (hydric) 3. HUC boundaries
National Hydrology Dataset (NHD)	1. Streams and Lakes
Alaska Department of Fish and Game (ADF&G)	1. Anadromous Waters Catalog 2. Moose Habitat Range
Alaska Audubon	1. Important Bird Areas (IBAs)
United States Geological Survery (USGS)	1. Big Lake hydrology layer
Great Land Trust (GLT)	1. Conservation Easement parcels

2.2 Filters

Due to the large area of the Matanuska-Susitna Borough, and the numerous parcels contained within it (106,189 parcels), it was necessary to first reduce the number of parcels that would be considered in this analysis. To decrease the number of parcels, GLT used a set of filters. Parcels remaining for consideration in the analysis must pass all the filters. The filters were:

1. Within the boundaries of the Mat-Su Borough.
2. Below 1500ft elevation and/or within 1 mile of a road.
3. Greater than 5 acres.
4. Owner other than Federal or State (Public University and Mental Health Trust lands are considered private)

In addition to reducing the large number of parcels, initial filters were also useful for removing certain parcels based on the infeasibility of conservation projects, either due to location or ownership (State, Federal, Borough, Private, etc).

The Mat-Su Borough boundary filter was chosen for this prioritization because GLT wanted to develop a strategic conservation planning tool, designed to identify and guide future conservation projects in this region. GLT has already completed similar projects for the Municipality of Anchorage. In addition, this is also a useful proxy for watershed analyses, as the MSB boundaries roughly match the Matanuska and Susitna watershed boundaries.

An elevation filter was also applied. All parcels below 1500 feet of elevation met this filter. In addition, parcels above 1500ft but within one mile of roads were also included in this prioritization (Figure 2). With the exception of areas within 1 mile of roads, there is very little privately owned land or land that is slated for development within the foreseeable future. Therefore, by filtering out these high-elevation, low-risk lands, GLT can focus on the lower elevation lands that are currently under a higher threat of development and in need of conservation.

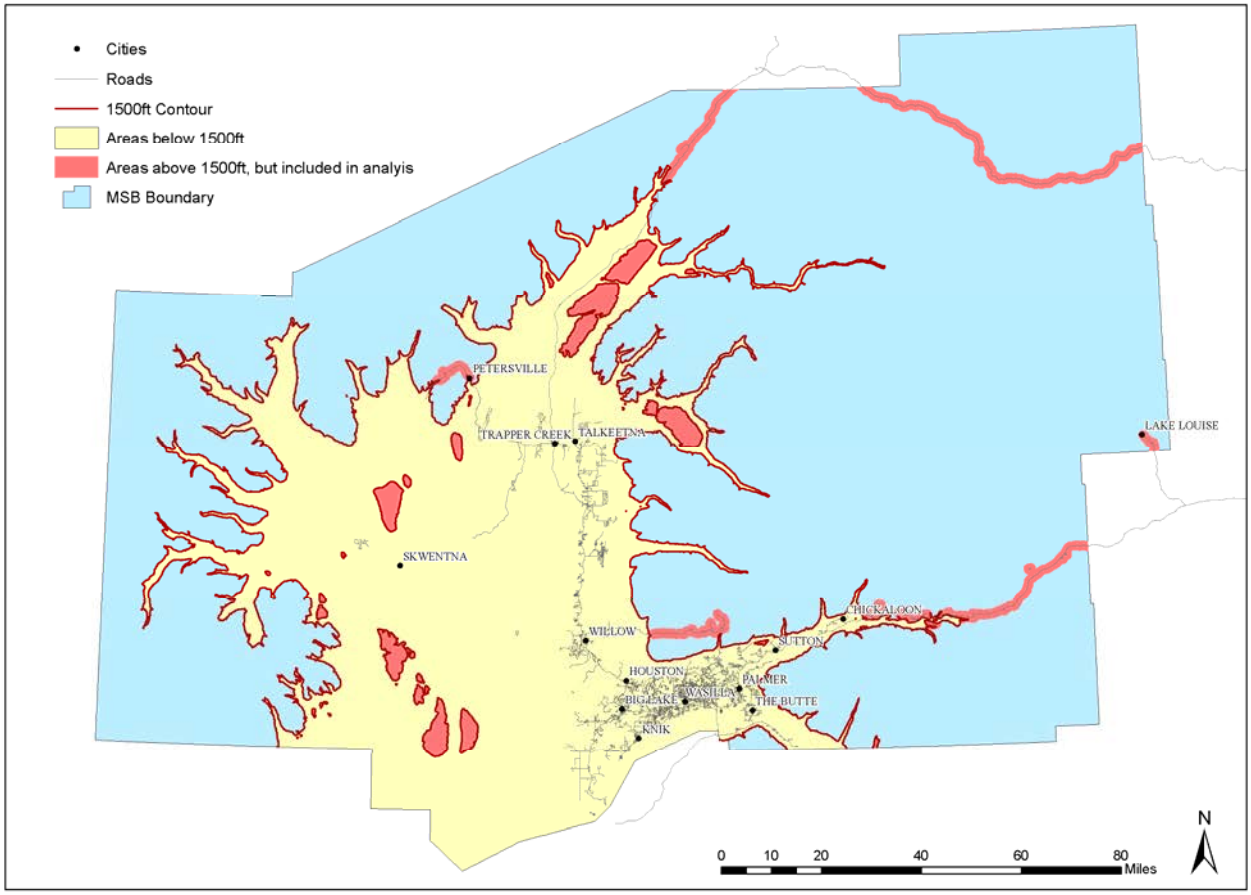


Figure 2. Initial Parcel Filters.
Everything below the 1500ft elevation line is displayed in yellow. Points of higher elevation within this area (displayed in pink) were ultimately included in the analysis. Additionally, areas outside the general 1500ft elevation area were included if there were within 1 mile of a road.

Third, a size filter was used to remove small parcels. Because transaction costs for a conservation easement on a small parcel are about the same as larger parcels, it is more cost effective to focus on parcels with a higher acreage. The cutoff chosen for this parcel prioritization was 5 acres, and any parcel smaller than this was filtered out (Figure 3).

Finally, the ownership for each parcel was taken into account due to the difficulty of acquiring Federal and State lands (with the exception of Public University and Mental Health Trust lands which were considered Private). While many of these State and Federal lands may have extremely high conservation value, they were removed from the list to allow parcels with other types of ownership a better chance of being identified for conservation.

After all filters were applied, there were 15,612 parcels remaining for analysis. These remaining parcels are primarily in Private ownership, but other owners included Borough, City, Mental Health Trust, Native Corporation, Public University Lands and State & Native Corporation (
Figure 4).

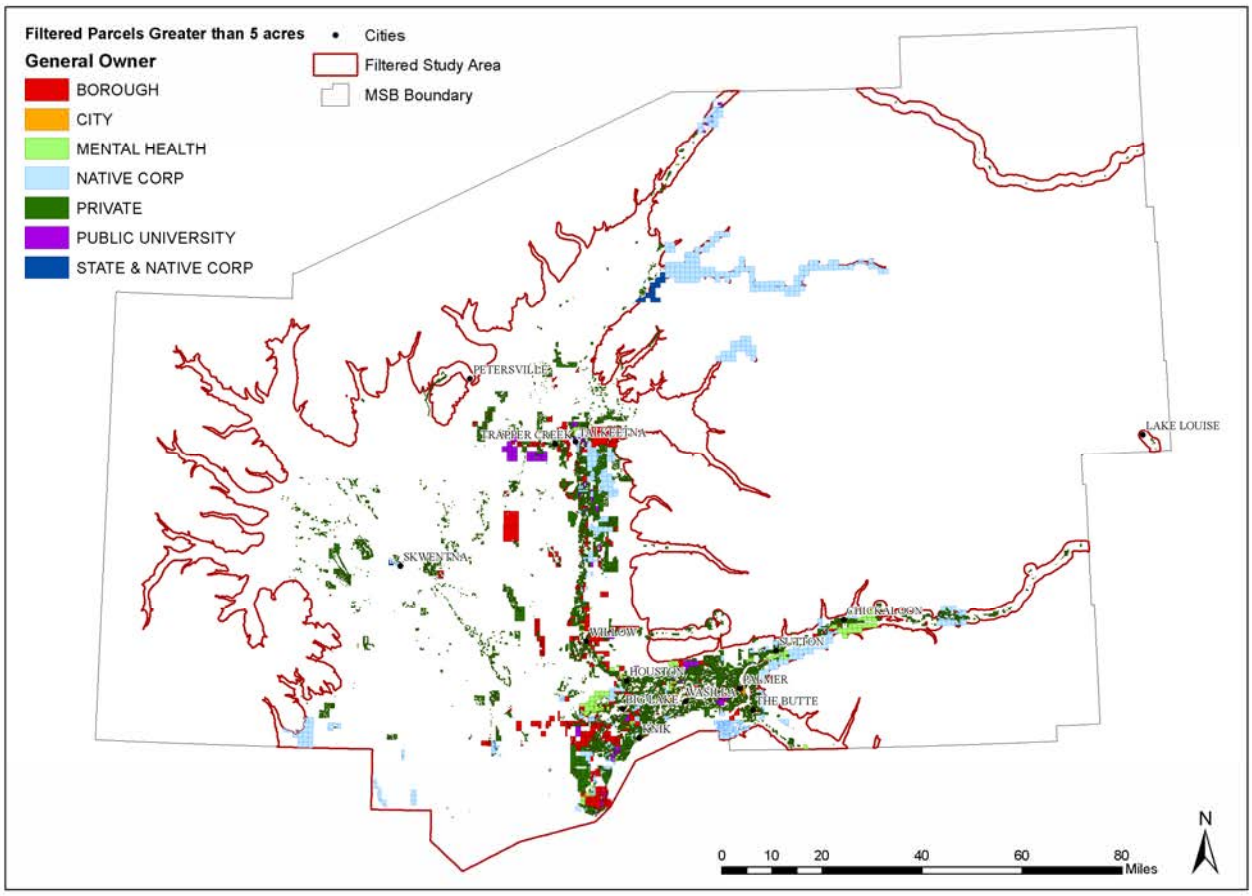


Figure 3. Ownership of Parcels Greater than 5 Acres within Filtered Area

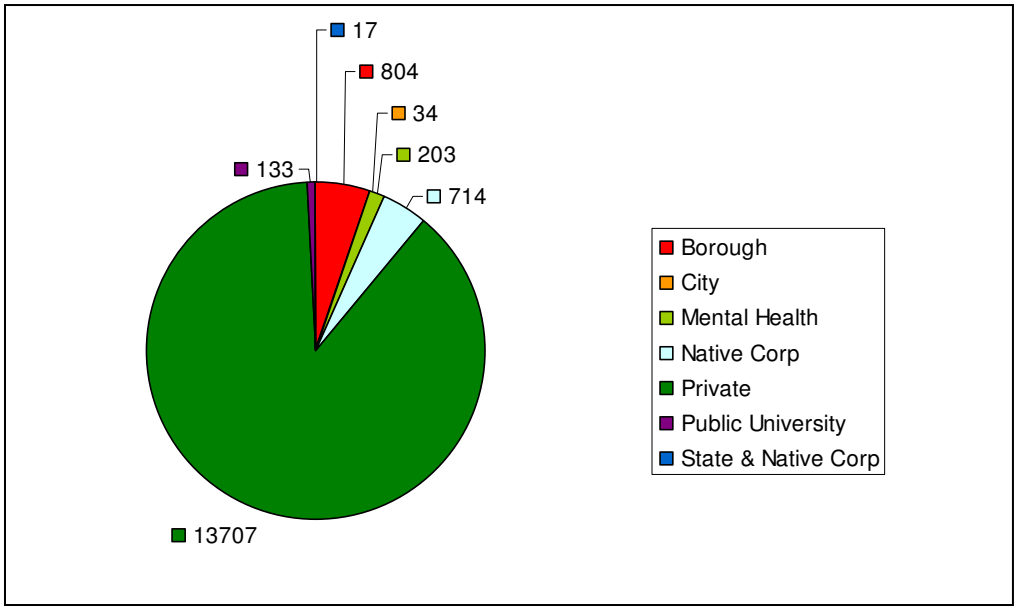


Figure 4. Breakdown of Initial Parcels by Ownership Type

2.3 Prioritization Criteria Data Processing and Scoring

The MSB Conservation Prioritization Project utilized 13 different conservation criteria:

1. Adjacent to or within protected areas.
2. Adjacent to or containing a threatened or impaired waterbody.
3. Presence of wetlands.
4. Normalized area of wetlands.
5. Presence of anadromous streams.
6. Presence of any stream.
7. Normalized area of 300ft riparian buffer zone.
8. Development vulnerability.
9. Anadromous fish diversity.
10. Adjacent to or within IBAs.
11. Moose habitat.
12. Adjacent to or within MSB community infrastructure.
13. Normalized parcel size.

For all criteria, the best available data was used. Some of this data, however, required processing before the criteria data could be used to score the parcels. This section will briefly discuss the methods used to process all conservation criteria data.

2.3.1 Adjacent to or Within Protected Areas

Conservation management status (CMS) describes the degree to which land, particularly public land, is legally designated and explicitly managed for biodiversity conservation. Based on the U.S. Geological Survey's Gap Analysis Program (1998), which provides a framework for assigning conservation management status, The Nature Conservancy (TNC) recently assigned four CMS categories to Mat-Su lands (Smith and Geist 2010). In general, CMS 1 and 2 have a strong emphasis on conservation protections and have legal designations that are challenging to change. CMS 3 may protect selected natural features or have minimal development, but the intent of the management is for human activities like resource extraction or intense recreation. CMS 4 public lands are developed or the management intent is primarily for human uses, such as mining. TNC conservatively assumed that all private lands are primarily managed for human use. Protected areas used for this criterion consisted of all parks, refuges, recreation areas, and other areas listed in Smith and Geist (2010) as having a CMS of 3 or lower.

To create a final protected areas layer that contained all these areas, multiple data sources were combined. The administrative boundaries layer, representing the boundaries of most parks and reserves in the borough, was obtained from NRCS. Kepler Bradley State Park, the MSB Wetland Mitigation Bank parcels and GLT conservation easements were also added as protected areas. Finally, there are a number of parcels, adjacent to Palmer Hay Flats that are managed as if they were part of the game refuge, which were also included in the protected areas layer.

With all these areas combined, each was assigned a CMS score. Parcels that intersected with protected areas with a CMS 1 or 2 were given 1 point, while those parcels that intersected with protected areas with a CMS 3 were given 0.5 points. Parcels that were not in or adjacent to protected areas) received 0 points for this criterion (Map 1, page 33).

2.3.2 Adjacent to or Containing a Threatened or Impaired Waterbody

Waterbodies throughout Alaska have been classified through the Alaska Clean Water Action rating system. These rankings (with 1 being pristine and 5 being critically impaired) were used to determine impaired waterbodies. Rivers, streams and lakes with an ACWA classification of 3, 4 or 5 were considered "impaired" for this analysis.

Because the MSB parcel layer has a number of registration issues that are impossible to fix on a borough-wide scale for a project of this scope, GLT decided to compensate for possible spatial errors by buffering these impaired waterbodies by 200ft on all sides. Parcels that intersected any part of the 200ft buffer around any impaired waterbody, were ranked higher than parcels on pristine waterbodies. By giving parcels in impaired watersheds a higher priority, GLT can identify parcels that, through their acquisition and protection, could help slow the impairment of these waterbodies. Parcels intersecting the impaired buffer zone were given a score of "1", while the remaining parcels were given a score of "0" (Map 2, page 34).

2.3.3 Presence of Wetlands

Four different sources were combined to create a total wetland coverage for the MSB. Because it is recognized by most agencies in Alaska as being the most accurate and current wetlands map, data collected through the MSB Wetlands Mapping Project (06-09) were used where they were available. This data, however, only covers the coastal region from Susitna Flats State Game Refuge to the Matanuska River, and had to be combined with other sources to create a more complete wetlands coverage.

Except where MSB Wetlands data were available, the National Wetlands Index (NWI) was used where it existed. However, although NWI is a widely relied upon national dataset, there are still many parts of the country, and specifically, many parts of Alaska, where the wetlands have not been mapped at all, or are mapped but digital data is still not available. Because of this, there were still a number of areas, specifically the area east of Talkeetna, near Skwentna, and the area between the Matanuska and Knik rivers, that were lacking wetlands coverage even when combining the MSB and NWI datasets, and other data had to be used as a wetlands proxy.

GLT utilized hydric soils data from the National Resources Conservation Service (NRCS) as a proxy for wetlands where no other wetland data existed. Although hydric soil is only 1/3 of the legal requirement for an area to be a wetland, the predominance of undrained hydric soil is a key indicator for identifying wetlands, and in fact, some states rely solely on this feature to determine the extent of their wetlands (Tiner 1999). However, although some soil classifications contain hydric soils, it can be in such a small percentage of the total soil composition that it would be unlikely to represent an area of wetlands. To avoid this over-selection, GLT used only soil types that contained more than 85% hydric soil. Using this hydric soils data as a proxy filled in many of the gaps left by the NWI and MSB data, but even the NRCS soils map is not complete. Even with the three layers combined, there were still small areas remaining at the edges of the study area at higher altitudes, where all three datasets were incomplete.

To ensure that these areas were not underscored due to lack of data, a second proxy was used in addition to hydric soils. This second proxy consisted of rivers, from the National Hydrology Database (NHD), with a 300ft buffer on either side, and lakes, taken from the Mat-Su borough hydrology polygon layer. Unfortunately this proxy only covers Riverine and Lacustrine wetland types, but at higher elevations other wetland types are uncommon anyway.

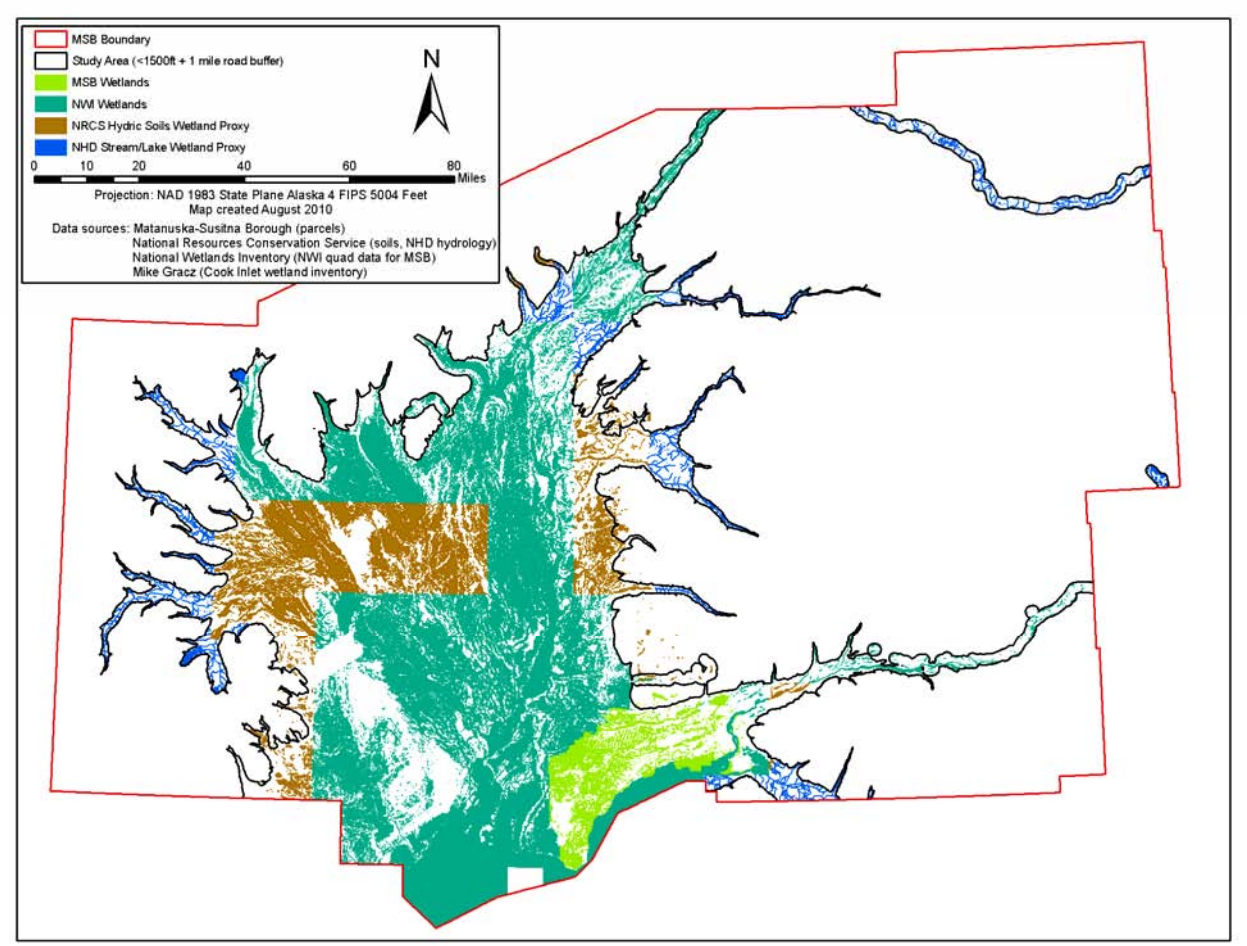


Figure 5. Coverage of Different Data Sources for a Complete Wetlands Layer

Once these four wetland datasets were prepared, all were merged to make once complete wetland coverage (Figure 5). If a parcel intersected with any of these polygons, it was considered to have wetlands and was given a score of "1". If it didn't, it was given a score of "0" (Map 3, page 35).

2.3.4 Normalized area of wetlands

While it is important to determine the presence or absence of wetlands, it is also useful to rank parcels based on the area of wetlands present. To determine this, the same merged wetland layer used in the presence/absence criteria was used again here, and was intersected with all the parcels. This intersection creates a separate output file containing only polygons of wetlands within individual parcels, each referenced to their respective parcels by a parcel ID number. The

area of these wetland polygons, within each parcel, can then be calculated and then joined back to the original parcel dataset.

However, because simply using the total acreage of wetlands on a parcel would give some parcels a score of over "600", essentially weighting this criteria 600 times more than any other, the wetland acreage for each parcel was then normalized. This usually involves dividing all the areas by the largest value, so the parcel with the largest wetland area gets a score of "1" and every other parcel gets some score between 0 and 1. However, because there were a handful of outliers (parcels with large wetland acreage), traditional normalization would produce a score of essentially zero for most of the parcels because their smaller wetland acreages would've been divided by such a high number. Instead, all parcels with more than 300 acres of wetlands were given a score of "1", and every other parcel was normalized using 300 as the top score. This still creates scores ranging from 0-1, but it doesn't skew the criteria as much in favor of the extremely large parcels (Map 4, page 36).

2.3.5 Presence of Anadromous Streams

The Anadromous Waters Catalog (AWC), administered by the Alaska Department of Fish and Game (ADF&G), contains two datasets: a line shapefile representing anadromous streams and a polygon shapefile representing anadromous lakes. Like the line file for the ACWA impaired waterbodies, both the AWC streams and lakes were buffered by 200ft to account for parcel registration issues throughout the borough. Once buffered, these two layers were merged into one total AWC buffered zone.

Unfortunately, however, the AWC stream data is only available in line form, and therefore often not very accurate for wider or braided rivers (Figure 6). To resolve this issue, the MSB hydrology polygon layer was used in combination with the AWC. All features from the polygon layer that intersected with the AWC shapefile were selected and exported as an additional shapefile. These polygons were better able to represent wider and braided rivers. This newly exported polygon layer was then also buffered by the same 200ft, and then merged with the other buffered AWC layers. Any parcel that intersected with the complete AWC buffered area was given a "1", any parcel that didn't, was given a "0" (Map 5, page 37).

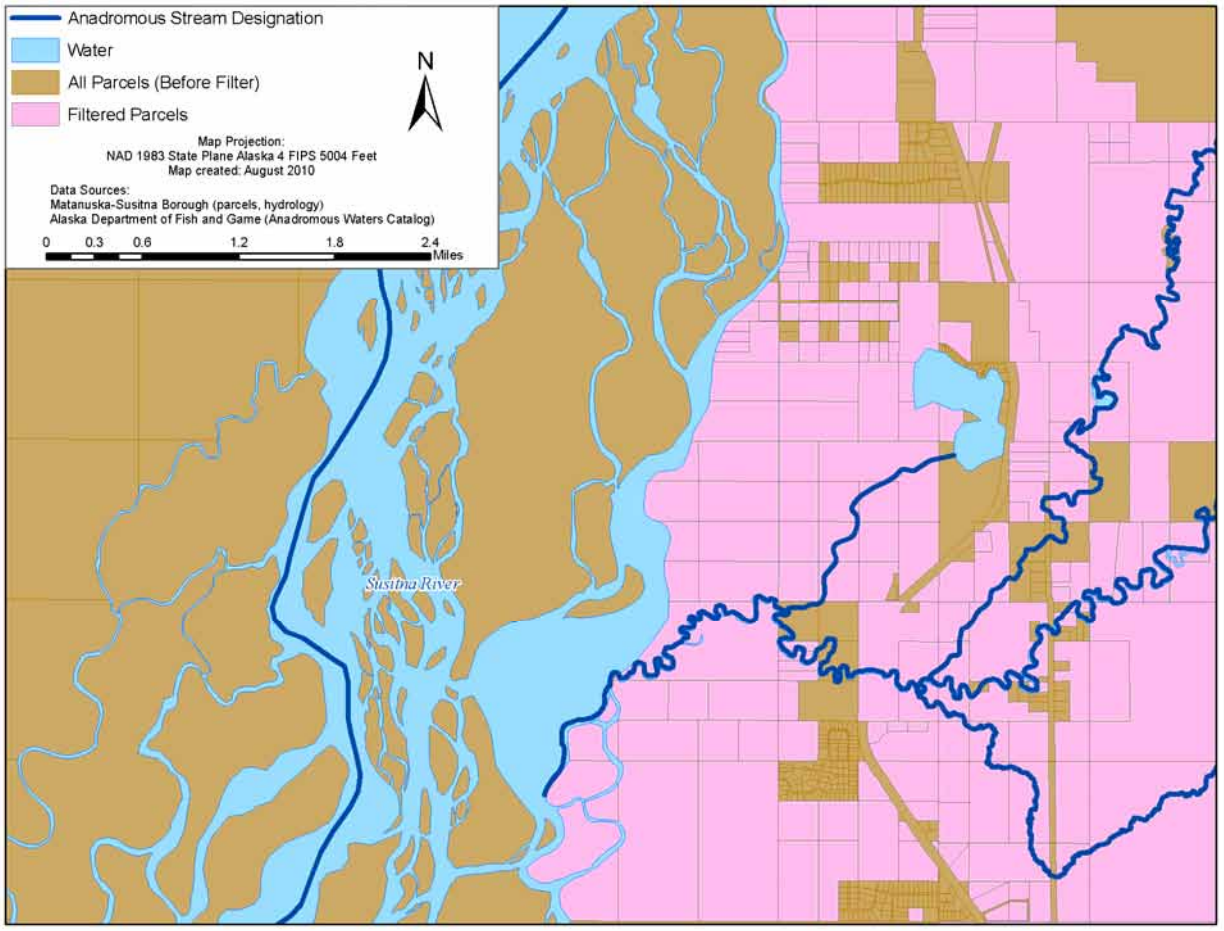


Figure 6. Example of Inaccuracies in AWC Line File
Anadromous stream designation (dark blue) for a portion of the Susitna River. Note the amount of river (light blue) that is not designated as anadromous. To resolve this issue, all river polygons from the Matanuska-Susitna Borough hydrology data that intersected with a line from the AWC were also considered anadromous. In this example, everything shown in light blue was, in fact, considered anadromous.

2.3.6 Presence of Any Stream

The most accurate total stream layer for the entire MSB is the National Hydrology Dataset (NHD) stream layer. However, there are some smaller areas that have been mapped in more detail, such as the Big Lake watershed streams. The Big Lake watershed stream layer, from the United States Geological Survey (USGS), was used instead of the NHD stream layer where available, and the two were combined into a single Mat-Su Borough stream file.

As with the AWC line files, however, even though this stream layer is the most accurate on available, as a line file it still cannot accurately represent wide and braided rivers. Again, to fix this problem, the MSB hydrology polygon layer was used, this time in its entirety. Although this layer includes islands and not just the waterways themselves, these features were retained for this criterion since a riparian buffer zone will be added anyway. Although the buffer is only 300ft for all other parts of the stream, it is arguable that the entirety of these river islands is riparian zone anyway.

This 300ft riparian buffer zone was then placed on both the combined NHD/Big Lake watershed stream file and the Mat-Su borough polygon file and these two buffered files were merged into a single shapefile. Any parcel that intersected with this shapefile, and therefore a river or its riparian zone, was given a "1", while any parcel that didn't was given a "0" (Map 6, page 38).

2.3.7 Normalized Area of 300ft Riparian Buffer Zone

While it is important to determine the presence or absence of rivers and streams on a parcel, it is also useful to rank parcels based on the area of riparian zone present. To determine this, the same merged and buffered streams layer used in the presence/absence criteria was used again here, and was intersected with all the parcels. This intersection creates a separate output file containing only polygons representing riparian zones within each parcel, each referenced to its respective parcel by a parcel ID number. The area of these riparian buffer zone polygons can then be calculated and then joined back to the original parcel dataset.

However, because simply using the total acreage of wetlands on a parcel would give some parcels a score of over "300", essentially weighting this criteria 300 times more than any other, the riparian buffer zone acreage for each parcel was normalized. This usually involves dividing all the acreages by the largest value, so the parcel with the largest wetland area gets a "1" and every other parcel gets some score between 0 and 1. However, because there were a handful of outliers (22 parcels with large riparian zone acreages), this method would have produced a score of essentially zero for most of the parcels because their smaller acreages would've been divided by such a high value. Instead, all parcels with more than 300 acres of riparian zone were given a score of "1", and every other parcel was normalized using 300 as the top score. This still creates scores ranging from 0-1, but it doesn't skew the criteria as much in favor of the extremely large parcels (Map 7, page 39).

2.3.8 Development Vulnerability

The Mat-Su Salmon Partnership (2009) previously created a GIS atlas of Mat-Su watersheds which included 3 vulnerability factors related to development that GLT used in this prioritization. These data were produced on a subwatershed, or Hydrologic Unit Code 12 (HUC 12), level (Figure 7)[1]. The three factors used from the Mat-Su Salmon Partnership atlas were:

1. Road density (MSB GIS, 2008)
2. Converted and impervious land cover (USGS National LandCover Dataset, 2008)
3. Subdivisions (MSB GIS, 2008)

These three factors were weighted equally and summed for each HUC12. Although these factors are inappropriate on a parcel level due to their inherently large scale, they can be analyzed on a HUC12 level. With this is mind, parcels were assigned a development vulnerability score according to what HUC12 the parcel's centroid (the parcel's center of mass) was in (Map 8, page 40).

[1] Hydrologic unit codes are a way of identifying all of the drainage basins in the United States in a nested arrangment from largest (Regions) to smallest (Cataloging Units). Hydrologic unit codes were developed by the U.S. Geological Survey's Office of Water Data in 1972 in cooperation with the U.S. Water Resources Council and supported by the U.S. Geological Survey's Resources and Land Information program.

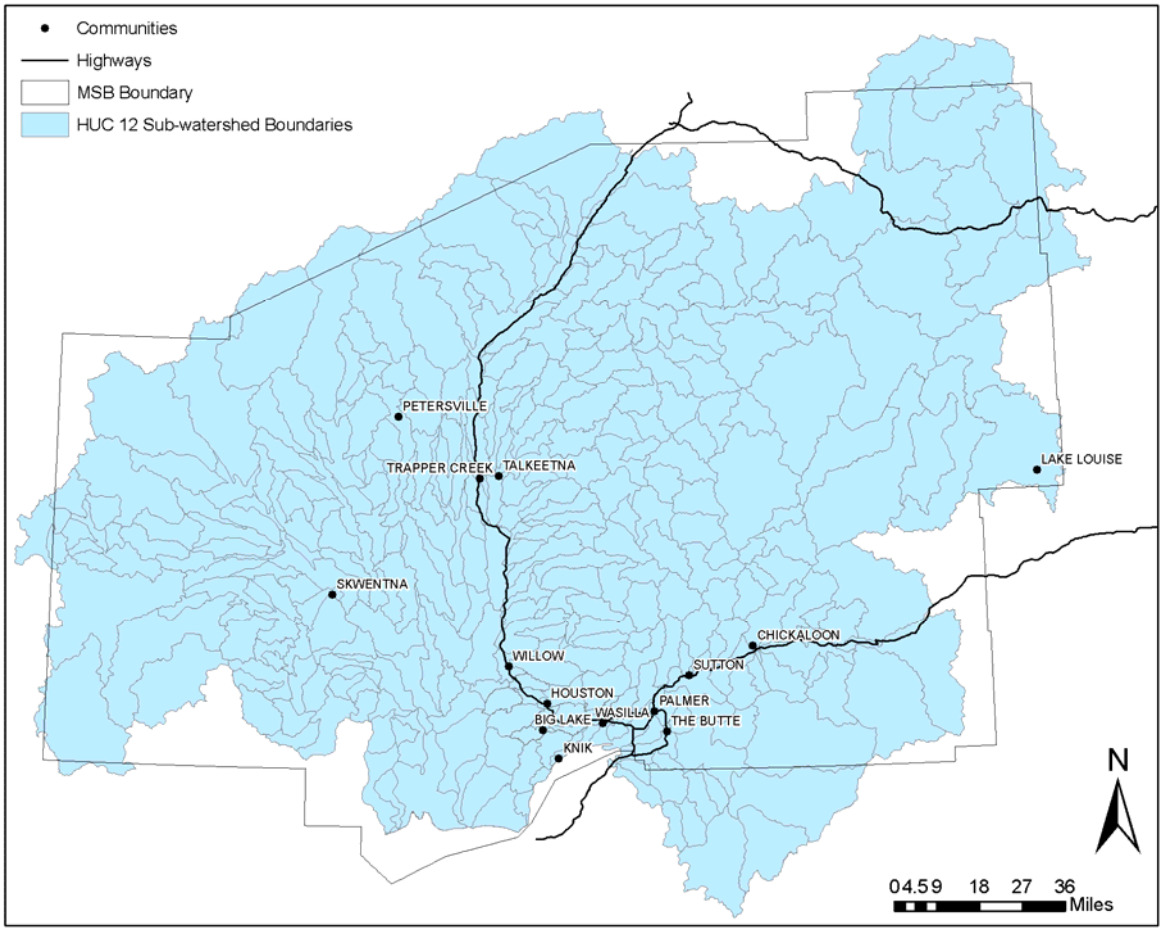


Figure 7. HUC 12 Sub-watershed boundaries used for Development Vulnerability and Anadromous Fish Diversity Criteria

Because the combined score for these three factors was often greater than "1" and we did not want to weight this category higher than others, these original scores were broken down using 5 natural breaks (Jenks), and reclassified as follows:

Original Vulnerability score		Reclassified score
1. 0 – 0.1	=	0
2. 0.11 – 0.4	=	0.25
3. 0.41 – 1.0	=	0.5
4. 1.1 – 1.8	=	0.75
5. > 1.81	=	1

2.3.9 Anadromous Fish Diversity

The Anadromous Waters Catalog has data on which anadromous[2] species have been found in a given reach of stream, as well as, certain life stage information. Although the life

[2] Anadromous refers to fish, such as salmon and eulachon, that migrate from the ocean up fresh water rivers to breed.

stage information was not complete enough to use for this analysis on a borough-wide scale, a simple count of how many species had been documented in a given section of stream was used to determine anadromous fish diversity. While the Alaskan AWC catalogs a total of 27 different anadromous species throughout the state, only 9 have been recorded in MSB waters (Arctic Lamprey, Chinook Salmon, Chum Salmon, Coho Salmon, Dolly Varden, Eulachon, Humpback Whitefish, Pink Salmon and Sockeye Salmon) . Anadromous fish diversity, therefore, ranged from 0-9. Although not all parcels will contain an anadromous stream, all parcels were scored based on the anadromous fish diversity within their subwatershed. The basis for this is that even upper-watershed parcels are important contributors to the overall health of a given stream.

Because anadromous diversity scores spanned from 0-9, these scores first had to be reclassified so as to not overweight this criteria. The newly reclassified scores were as follows:

Anadromous Fish Diversity		**Reclassified score**
0	=	0
1	=	0.11
2	=	0.22
3	=	0.33
4	=	0.44
5	=	0.55
6	=	0.66
9	=	1

* There were no streams with 7 or 8 fish.

Like the development vulnerability criterion that was scored on a subwatershed basis (Figure 7), all parcels within a sub-watershed adopted that watershed's reclassified fish diversity score (Map 9, page 41). If a parcel spanned two or more sub-watersheds, it was assigned the score for the sub-watershed in which its centroid was found.

2.3.10 Adjacent to or Within IBAs

The Important Bird Areas Program (IBA), run by the National Audubon Society, is a global effort to identify and conserve areas that are vital to birds and other biodiversity. Important Bird Area (IBA) data was obtained from Alaska Audubon, which showed 6 IBA sites within the MSB boundaries: Sheep Mountain, Palmer Hay Flats, Goose Bay, Susitna Flats, Jim Creek Basin, and Kahiltna Flats-Petersville Road. Any parcel within or adjacent to any of these areas were given a score of "1", while all other parcels were given a score of "0" for this criteria (Map 10, page 42).

2.3.11 Moose Habitat

While there is little up-to-date mammal information available, the Alaska Department of Fish and Game does have a series of habitat maps from their 1985 Alaska Habitat Management Guides that are still relatively accurate. After reviewing the moose habitat range map with Palmer Fish and Game experts, GLT arrived at the updated version, which was ultimately used in this prioritization (Figure 8).

This range map consisted of separate areas designated as important wintering, rutting and calving ranges for moose. Because the wintering areas are what limit the moose population, these areas were considered the most valuable, followed by calving and then rutting. In order to arrive at a total score for moose habitat that equaled 1, these habitat types were scored as follows: wintering = 0.5, calving = 0.3, and rutting = 0.2. With these scores, an area that served as all three types of habitat would have a total score of "1", and all other combinations would be some value between 0 and 1 (Map 11, page 43).

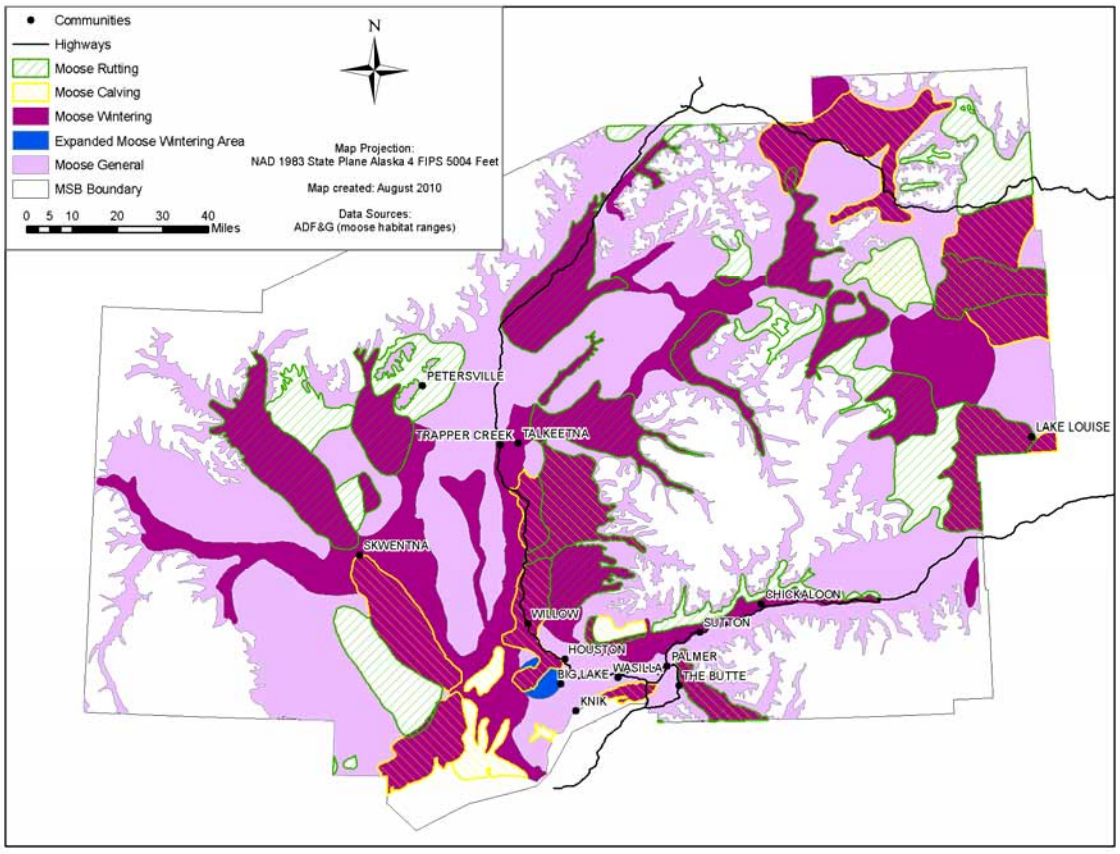


Figure 8. Moose Habitat Ranges with Addition Suggested by ADF&G

2.3.12 Adjacent to or Within MSB Community Infrastructure

The Matanuska-Susitna Borough has done a Green Infrasturcture analysis for two regions: the Core Area and the Port MacKenzie area. This green infrastructure represents an interconnected network of protected land and water, including forests, waterbodies, parks, trails,

cultural resources, farmland, wildlife habitat, open space, wetlands and fisheries. To this Green Infrastructure assessment, we also added schools and recreation facilities, to create a community infrastructure criterion. While the MSB green infrastructure map is already buffered to some extent, the schools and recreational facilities were not. Although these entities were originally represented only by point files, these points were used to locate the associated parcel, which was then buffered by 200ft and merged with the MSB green infrastructure map. Any parcel that was in or adjacent to any of this merged community infrastructure layer, was given a score of "1". All other parcels were given a score of "0" (Map 12, page 44).

2.3.13 Normalized Parcel Size

The last criteria used to rank parcels was their size. Like the other area criteria, however, if the number of acres is simply taken as the score for parcel size, this criteria will be weighted much more than the other criteria. Instead of using the raw acreage, the normalized parcel size was used. However, to neutralize extreme outliers, all parcels with a size greater than 640 acres, were simply given a score of "1". All other parcels were then normalized by dividing by 640, so all scores ranged from 0-1 (Map 13, page 45).

2.4 Summary of Scoring

The 13 criteria listed in Section 2.3 were used to calculate parcel scores. Each criterion ranged from 0-1 in value for each parcel, and summed to a maximum score of 13. Variables based on presence or absence of a feature were binomial, with "0" for an absent feature and "1" for the presence of a feature. Continuous variables, such as area and vulnerability were given a raw score (ex: acres), which was then normalized by dividing the raw score by an adjusted high score, giving everything with this value or higher a score of "1" and all other parcels a score less than 1 but greater than zero. Each factor was weighted equally in the scoring. The 13 criteria and how they were scored are summarized in Table 2.

Table 2. Summary of Scoring for All Criteria

Criteria	Score
1. Adjacency to or within protected areas	0/1
2. Adjacent to or containing a threatened or impaired waterbody.	0/1
3. Presence of wetlands	0/1
4. Normalized area of wetlands	0-1
5. Presence of anadromous stream	0/1
6. Presence of any stream	0/1
7. Normalized area of 300ft riparian buffer zone	0-1
8. Development vulnerability	0-1
9. Anadromous Fish Diversity	0-1
10. Adjacent to or within IBAs	0/1
11. Moose habitat	0-1
12. Adjacent to or within MSB community infrastructure	0/1
13. Normalized parcel size	0-1

2.5 Scenarios

Due to the large size of the Mat-Su Borough and the variety of data and conservation criteria used, GLT felt it was useful to focus on several scenarios instead of just one. The three final scenarios were:

Scenario 1. All 13 criteria included and weighted equally (> 5 acres)
Scenario 2. Only the 10 ecological/physical criteria included and weighted equally (> 5 acres)
Scenario 3. Focus on the greater core area (> 1 acre)

Scenario 1 serves as a base scenario. All 13 criteria discussed previously were included with equal weighting. Scenario 1 differs from Scenario 2 in that it includes human impact elements such as impaired water bodies, development vulnerability and community infrastructure. Not only are the impaired water bodies and development vulnerability criteria included, but because of the way these criteria were scored, Scenario 1 gives added emphasis to water bodies with low water quality and areas that are located in quickly developing areas. Additionally, because the input data for the community infrastructure criteria is mainly located in between Palmer and Port MacKenzie, Scenario 1 will trend towards parcels in this area. Overall, Scenario 1 can be thought of as a "reactive" approach, targeting parcels for conservation that are currently threatened or likely to be threatened by development in the near future.

Scenario 2, on the other hand, removes these three criteria (impaired water bodies, development vulnerability and community infrastructure). The remaining 10 criteria were weighted equally and added together for a possible high score of 10. Due to the exclusion of the three criteria mentioned above, Scenario 2 will, therefore, favor parcels with higher ecological values, even if they are located in undeveloped and unthreatened regions. Because of this, Scenario 2 can be thought of as a "proactive" approach, targeting parcels that contain high-quality habitat, regardless of their level of threat from development.

Finally, Scenario 3 takes a closer look at the greater core area. Given the rapid growth in this region, GLT felt it was important to consider conservation options in this region more carefully. Although the "Core Area" can be defined in various ways, for this analysis, GLT defined the "Greater Core Area" for Scenario 3 as the area covered by Mike Gracz's Cook Inlet Wetland Classification and Mapping Project, and can be seen in Figure 9. This was chosen as the study area for two reasons. One, it adequately covers the rapidly developing regions around Palmer, Wasilla and Port MacKenzie. And two, it eliminates one of the complications in Scenarios 1 and 2 of having multiple data inputs for a single factor – the wetlands criteria. Other than a different focal area, however, the only major change between Scenario 3 and Scenario 1 is that a different parcel size filter was used. In Scenario 3, all parcels greater than 1 acre were considered. Where as, in Scenario 1 and 2, only parcels greater than 5 acres were included in the analysis. This change is important for the greater core area because so much of the land has already been subdivided into these smaller sections and without taking these smaller parcels into account, important conservation areas could easily be overlooked.

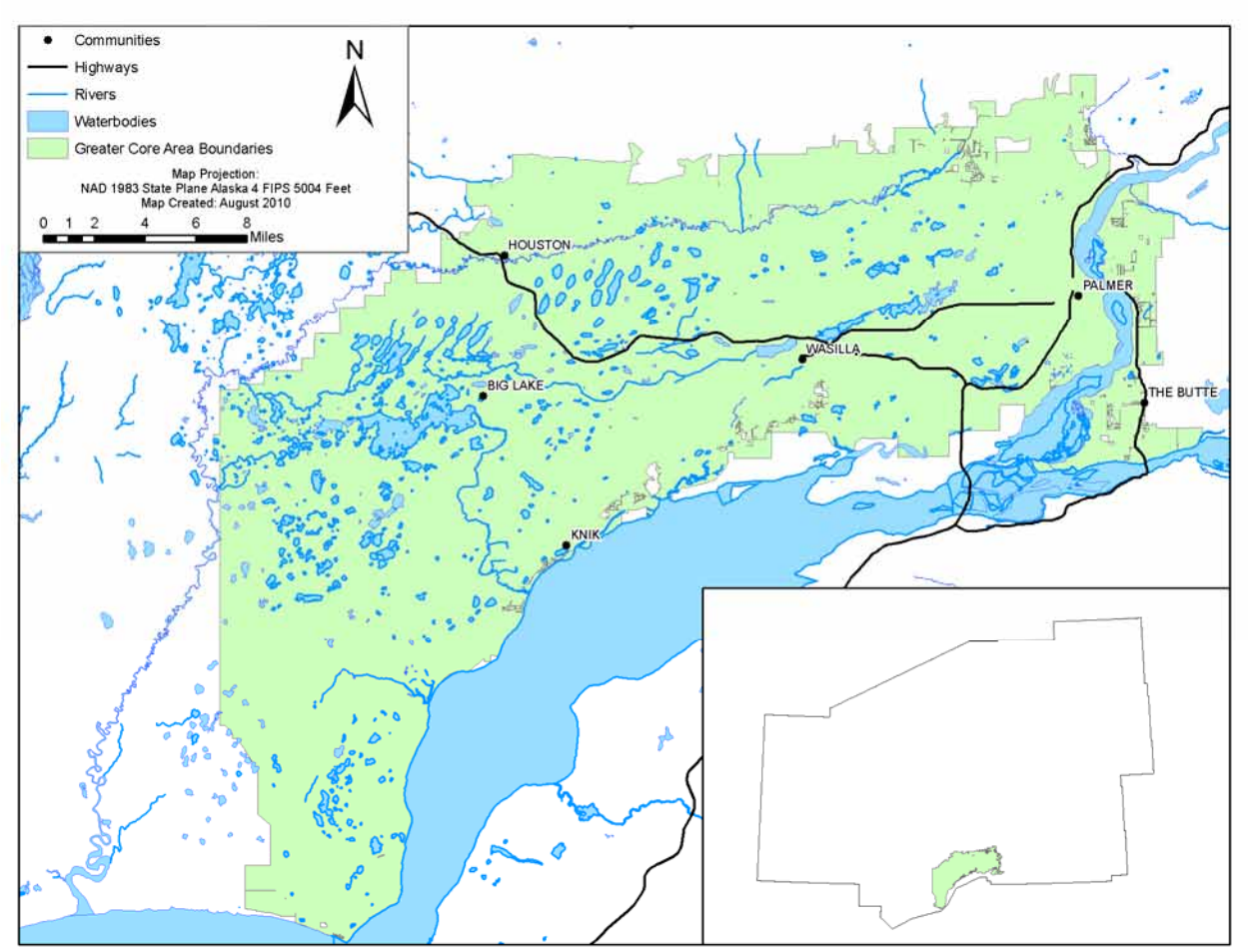


Figure 9. Extent of Scenario 3 (Greater Core Area) Prioritization Analysis

2.6 Advice and Guidance

GLT solicited expert advice for what data to consider and how best to use these data in the prioritization process from a variety of sources. Also, steering committee meetings were held in May, June, July and August 2010 to garner additional recommendations. Contact information for all individuals who gave input and feedback in the project is listed in Appendix C.

To reconcile the two different sources of wetland data (NWI and Gracz's Cook Inlet Mapping Project), as well as the lack of any data for much of the study area, GLT held discussions with Julie Michaelson, USFWS Assistant Wetlands Coordinator. Julie recommended using the wetlands data that is being gathered for the MSB by Mike Gracz where available, and then using the available NWI data for the remainder of the borough. Given the large gaps in mapped and digitally available NWI data for the Mat-Su borough, Julie also suggested using hydric soils as an indicator of wetland presence, to serve as a proxy in locations where no specific wetlands data is available. Bill Rice, a hydrologist for USFWS, who has performed similar mapping exercises before using hydric soils data as a proxy where wetlands data are unavailable, provided GLT with some insight as to how to proceed in areas lacking specific wetlands data. Bill suggested including all soil types containing more than 85% hydric soil. At his suggestion, GLT created a hydric soil layer from the original NRCS soil data that contained

only soils with more than 85% hydric soil to serve as a wetland proxy in areas outside the boundaries of current wetland maps.

To assess the accuracy and coverage of the AWC, GLT met with Theresa Tanner, USFWS Fisheries Biologist, who gave updates on the AWC and informed GLT that ADF&G was close to completing a polygon (lakes) layer for the AWC. GLT then met with J Johnson, Habitat Biologist and the AWC contact for the ADF&G. J mentioned that while the AWC is not complete, and some of the data is very old, the AWC is routinely referenced by outside agencies for regulatory purposes and is still a useful criterion to include. He also provide GLT with the most updated AWC polygon file available, which would include anadromous lakes not covered in the original AWC line file.

In determining how to utilize the watershed-level, development vulnerability study previously performed by TNC, GLT met with Marcus Geist, the GIS Analyst for TNC. Although the original TNC layer included 8 criteria, after discussing the relative value of each with Marcus, GLT decided to include a pared-down, 3-criteria version of the vulnerability dataset, especially since water quality and conservation management status (two of the original vulnerability criteria) were already being considered as discrete criteria in this prioritization. The 3 criteria retained were kept because not only were they capturing important conservation concerns not addressed by other criteria in this study, but they were also data that would not have been suitable on a parcel level. These 3 criteria (road density, converted and impervious lands, and subdivisions) were then recombined to create a suitable development vulnerability score for this prioritization project.

When determining how to include pertinent data on birds and bird habitat, GLT met with Lynn Fuller, the Alaska Coordinator for Pacific Coast Joint Venture and corresponded with Susan Sharbaugh, Senior Scientist for the Alaska Bird Observatory (ABO) in Fairbanks. Both Lynn and Susan referenced a report recently completed by ABO: Matanuska-Susitna Area Bird Habitat Use Review Project (2010). Although this report contains some detailed documentation for certain species in some areas, given the geographic scope of this prioritization project, there remained large data gaps in some regions. Additionally, much of the information collected was not available in electronic form, and given the short time frame of the Mat-Su prioritization, it was not feasible to try to digitize it all. As a way to still include important bird habitat as a conservation criteria, using data that was not only internationally recognized as valid, but also digitally available, Lynn also suggested that the use of Important Bird Area (IBAs) data would also be appropriate. For feasibility purposes, GLT did ultimately decide to use the IBA data, provided by Melanie Smith, a biologist and GIS Analyst with Alaska Audubon, instead of the information from the ABO report.

While ADF&G possesses range maps for a number of mammals, after meeting with Tony Kavalok, Chris Brockman and Ken Bouwens from ADF&G, GLT determined that all other mammals besides moose reside entirely at higher elevations outside the study range, are too ubiquitous to serve as a ranking criterion or are too poorly mapped. Based on this, GLT chose to focus solely on moose habitat for a conservation criterion, rather than multiple mammals. Although the only available range maps for moose were from 1985, Tony, Chris and Ken said that for the most part, moose habitat remained essentially unchanged. Tony, did however, point

out one area that now had an expanded range: the area around Big Lake where there had been a fairly recent burn. The resulting cleared area has become a common moose wintering area. Based on this suggestion from Tony, GLT modified the range map to more accurately reflect the current wintering range of moose in the MSB. Tony, Chris and Ken also assisted GLT in determining which of the moose range types were most valuable. They recommended that we weight moose wintering range the highest because this is the only limiting factor to their population. Wintering range was then followed in importance by calving, and finally rutting ranges. These varied levels of importance were taken into account by GLT in the scoring of this criterion.

The final filters and conservation criteria were chosen after consulting with a steering committee assembled to guide this project. The steering committee members included: Bill Rice (USFWS), Matt LaCroix (EPA), Frankie Barker (MSB), Corinne Smith (TNC), Maureen deZeeuw (USFWS) and David Wigglesworth (USFWS). Many of the steering committee members were not only able to provide valuable insight into particular conservation criteria, but have also been involved and have experience working with similar prioritization projects in the past.

GLT recognizes the value of these meetings and would like to extend a “Thank you” to those who donated their time and assisted GLT with this project.

3. Results

For Scenarios 1 and 2, of the initial 106,189 parcels in the Mat-Su Borough parcel dataset, 15,612 were below 1500ft and/or within 1 mile of roads, were greater than 5 acres and were not state or federal land (excluding Mental Health and Public University Lands). For Scenario 3, of the initial 48,128 parcels within the greater core area, 23,920 were greater than 1 acres and were not state or federal land (excluding Mental Health and Public University Lands).

3.1. Scenario 1

The parcel rankings for Scenario 1 ranged from a high score of 11.037 (out of a possible 13) to a low score of 0.008 (Figure 10). From these 15,612 parcels, the top 500 were selected and displayed separately (Figure 11). Specific parcel rankings, for the top 500 parcels, with identification and scoring information can be found in Appendix B. Also, see Appendix A (pages 46-50) for more detailed maps of Scenario 1 results.

Taking just the top 500 parcels into account, parcel ownership was distributed among five categories (Figure 12), with the majority of parcels (293) being privately owned. Other major categories were Borough (98) and Native Corps (72) ownership. The top 500 parcels also included Native Corps and Mental Health Trust lands.

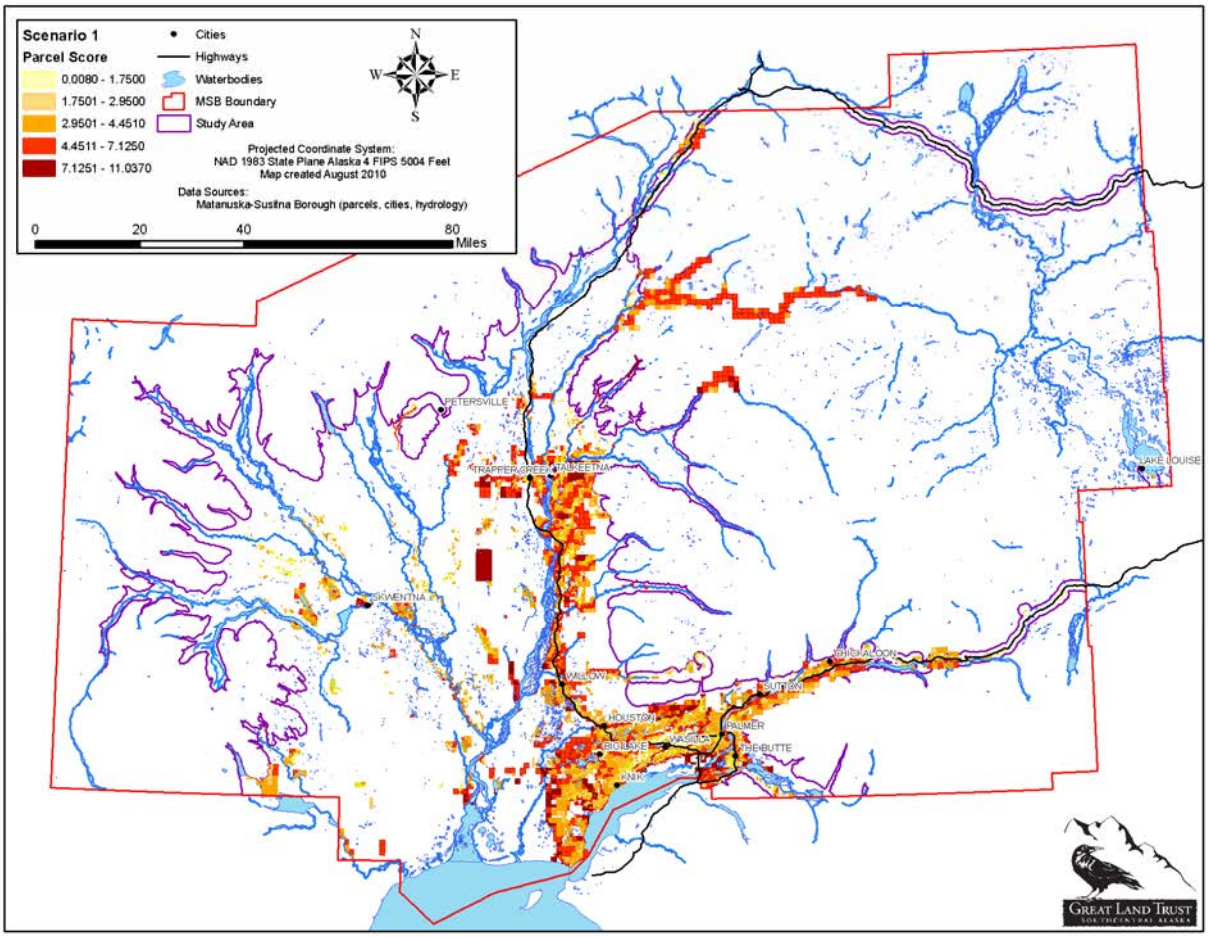


Figure 10. Final Parcel Scores for Scenario 1.

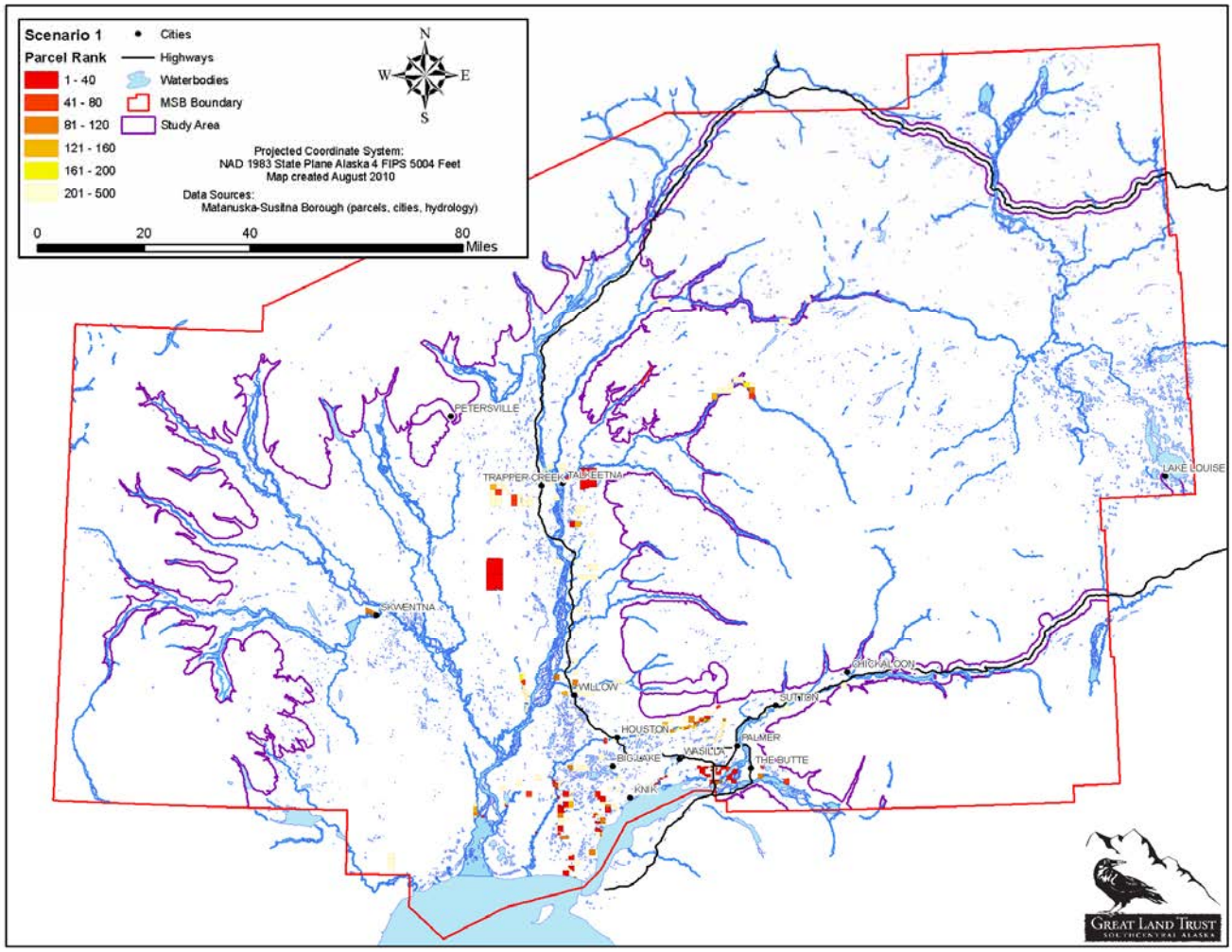


Figure 11. Top 500 Parcels from Scenario 1

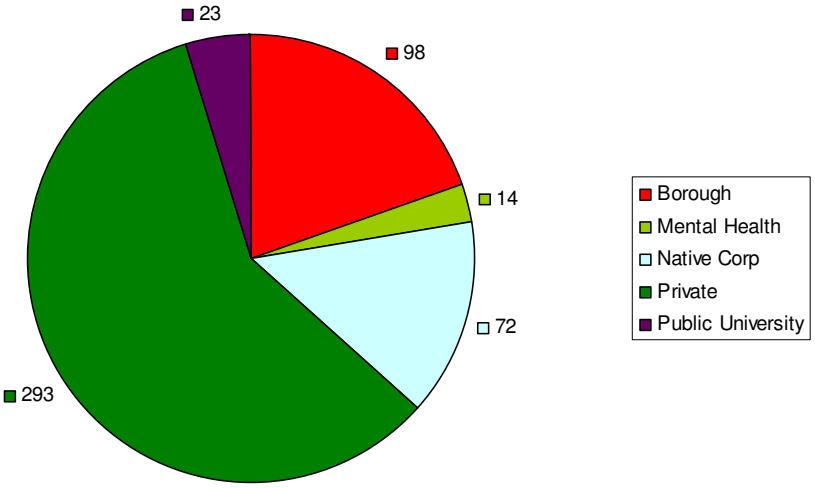


Figure 12. General Ownership for Scenario 1's Top 500 Parcels

3.2. Scenario 2

The parcel rankings for Scenario 2 ranged from a high score of 8.550 (out of a possible 10) to a low score of 0.008 (Figure 13Figure 10). From these 15,612 parcels, the top 500 were selected and displayed separately (Figure 14). Specific parcel rankings, for the top 500 parcels, with identification and scoring information can be found in Appendix B. Also, see Appendix A (pages 51-55) for more detailed maps of Scenario 2 results.

Taking just the top 500 parcels into account, parcel ownership was distributed among six categories, but unlike Scenario 1, there was no clear majority in ownership type (Figure 15). Native Corp (161), Private (158) and Borough (132) all showed an approximately equal majority. The rest of the top 500 parcels were made up of Mental Health Trust, Public University and State and Native owned lands.

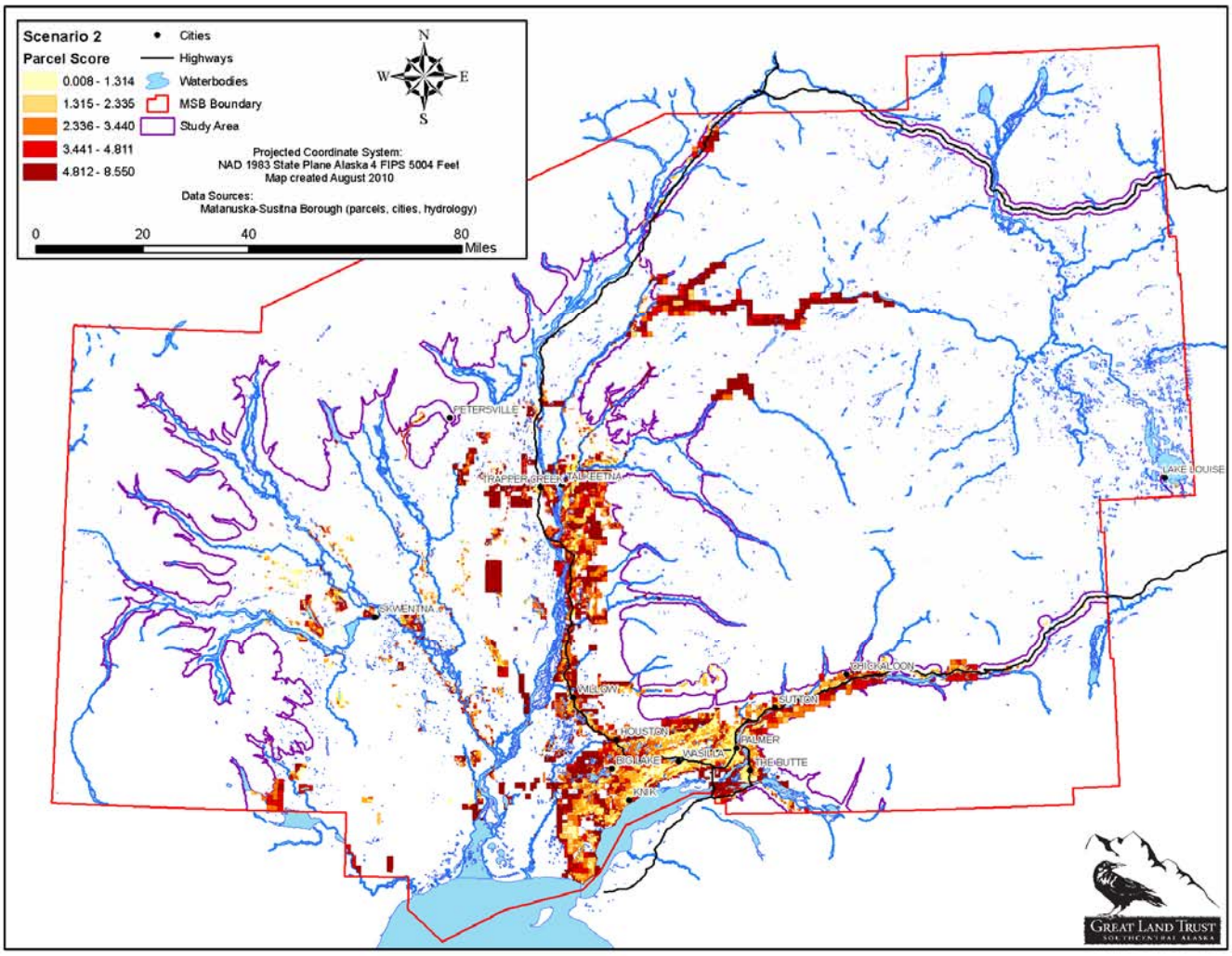


Figure 13. Final Parcel Scores for Scenario 2

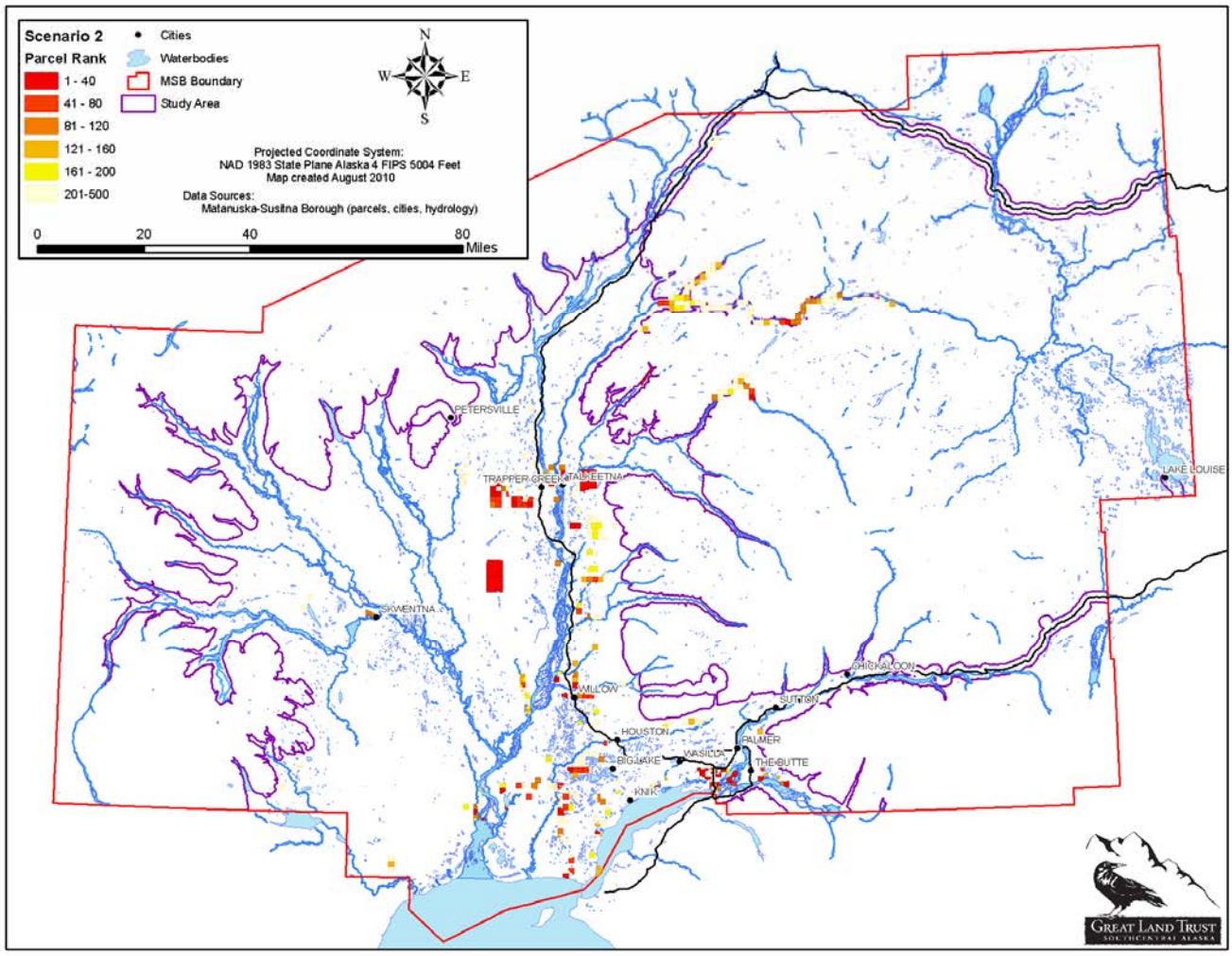


Figure 14. Top 500 Parcels from Scenario 2

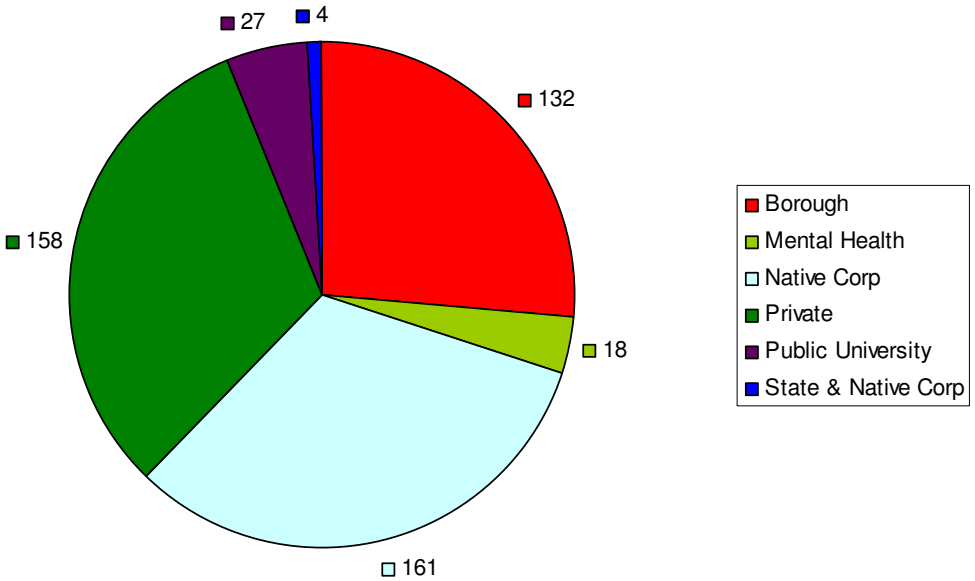


Figure 15. General Ownership for Scenario 2's Top 500 Parcels

3.3. Scenario 3

The parcel rankings for Scenario 3 ranged from a high score of 11.0364 (out of a possible 13) to a low score of 0.3616 (Figure 16Figure 10). From these 23,920 parcels, the top 200 were selected and displayed separately (Figure 17). Specific parcel rankings, for the top 200 parcels, with identification information can be found in Appendix B. Also, see Appendix A (page 56) for more detailed maps of Scenario 3 results.

Taking just the top 200 parcels into account, parcel ownership was distributed among five categories (Figure 18), with the majority of parcels (161) being privately owned. Other types included Borough (19), Mental Health Trust (5), Native Corp (10) and Public University (5).

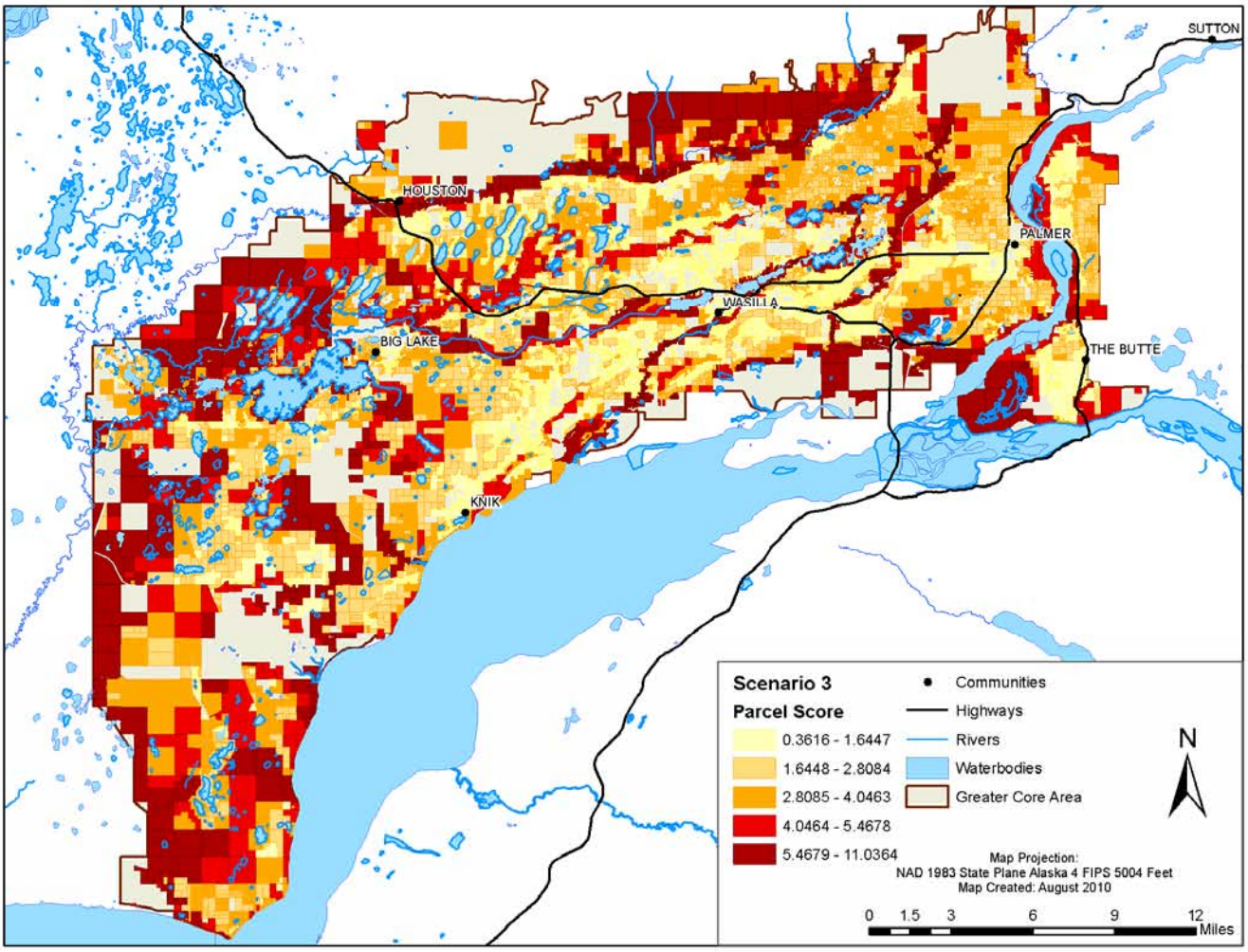


Figure 16. Final Parcel Scores for Scenario 3

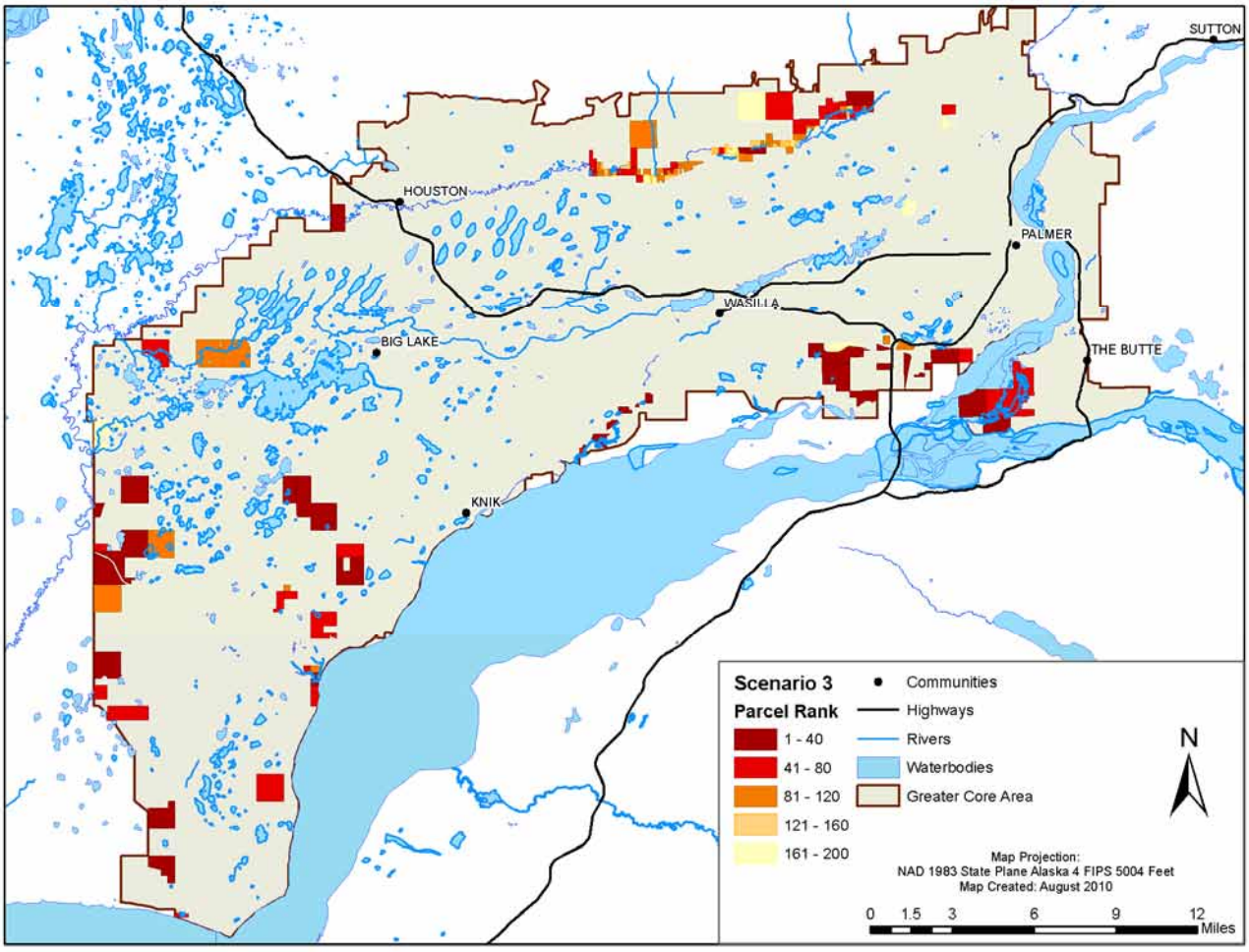


Figure 17. Scenario 3's Top 200 Parcels

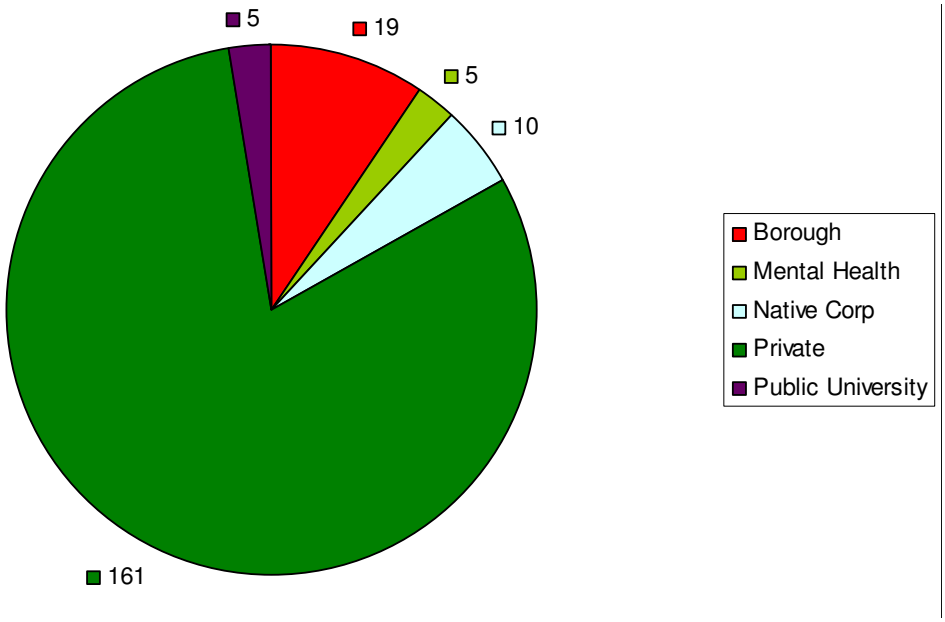


Figure 18. General Ownership for Scenario 3's Top 200 Parcels

4. Discussion

The results of this prioritization analysis indicate that there are many potential opportunities for high value conservation projects throughout the Mat-Su Borough. Landowners of the top 500 parcels from both Scenario 1 and Scenario 2 and of the top 200 parcels from Scenario 3 will be contacted to gauge interest in a conservation easement or land acquisition. (It is important to note that this will not equal 1200 total landowners, as many parcels rank high in more than one scenario.) If a land owner indicates interest, the feasibility of a conservation project will be evaluated. This will then require ground-truthing the interested landowner's parcels to verify the conservation value of the parcel indicated by this prioritization analysis.

Although prioritizations such as this one can be an important conservation tool, it is important to remember that the parcels selected in any of these scenarios are not the only high conservation value parcels. Prioritizations are simply one tool for identifying key areas, and in this case, this Mat-Su Prioritization Project simply works to focus GLT's energies in the Mat-Su Borough as a whole. Just because a parcel is not specifically identified by this prioritization as one of the top parcels, does not mean that particular parcel has no conservation value.

4.1 Possibilities for Future Additions to this Prioritization

While this prioritization did include a wide variety of conservation criteria, there are a number of changes that can and should be made when new and more accurate data becomes available. One change would be to include more detailed bird and mammal data. For example, the Alaska Bird Observatory is actively working on trying to tie various bird species of concern to particular habitat types. Ultimately it would be useful to prioritize the habitat of endangered or threatened bird species, but first, better habitat and land cover data needs to become available for the entire Mat-Su Borough. Similarly, the Wildlifers, contracted by MSB, are actively trying to compile a comprehensive report on the MSB mammals. Their report will review over 4,000 publications, agency documents, management reports, data, and other literature, but unfortunately very little GIS data exists for mammals in this region. While the data may not be readily available in digital format, it would still be worth reviewing when it's complete to assess whether any of it would make useful additions to prioritizing conservation lands in the Mat-Su.

A second change would be to continue to periodically update certain criteria to reflect regular changes in certain data sources. For example, both the in the presence of AWC designated streams and the anadromous fish diversity criteria use the ADF&G's AWC data as a major input. This catalog is continuously being added to, and a new publicly available dataset is published each year. Another data source to monitor would be the AWCA's impaired waters 303(d) list. As new streams and rivers become impacted, and streams previously listed get cleaned up, it would be beneficial to update this criterion to reflect these changes. Lastly, checking for NWI and Cook Inlet Wetland Classification and Mapping Program updates would be extremely beneficial, as the current wetlands data used in this prioritization is made up partly of proxy data, consisting of soils, streams and lakes. As these new, more accurate data become available, these changes should be reflected in the analysis.

Finally, it would be worth while to re-evaluate available cultural and historical data in the future. Important cultural and historical sites were originally planned as additional conservation criteria. However, due to privacy reasons, much of this data remains unmapped. In the event that progress is made on digitally mapping this data in the future, and some compromise could be reached between privacy and the responsible utilization of this data, it would be extremely useful to include this data in future prioritizations. While it is useful to show that a parcel has high conservation value in the ecological sense, if it also ranks high for cultural and/or historical reasons, it would give added weight to its selection for preservation.

4.2. Modifying this Analysis for Different Sub-Regions

Because this analysis was done without any specific outside requirements, it is extremely broad, and therefore has the ability to be tailored for various needs. Depending on available funding sources or specific conservation priorities, a number of the different criteria could be removed or weighted higher, focusing the prioritization on a particular subset of the conservation criteria.

Also, given the large geographic scope of Mat-Su Borough, Scenario 3 was done as an example subset prioritization, but this same method could be done for almost any group of parcels. It would be possible to select parcels based on town, watershed, adjacency to a particular waterbody, or any of a variety of other attribute. This could be done either with the finalized and scored ArcGIS shapefile or with the resulting Excel table. Once a subset was selected and exported as its own shapefile or Excel sheet, these parcels could then be resorted based on the "FinalScore" attribute and re-ranked accordingly. This would be particularly useful if GLT chooses to focus its work on one particular watershed or community.

5. References

Gap Analysis Program. 1998. A handbook for conducting gap analysis. U.S. Geological Survey, National Gap Analysis Program, Moscow, Idaho. Available from http://gapanalysis.nbii.gov.

Mat-Su Basin Salmon Habitat Partnership. 2009. Salmon Watersheds in the Mat-Su Basin: A Map Atlas to Prioritize Conservation. The Nature Conservancy: Anchorage, Alaska. Available at http://conserveonline.org/workspaces/MatSuSalmon.

Matanuska-Susitna Borough. 2003. 2003 Fact Book. Planning and Land Use Department. Palmer, AK.

Matanuska-Susitna Borough. 2009. EPA West Coast Estuaries Initiative Matanuska-Susitna Borough Cooperative Agreement: Water Quality Protection in the Matanuska-Susitna Borough through Green Infrastructure, Low Impact Development and Stormwater Management. Work Plan. September 2009. Palmer, AK.

Nature Conservancy's Conservation Management Status (CMS) Report (2010)

Smith and Geist. 2010. Conservation Management in the Mat-Su Basin (working title). The Nature Conservancy, Anchorage, Alaska. Available at corinne_smith@tnc.org.

Teale, K. 2009. A Prioritization of Land Parcels for Conservation in the Matanuska-Susitna Borough near Knik Arm. The Great Land Trust. Anchorage, AK.

Tiner, R.W. 1990. Wetland Indicators: A Guide to Wetland Identification, Delineation, Classification and Mapping. CRC Press LLC. Florida.

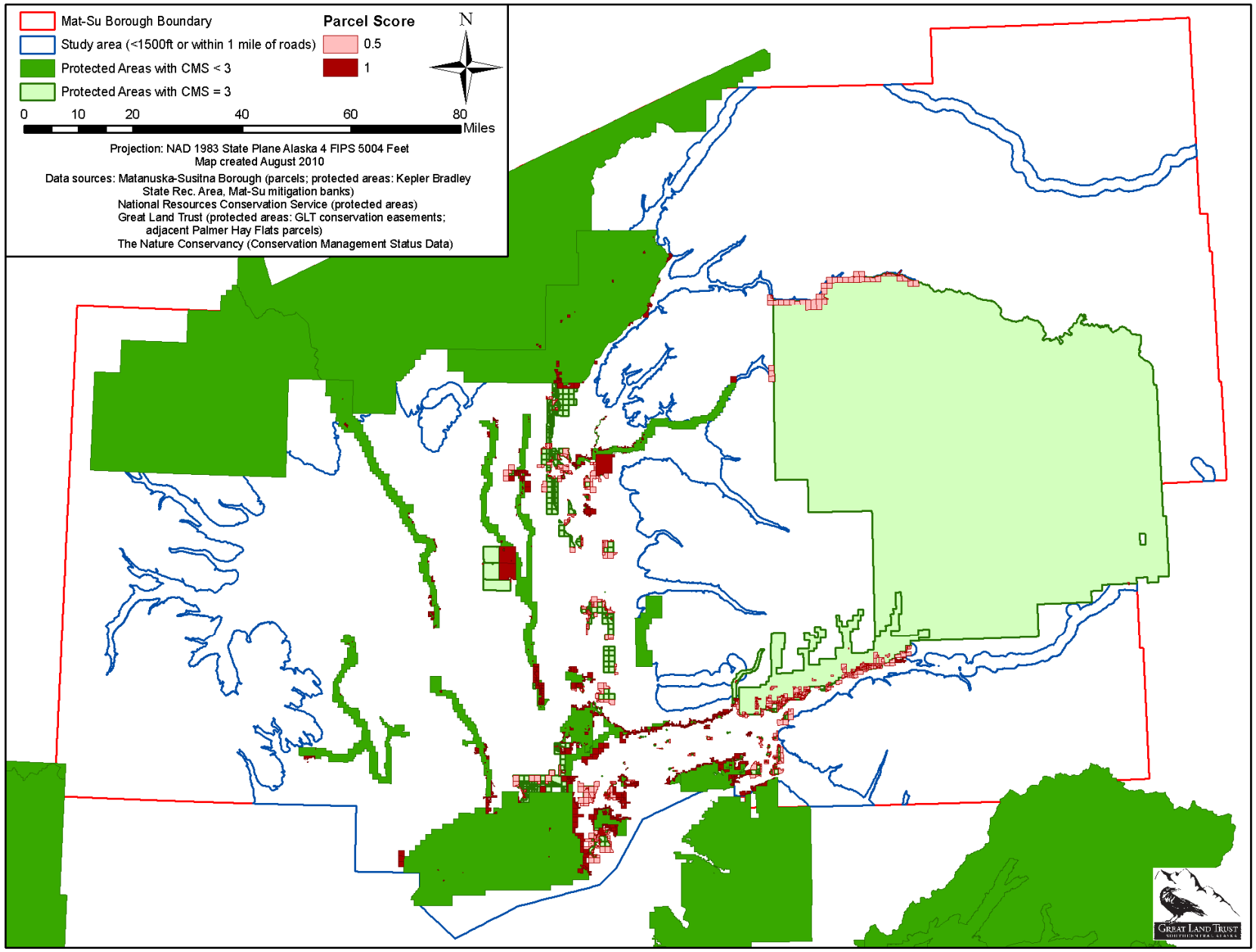
U.S. Census Bureau. 2010. State and Country Quick Facts: Matanuska-Susitna Borough, Alaska. http://quickfacts.census.gov/qfd/states/02/02170.html

Appendices

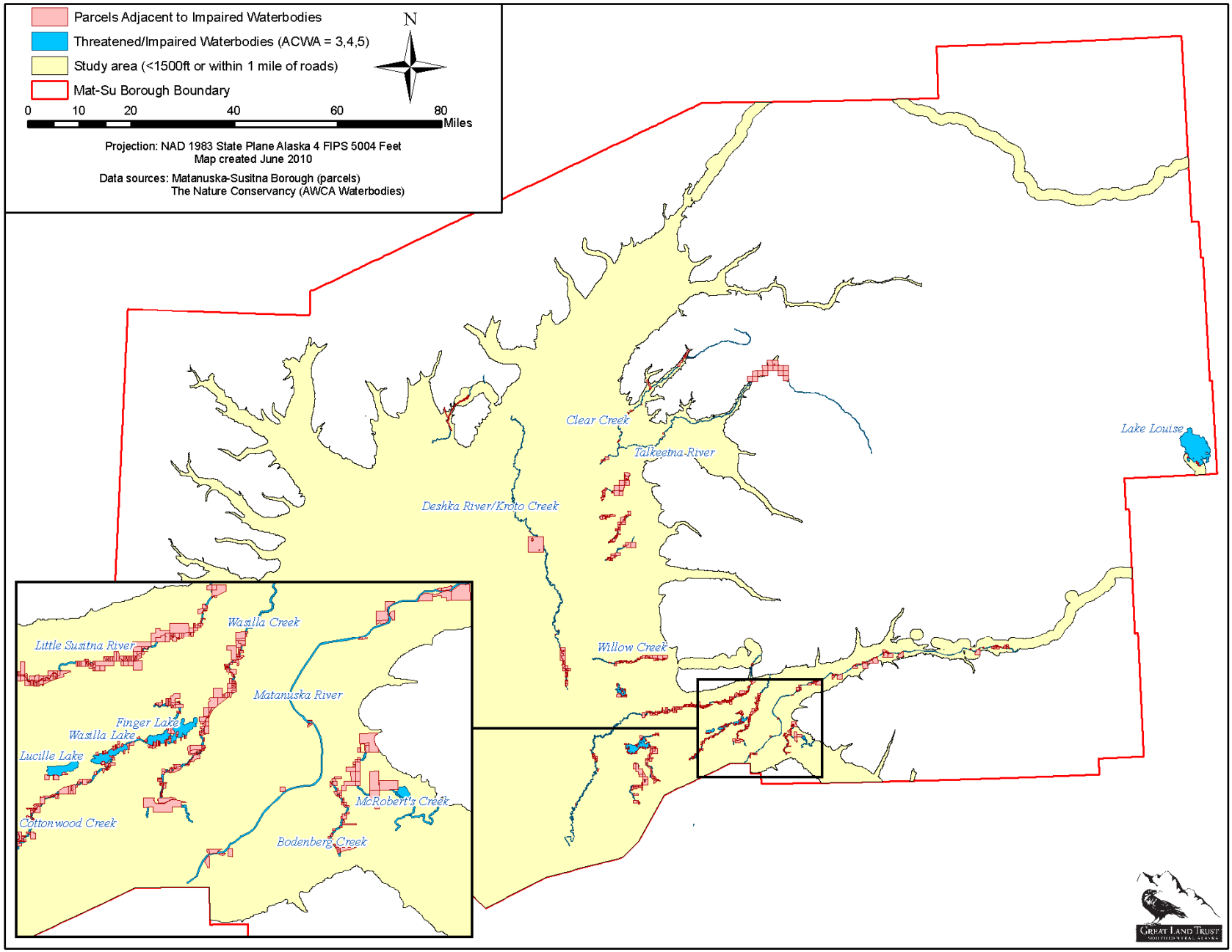
Appendix A. Map Atlas

List of Maps Displayed in Atlas:

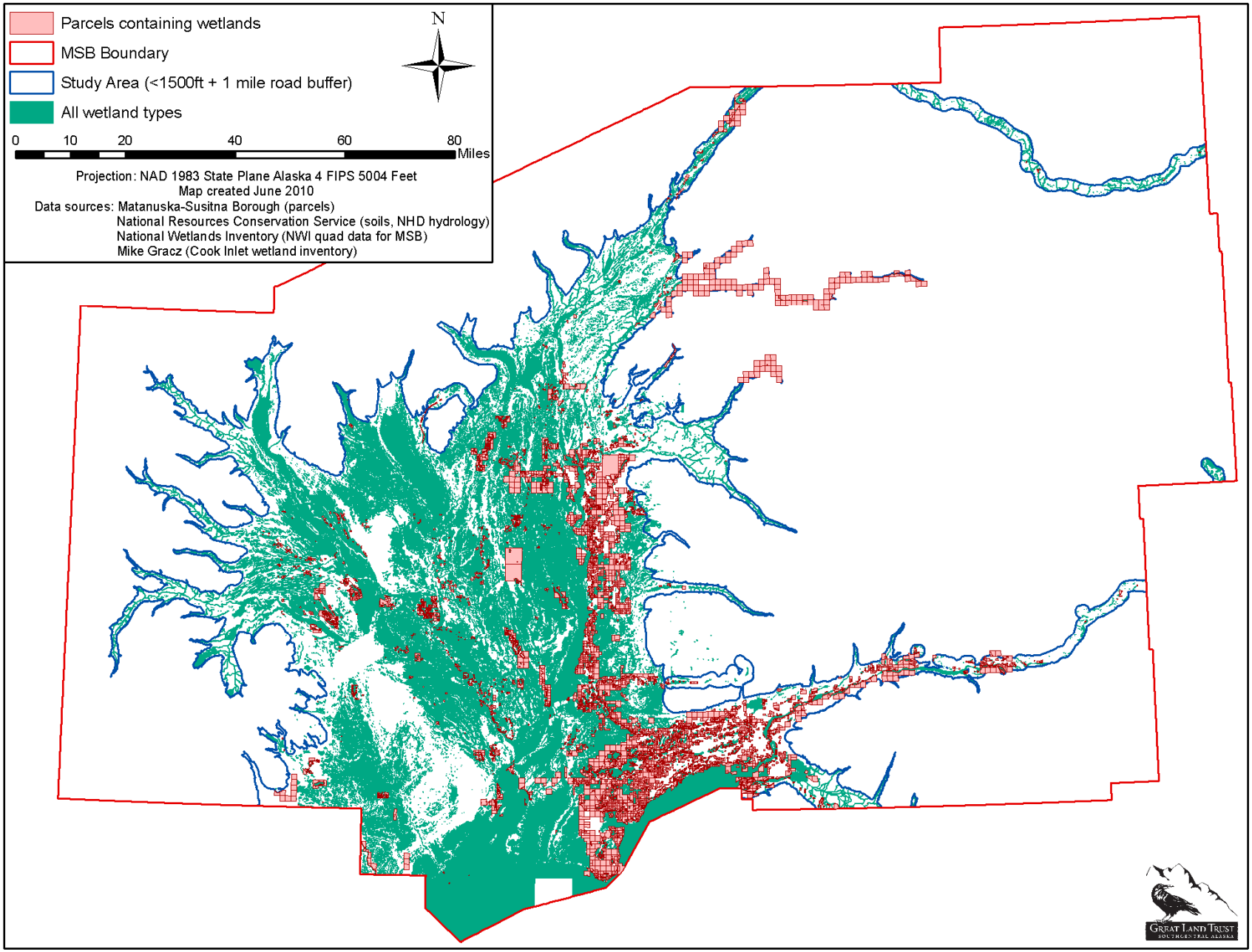
Map 1. Conservation Criteria 1: Protected Areas. Selected parcels are shown in dark red (with a score of 1) and pink (with a score of 0.5) depending on the Conservation Management Status of the Protected Area they were in or adjacent to.



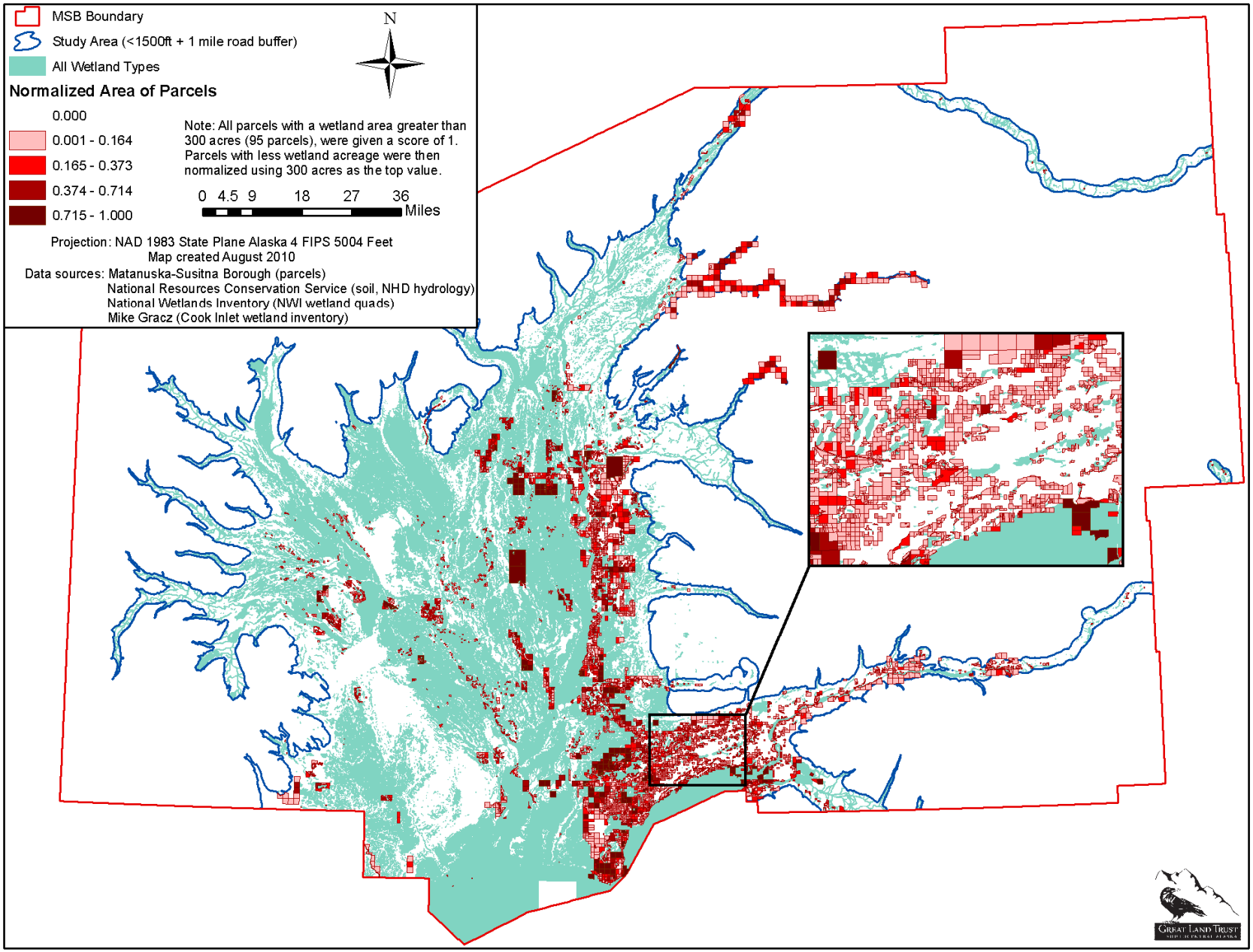
Map 2. Conservation Criteria 2: Impaired Waterbodies. Selected parcels (pink) are intersected by impaired waterbodies (blue).



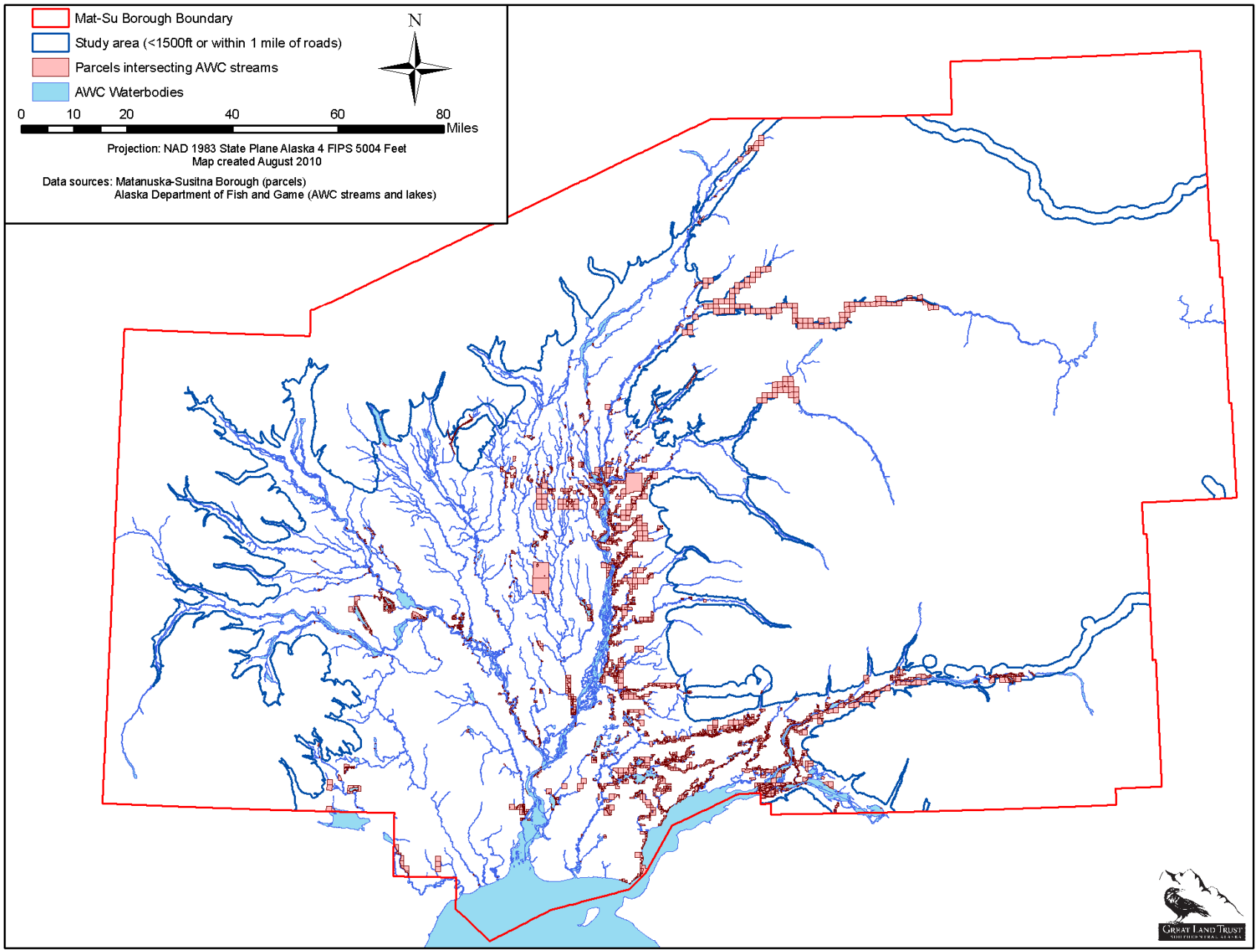
Map 3. Conservation Criteria 3: Presence of Wetlands. Selected parcels (pink) are intersected by any wetland type (green).



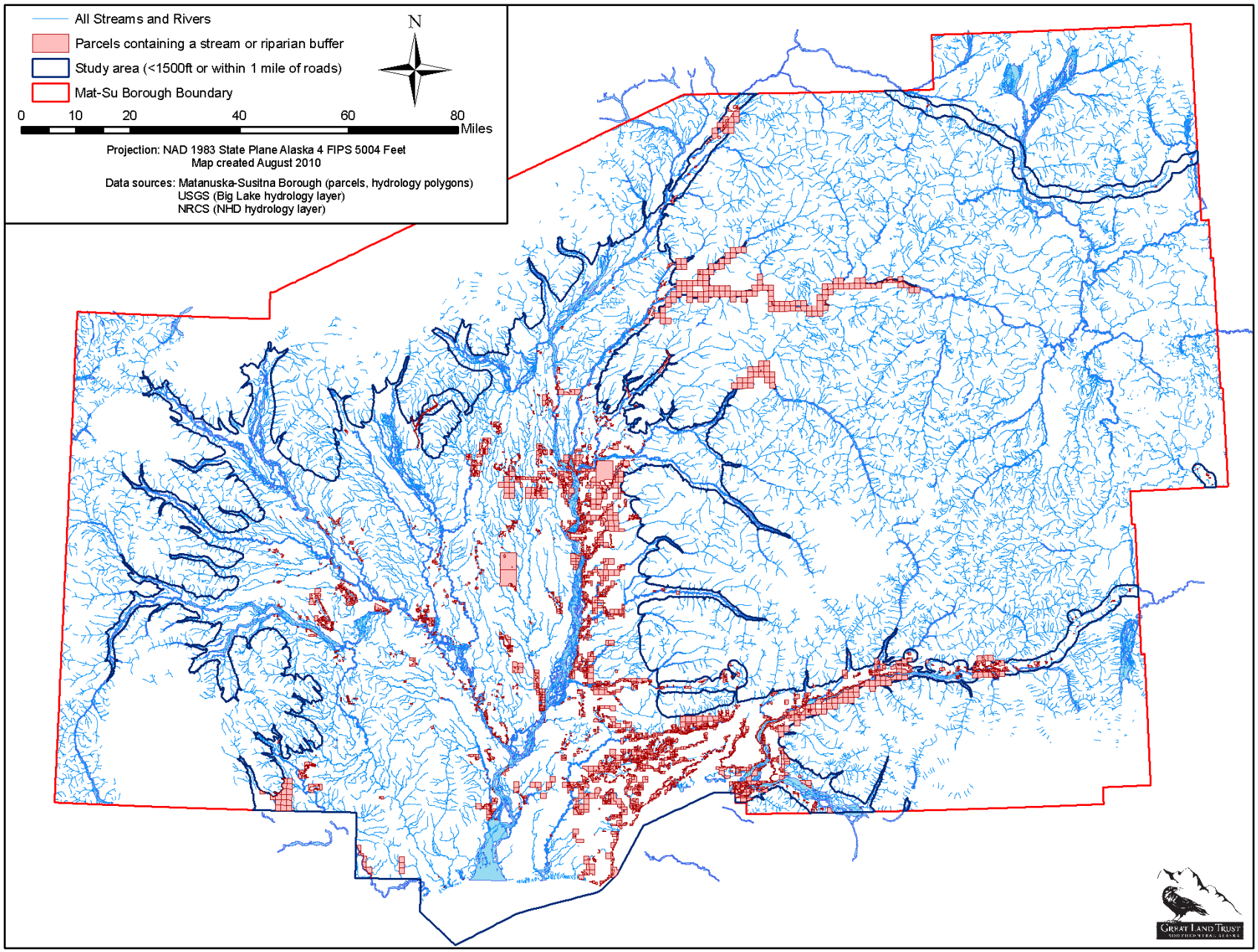
Map 4. Conservation Criteria 4: Normalized Wetland Area. Parcels are displayed according to normalized wetland area, with the light pink parcels having the lowest normalized area and the dark red parcels having the highest normalized wetland area.



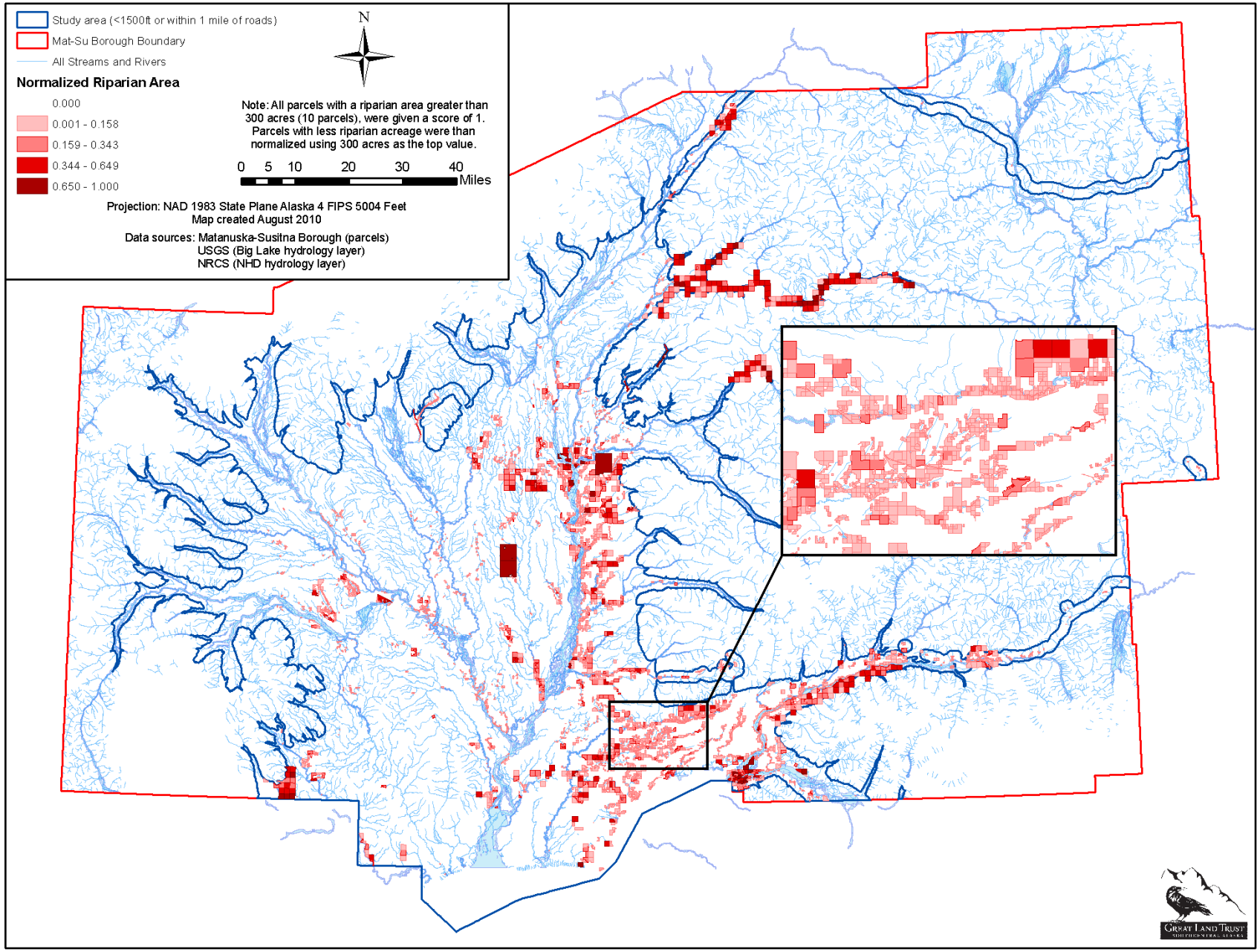
Map 5. Conservation Criteria 5: Anadromous Waters Catalog (AWC). Selected parcels (pink) are intersected by AWC waterbodies.



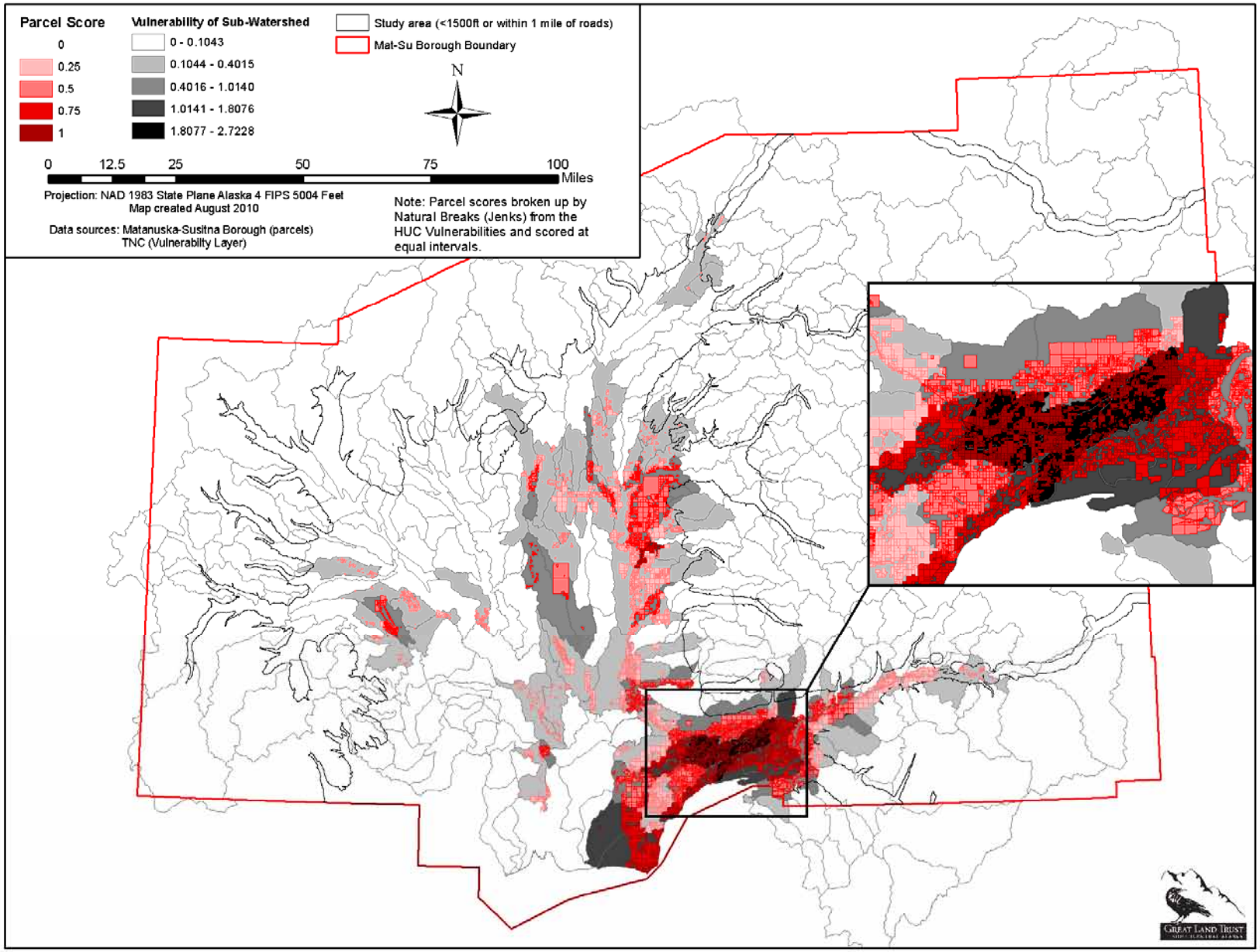
Map 6. Conservation Criteria 6: Presence of Any Stream. Selected parcels (pink) intersected with any stream or its 300ft riparian buffer.



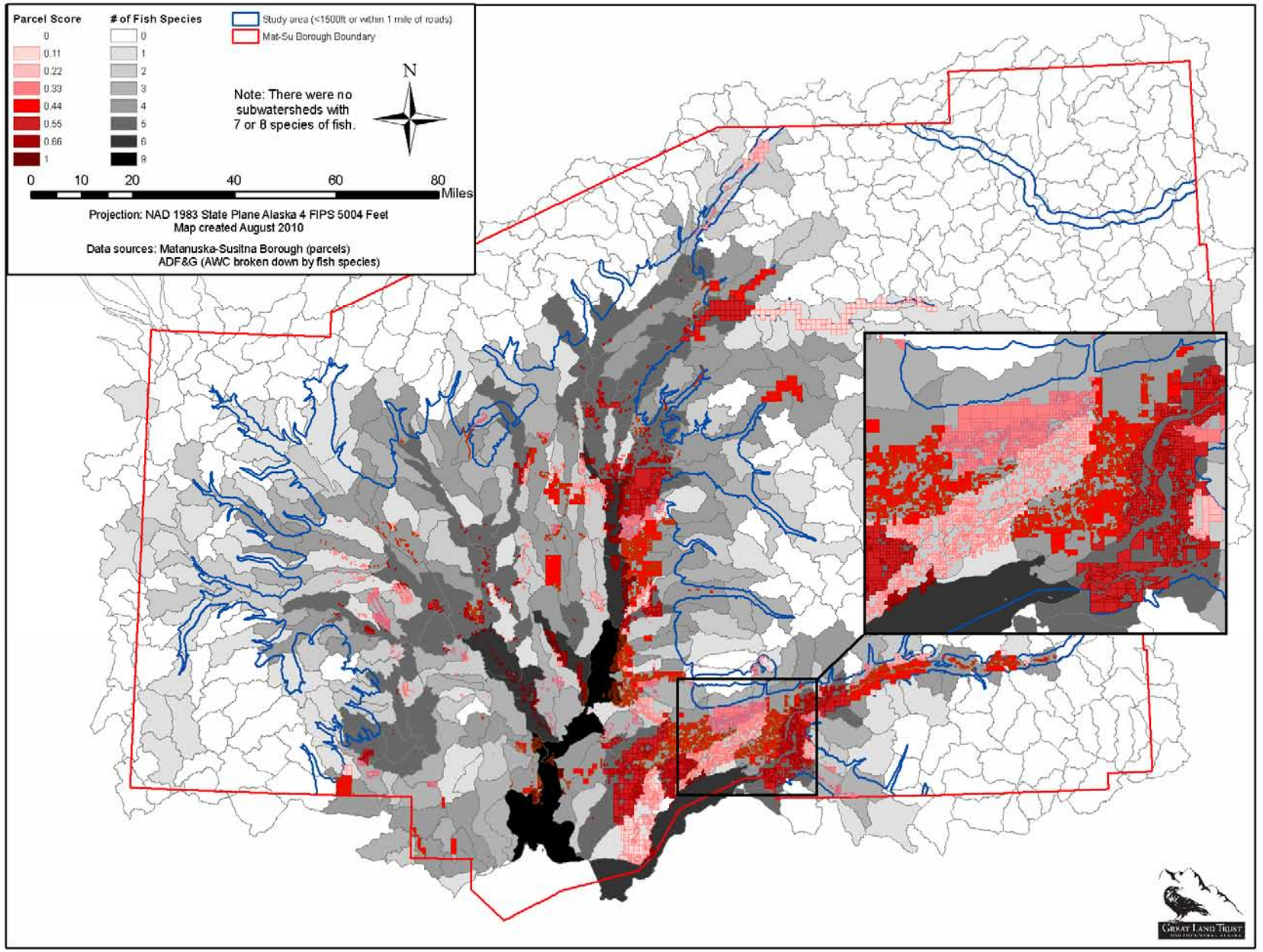
Map 7. Conservation Criteria 7: Normalized Riparian Buffer Zone Area. Parcels are displayed according to normalized riparian area, with the light pink parcels having the lowest normalized area and the dark red parcels having the highest normalized wetland area.



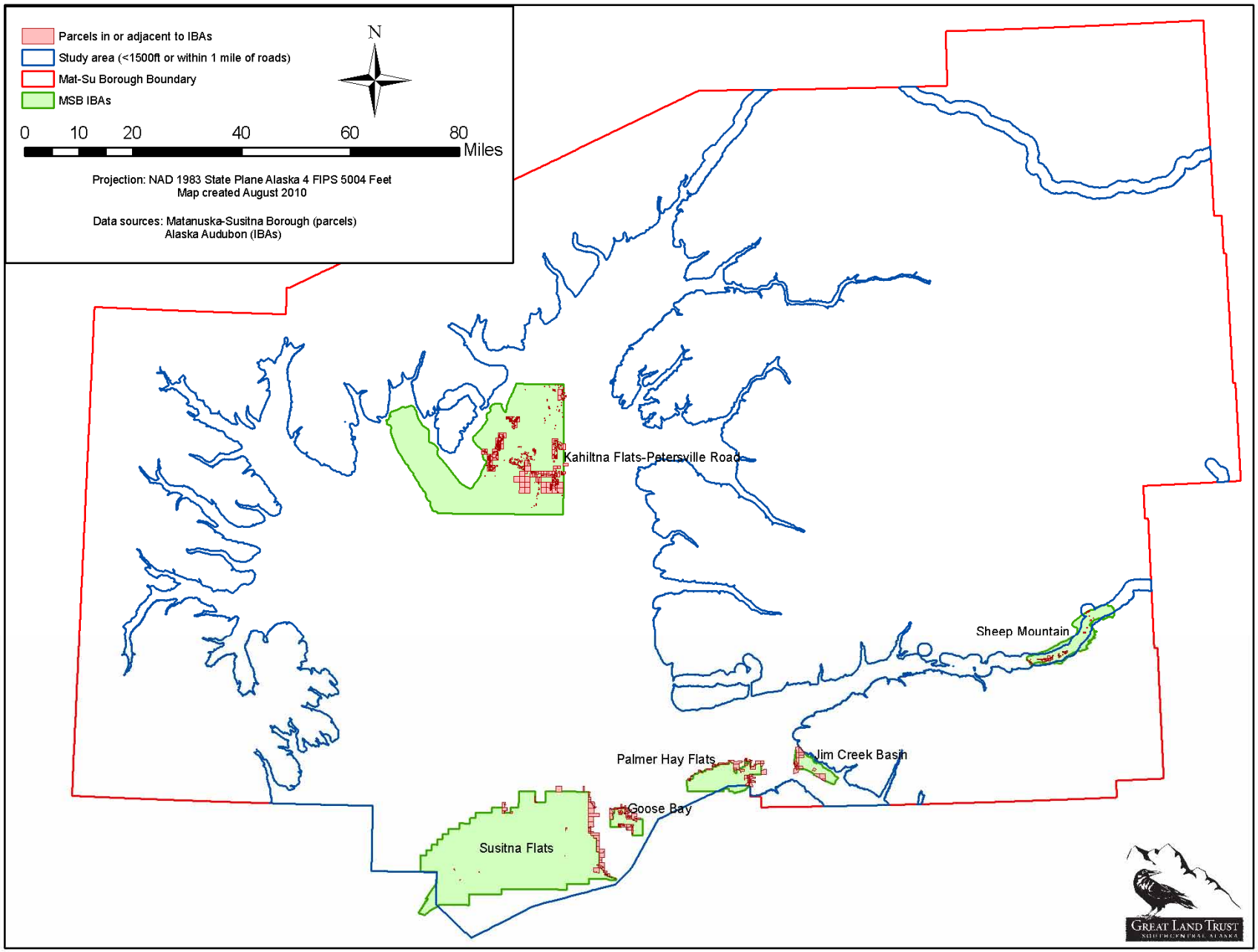
Map 8. Conservation Criteria 8: Development Vulnerability. Subwatersheds are displayed according to development vulnerability. Vulnerability factors considered were: 1. Road density, 2. Converted and impervious land cover and 3. Subdivisions. Maximum possible score = 3, minimum possible score = 0. Actual maximum score = 2.7228, actual minimum score = 0. Parcels were scored 0, 0.25, 0.5, 0.75 or 1 based on the vulnerability of the subwatershed they were in, and are displayed in various shades of pink/red, with the darker colors representing parcels in more vulnerable watersheds.



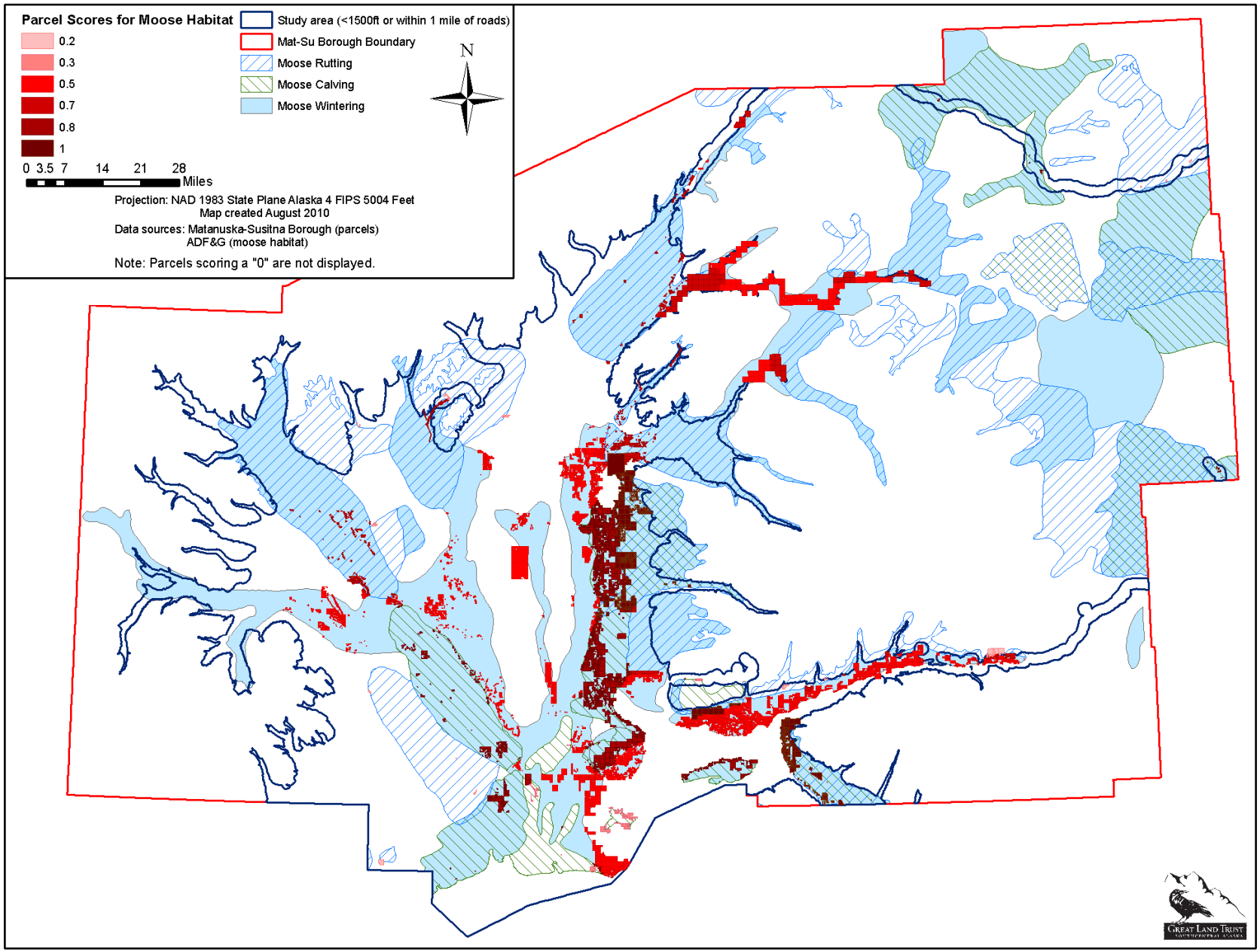
Map 9. Conservation Criteria 9: Anadromous Fish Diversity. Subwatersheds are displayed according to their anadromous fish diversity. Lowest diversity = 0 (white), and highest diversity = 9 (black). Parcels were scored 0, 0.11, 0.22, 0.33, 0.44, 0.55, 0.66 or 1 based on the fish diversity of the subwatershed they were in, and are displayed in various shades of pink/red, with the darker colors representing parcels in subwatersheds with higher anadromous fish diversity.



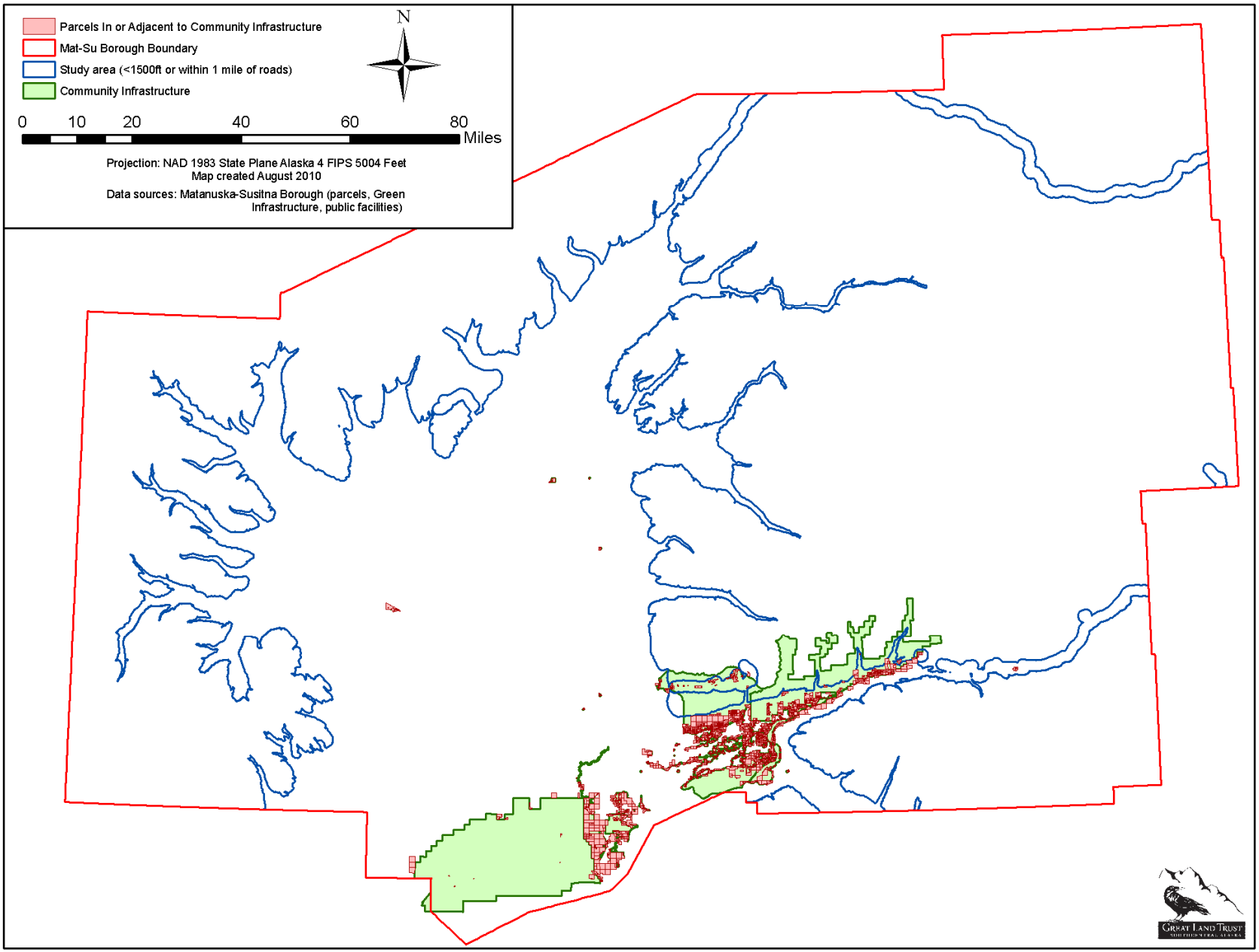
Map 10. Conservation Criteria 10: IBAs. Selected parcels (pink) in are adjacent to or within IBAs (green).



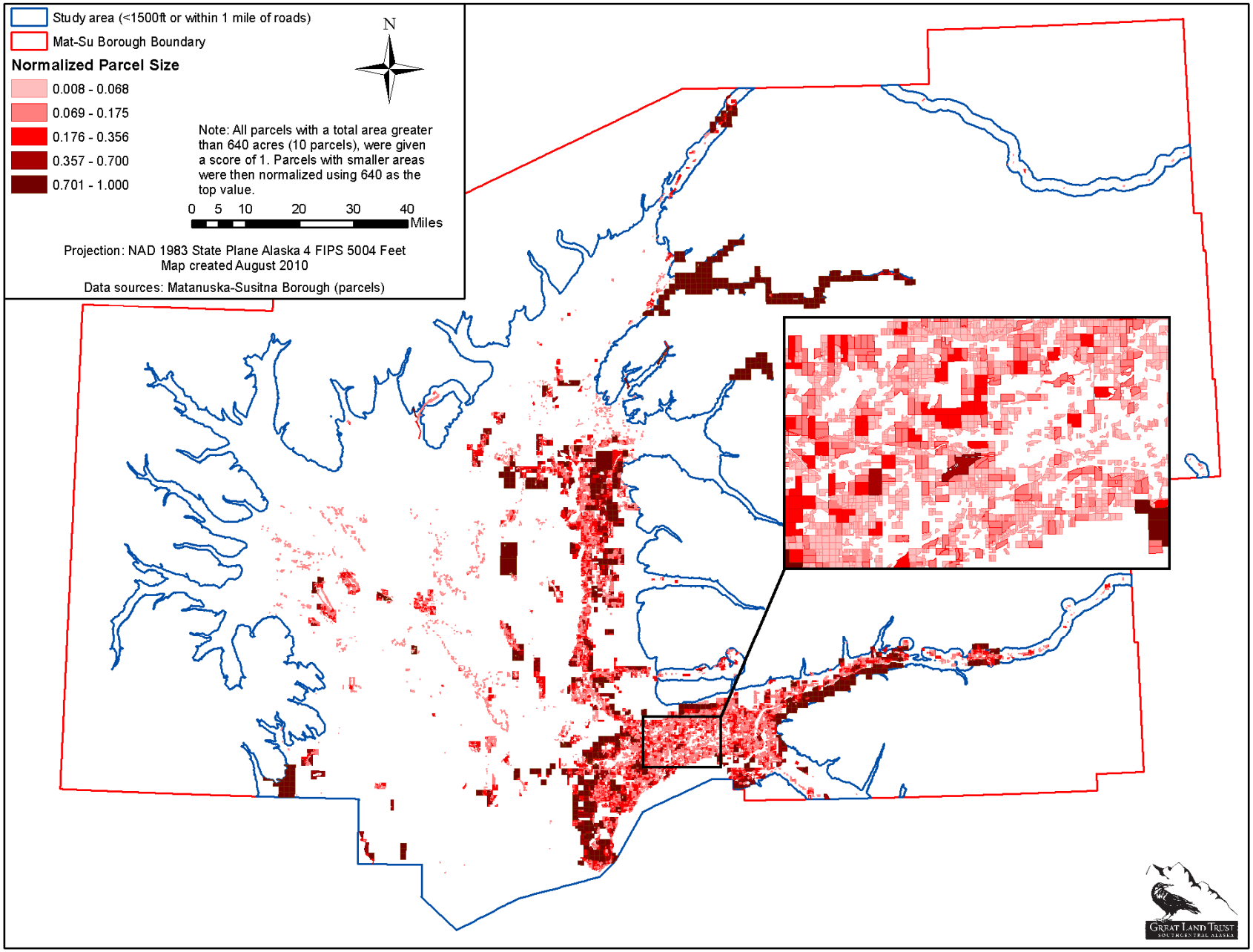
Map 11. Conservation Criteria 11: Moose Habitat. Selected parcels intersected with at least one classification of moose habitat. Parcels containing multiple classifications of habitat scored the highest (darker red). Parcels with lower scores are pink.



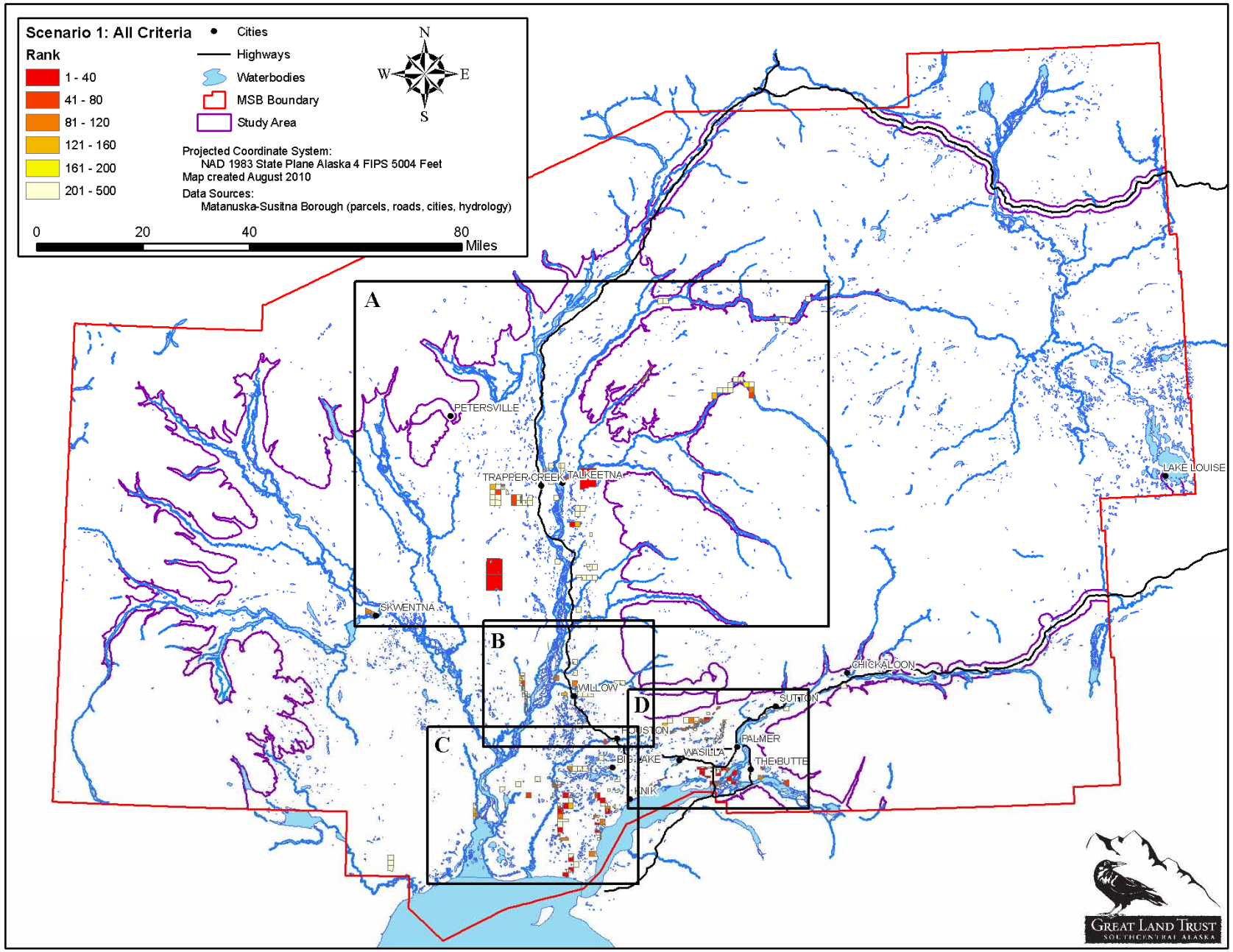
Map 12. Conservation Criteria 12: Community Infrastructure. Selected parcels (pink) were within or adjacent to some part of the MSB Green Infrastructure, school or public facilities.



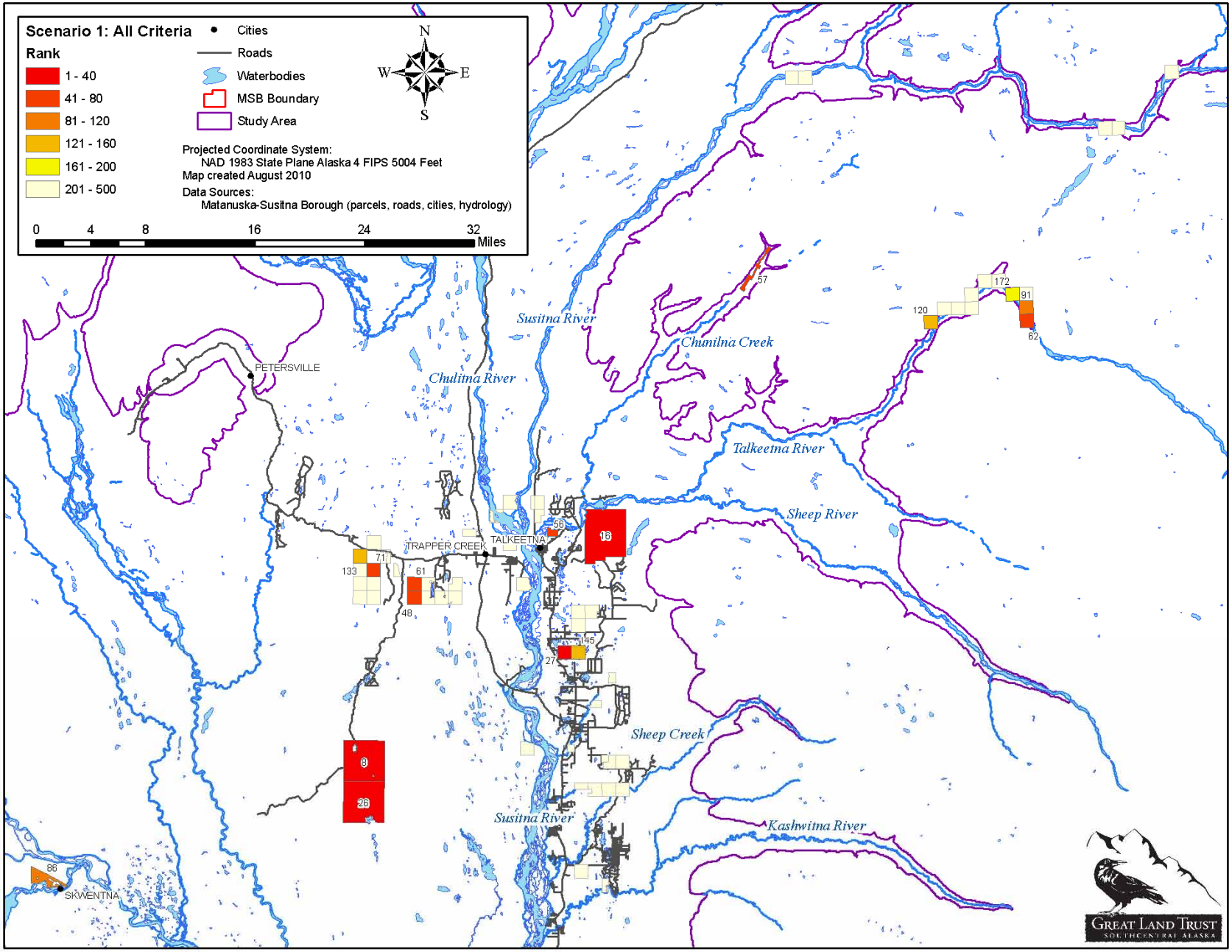
Map 13. Conservation Criteria 13: Normalized Parcel Size. All parcels are displayed by normalized size. Larger parcels are dark red, smaller parcels are lighter pink.



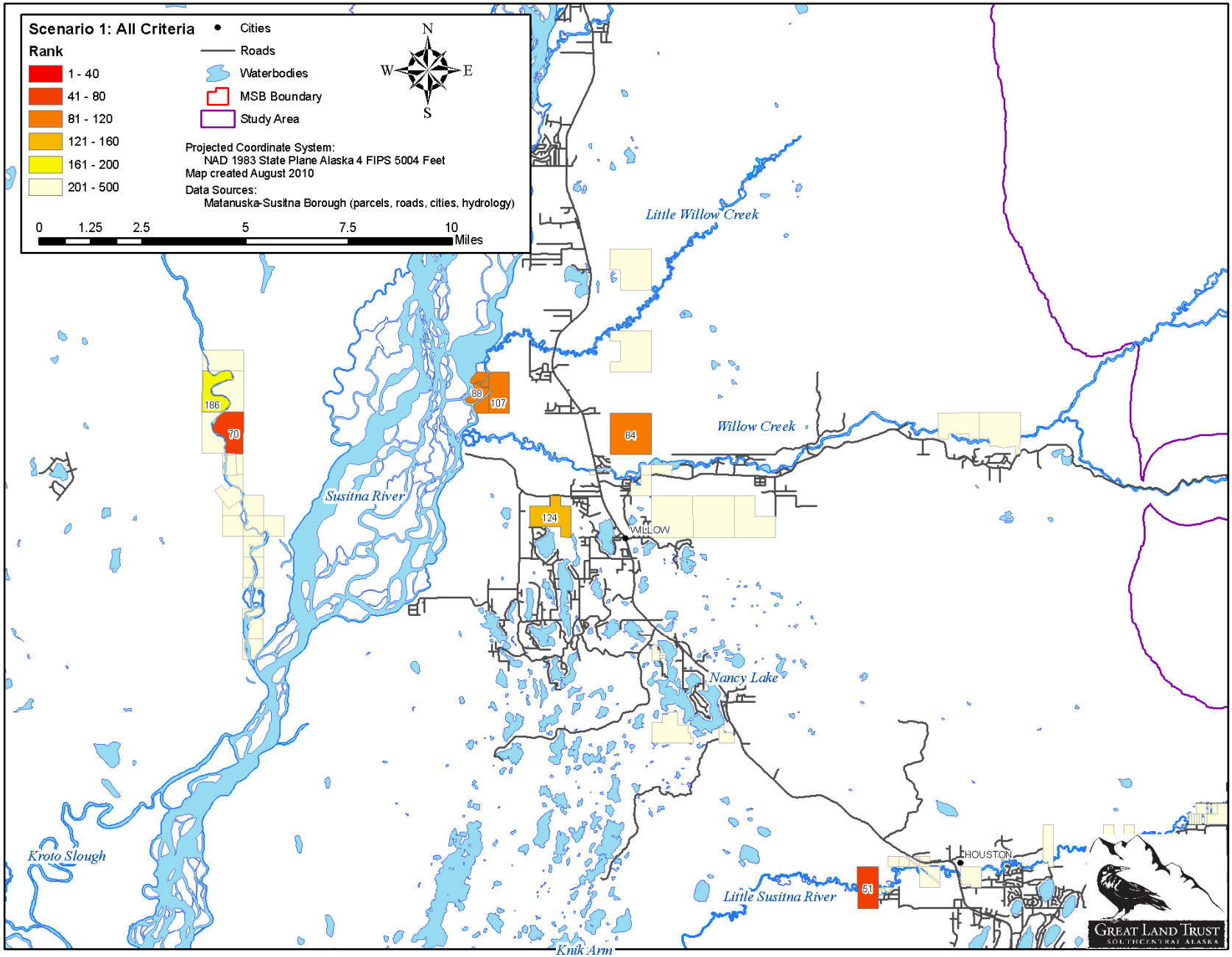
Map 14. Scenario 1: Overview Map of Top 500 Parcels for the Whole Mat-Su Borough. To see a more detailed map of a specific area, and numbered parcel rankings, referred to the appropriately labeled subset maps that follow (A, B, C, and D.)



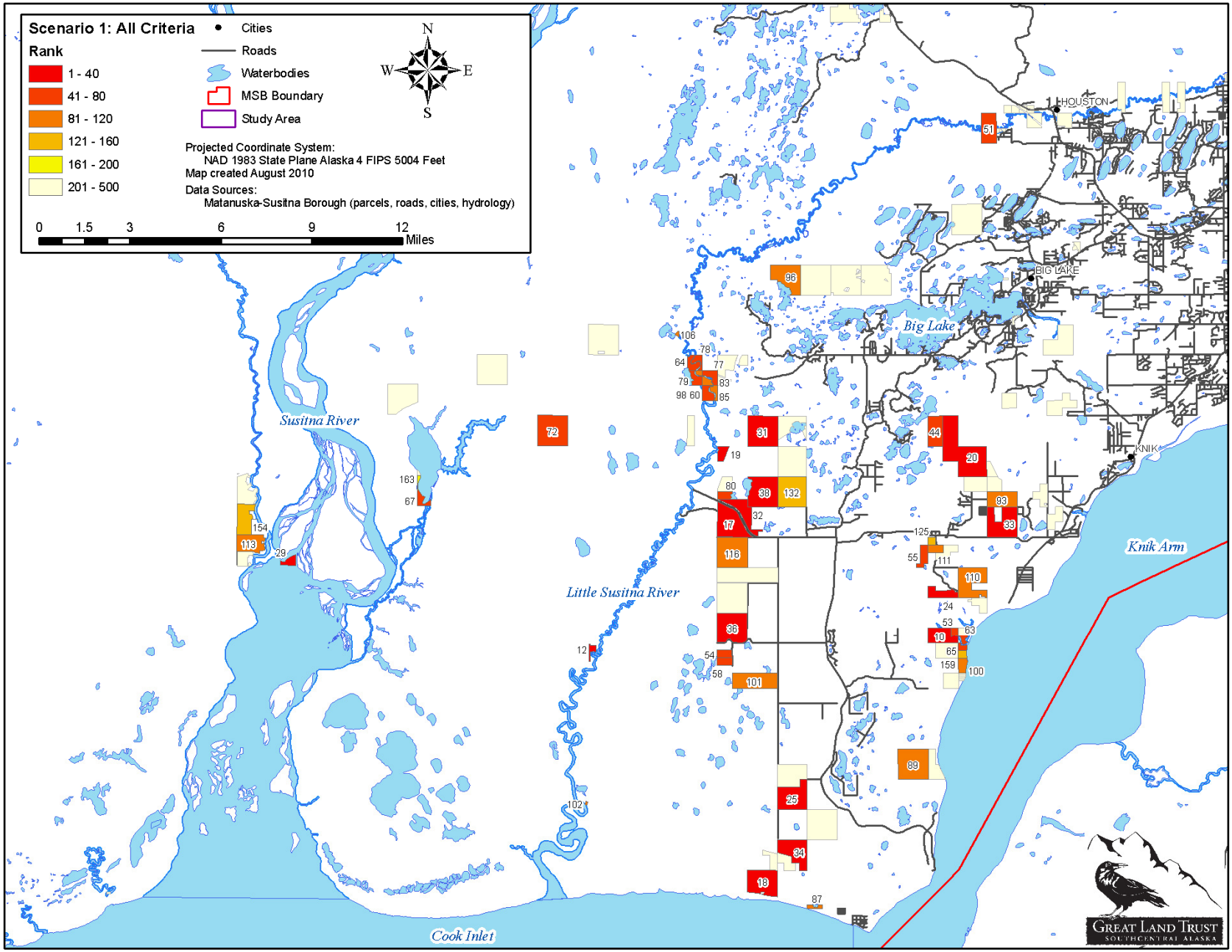
Map 15. Subset A of Scenario 1 Map.



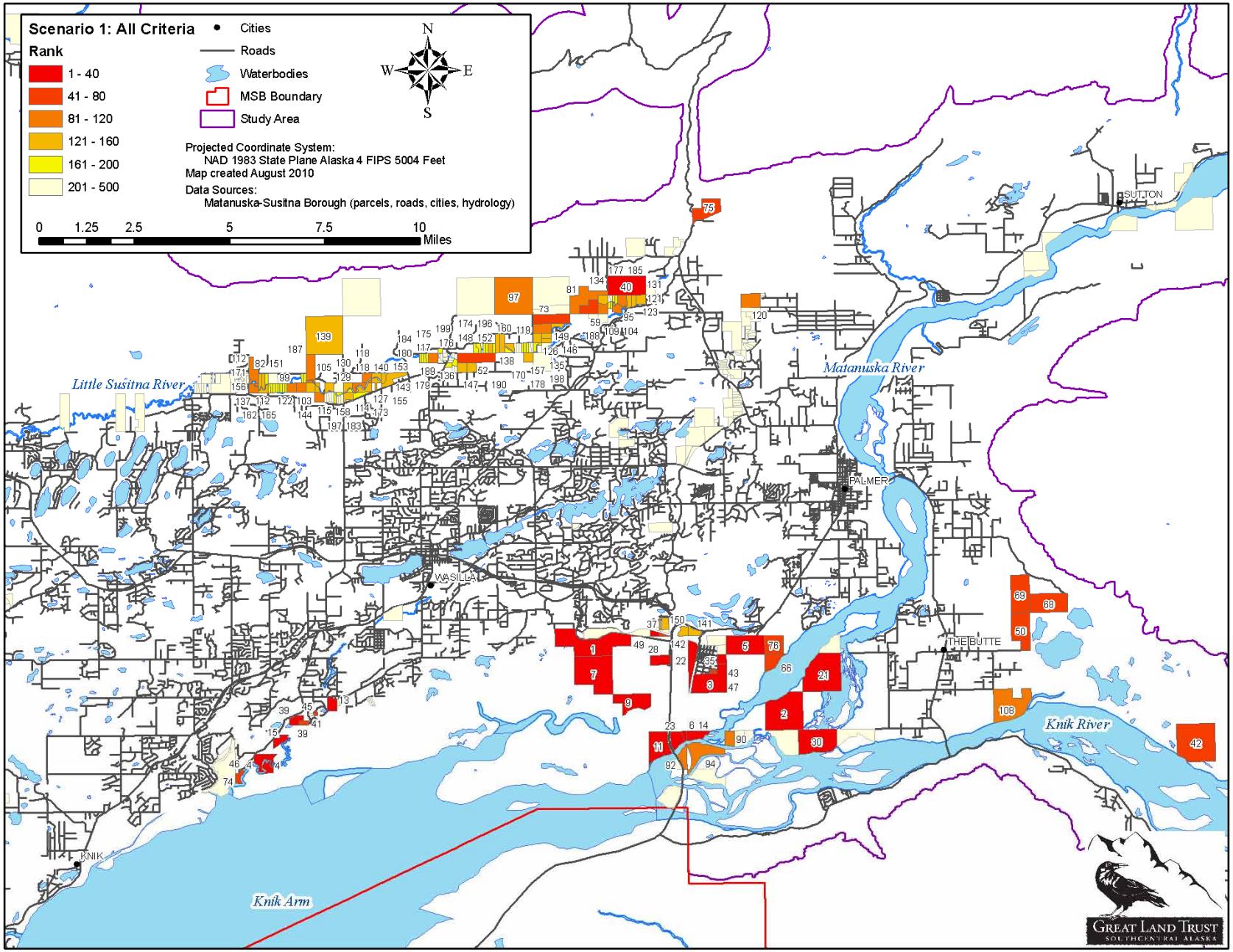
Map 16. Subset B of Scenario 1 Map.



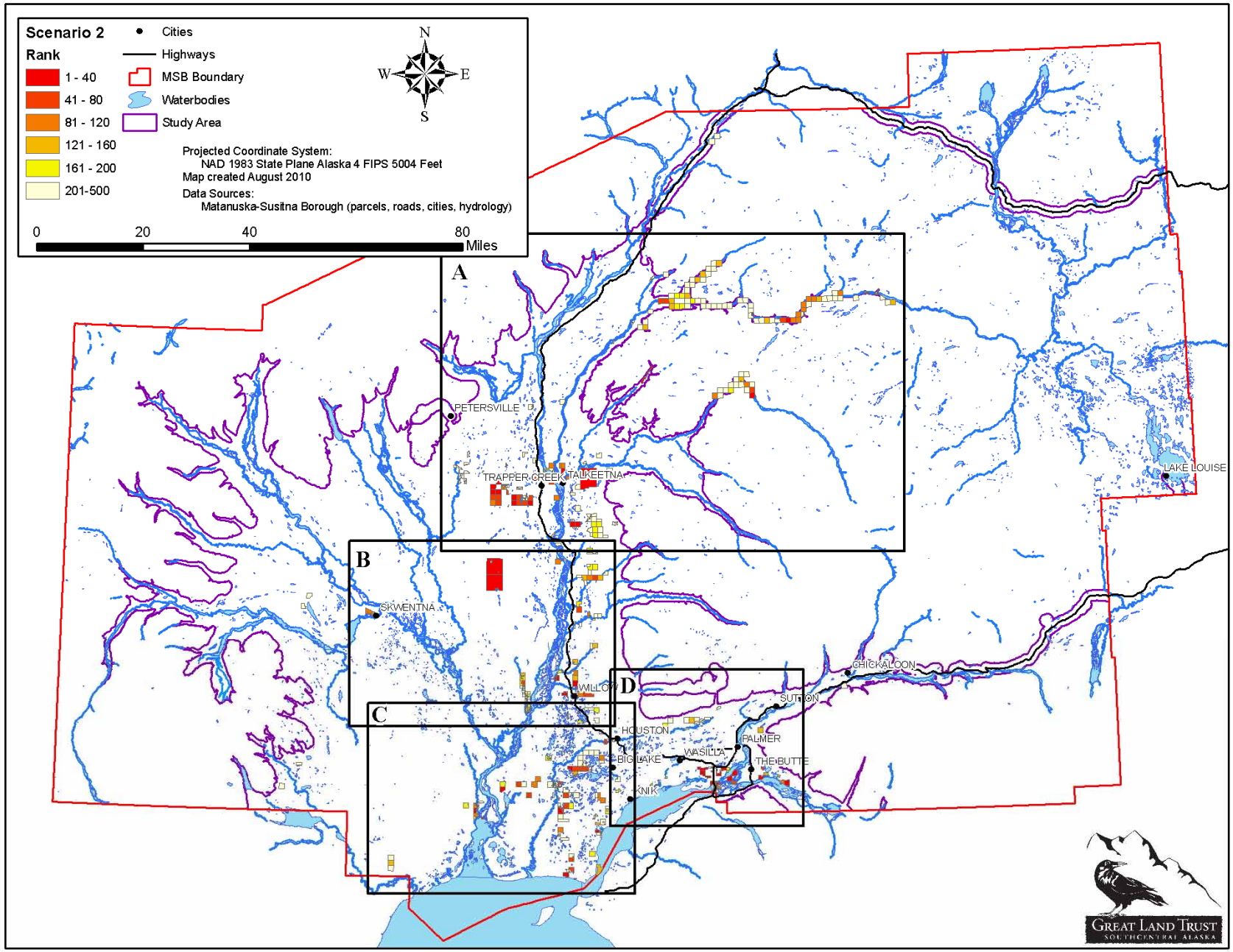
Map 17. Subset C of Scenario 1 Map.



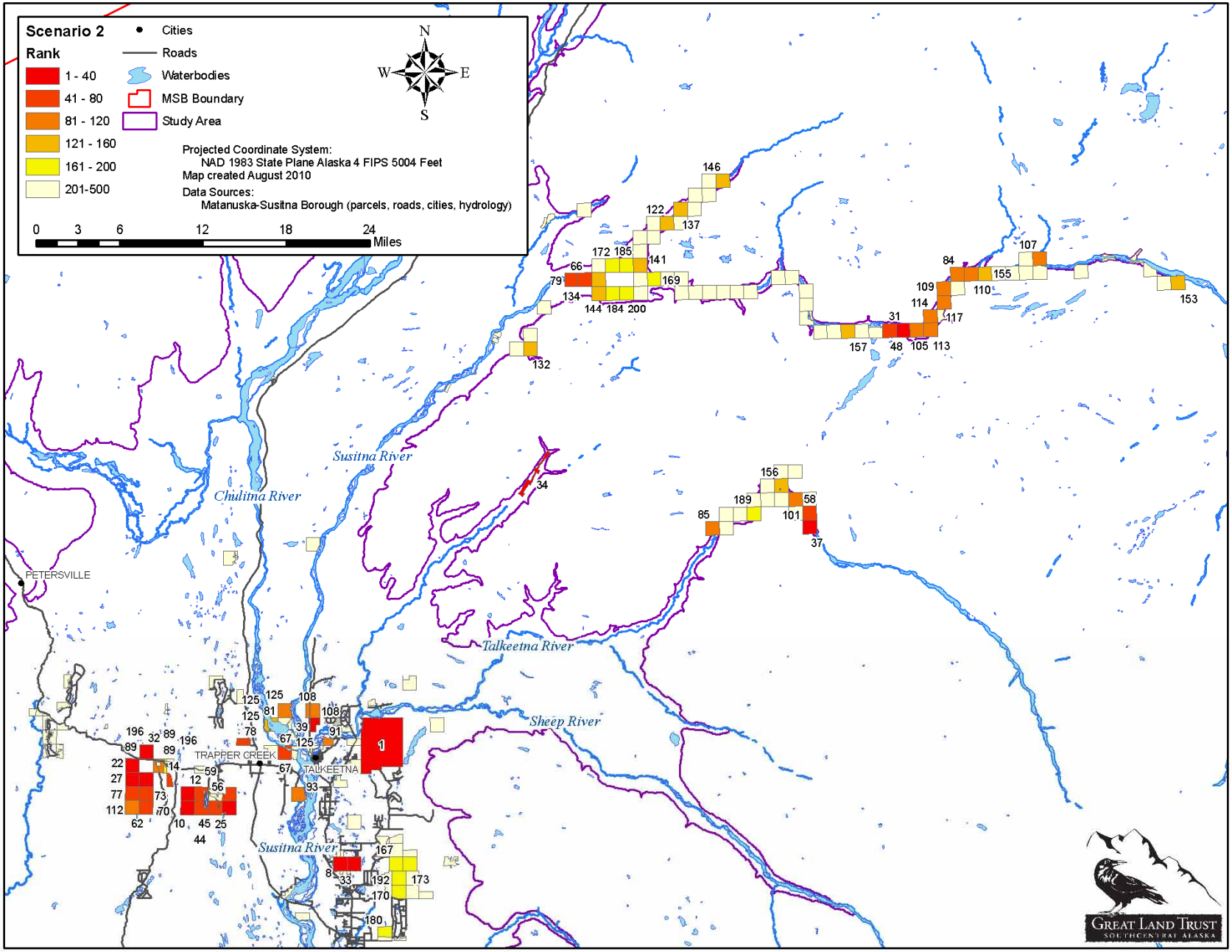
Map 18. Subset D of Scenario 1 Map.



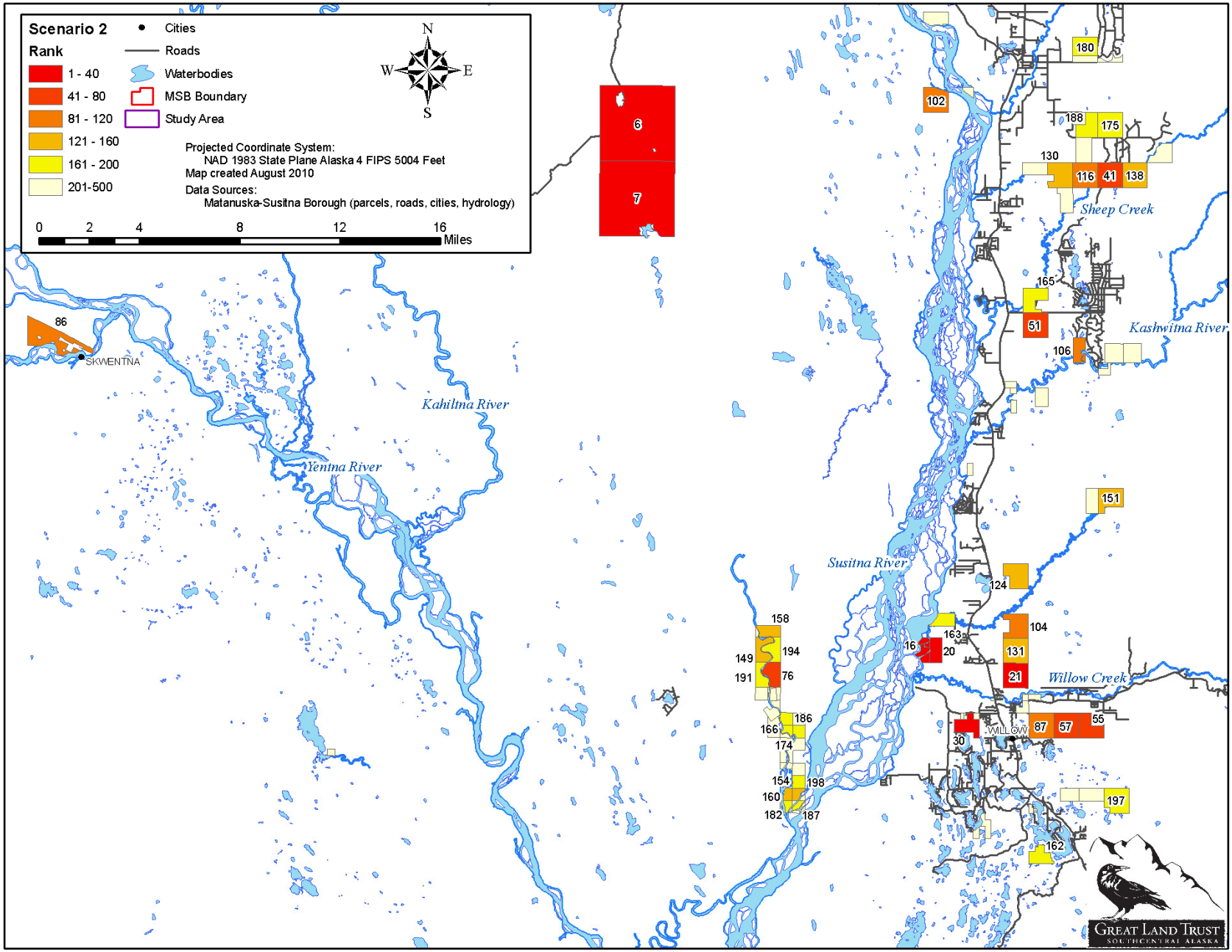
Map 19. Scenario 2: Overview Map of Top 500 Parcels for the Whole Mat-Su Borough.



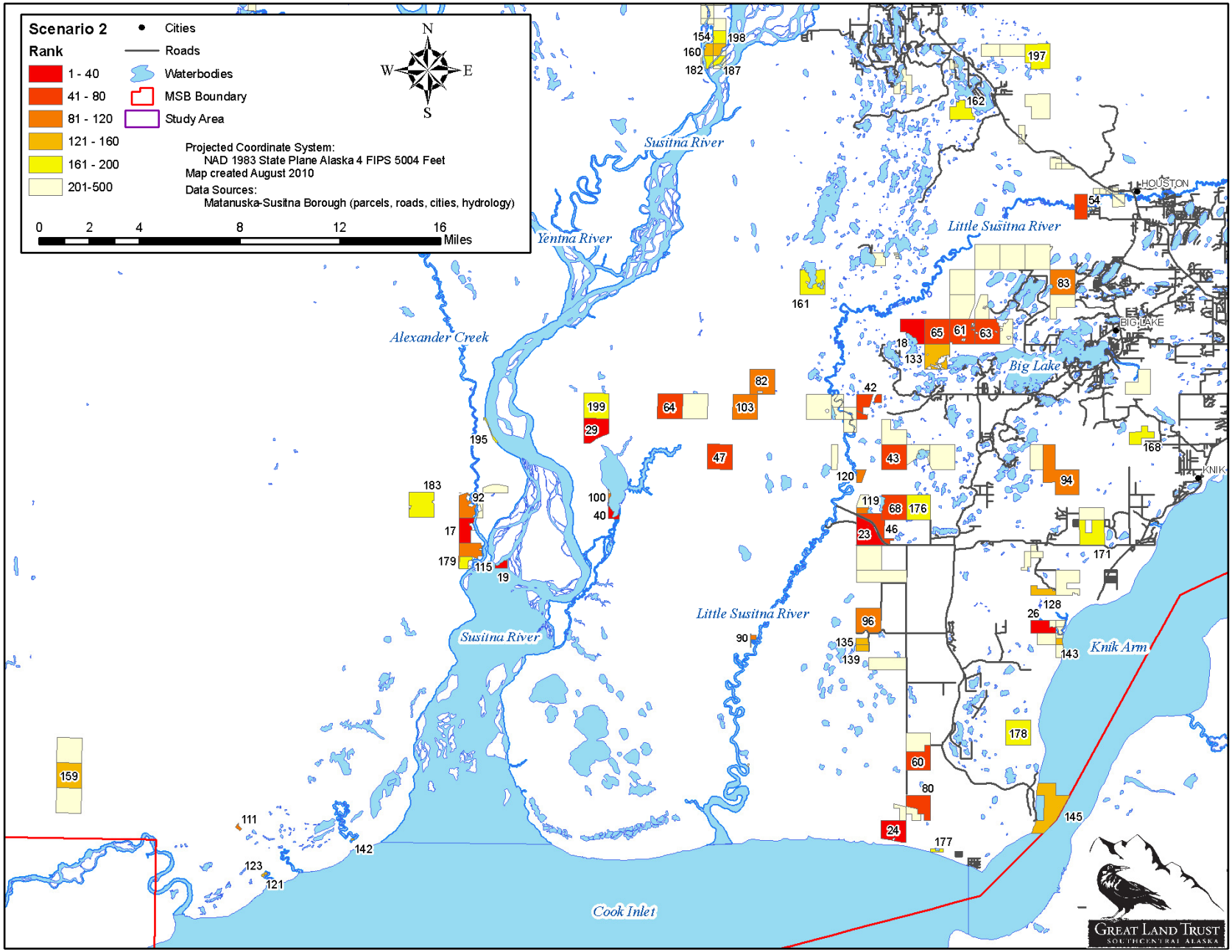
Map 20. Subset A of Scenario 2 Map.



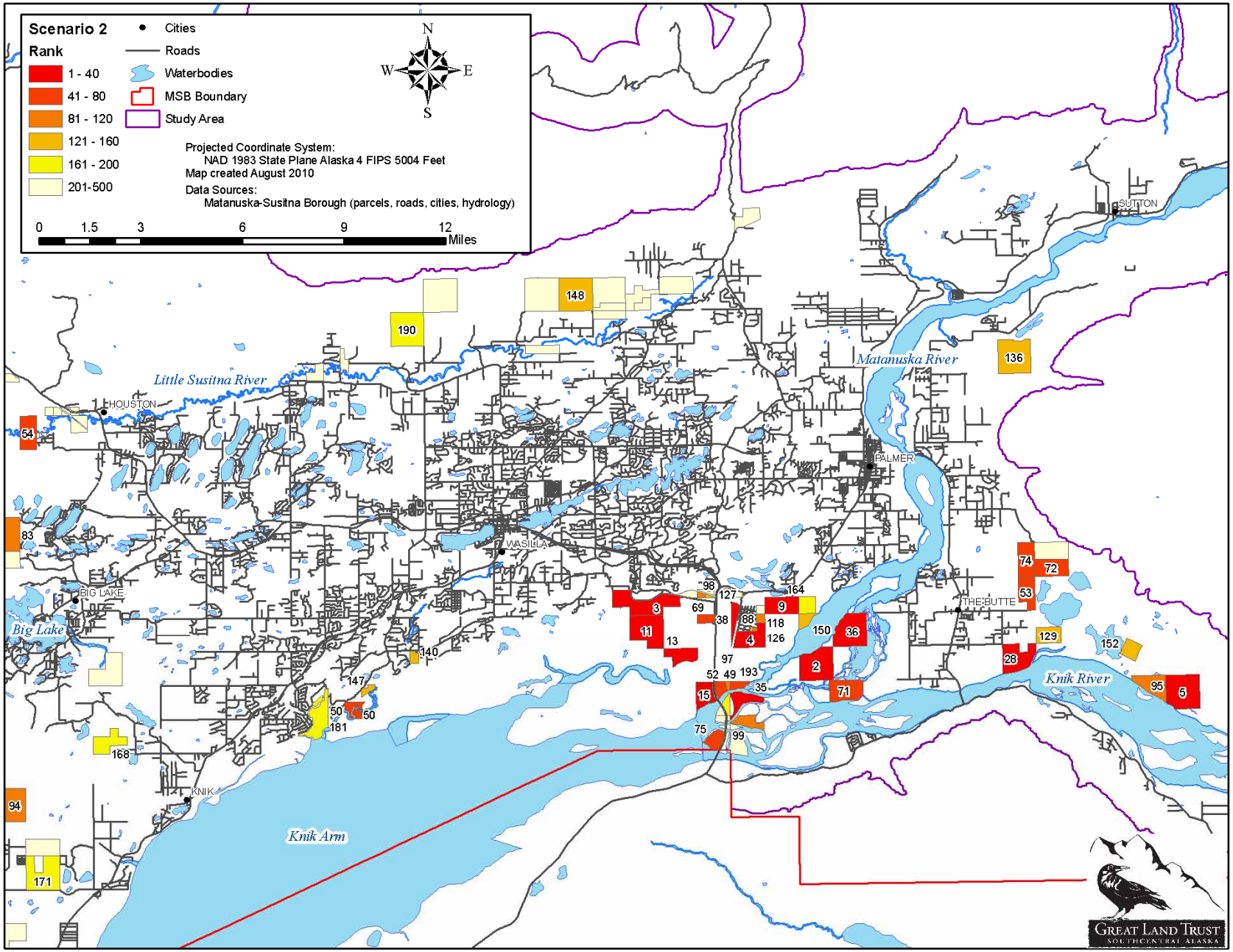
Map 21. Subset B of Scenario 2 Map.



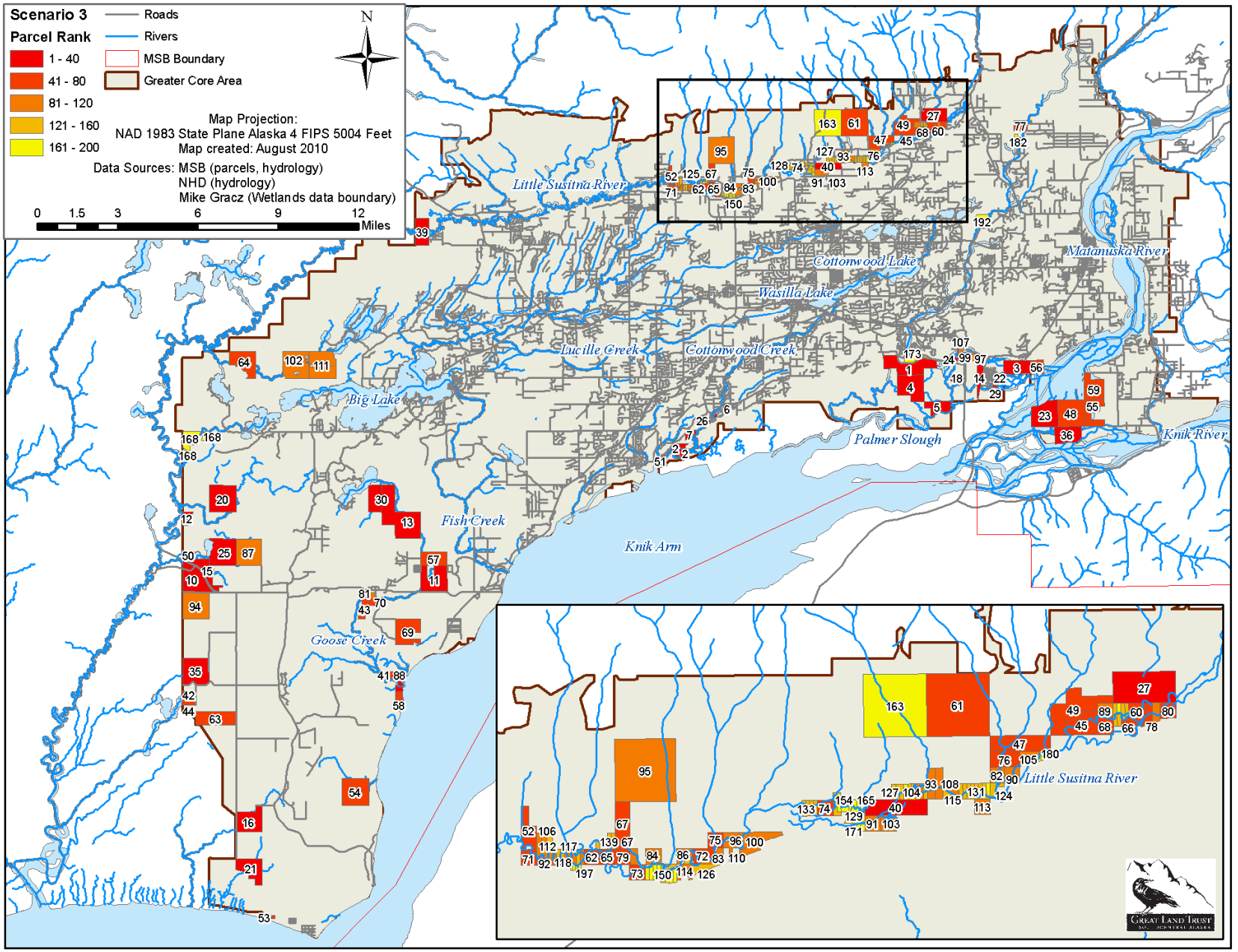
Map 22. Subset C of Scenario 2 Map.



Map 23. Subset D of Scenario 2 Map.



Map 24. Scenario 3: Overview Map of Top 200 Parcels for the Greater Core Area.



Appendix B. Parcel Summary Tables

Parcel summary tables for all three scenarios are available upon request in the form of Microsoft Excel worksheets. Parcels are identified by tax ID, acreage and ownership type. In addition to their final score and ranking for each scenario, how each parcel scored for all conservation criteria is also included.

Appendix C. Project Contacts

Name	Telephone	Email	Title
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Alaska Department of Fish and Game			
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Farmland Trust			
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The Nature Conservancy			
Corinne Smith Marcus Geist	276-3133 x121 276-3133 x102	corinne_smith@tnc.org mgeist@tnc.org	Mat-Su Basin Program Director GIS Specialist
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David Wigglesworth Maureen deZeeuw Theresa Tanner William Rice Julie Michaelson	271-3764 271-2777 271-1799 271-1798 786-3675	David_Wigglesworth@fws.gov Maureen_deZeeuw@fws.gov Theresa_Tanner@fws.gov William_Rice@fws.gov Julie_Michaelson@fws.gov	 Biologist Hydrologist Assistant Wetlands Coordinator

Appendix D. Detailed GIS Methods

Detailed methods, documenting all operations and changes are available upon request. This document outlines how data for each criterion was changed and utilized to arrive at the final useable form as well as how this finalized version was used to select and score parcels. In addition to documenting the ArcGIS tools used in this prioritization, it also details all the file names of final shapefiles as well as intermediate steps.