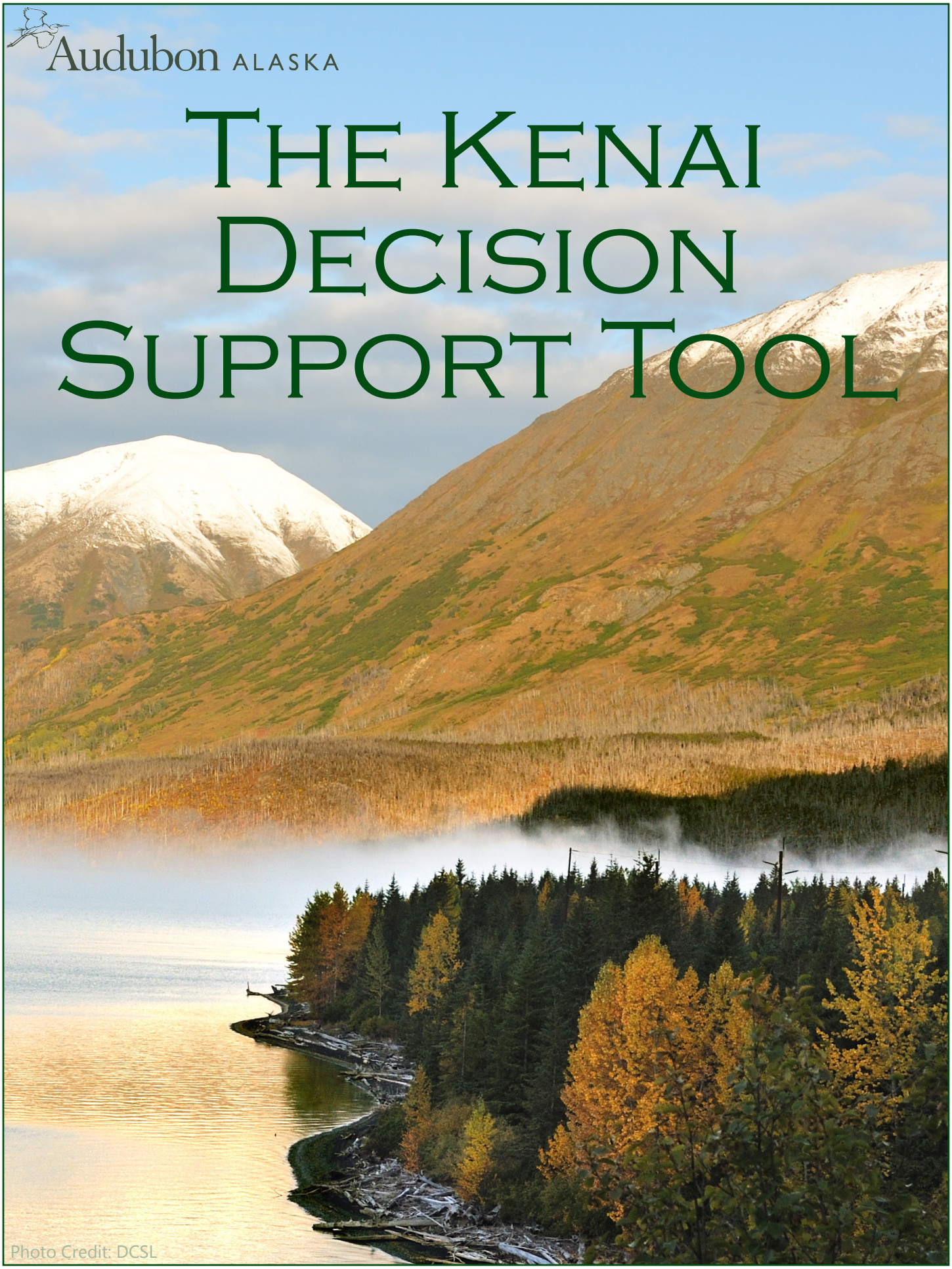
Audubon ALASKA

The Kenai Decision Support Tool



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The Kenai Decision Support Tool User Manual

Version: January 8, 2014

In Cooperation With

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Introduction

The Kenai Peninsula Lowlands, including the western third of the Kenai Peninsula, is an important area for many species of birds, fish, and other wildlife. It is also one of the more rapidly developing areas of the state, with a human population of 53,000 growing at 2.2% per year. There are 238,800 acres of private lands divided into 55,000 parcels on which 1.5 new housing units are being added each day. Increasing urbanization and habitat fragmentation is leading to heightened conflicts between humans and wildlife, and loss of habitat value. Road and home building, groundwater withdrawal, logging practices and recreational activities are all having an increased impact.

Land trusts, other conservation groups, federal agencies, and municipal groups all work to mitigate the effects of this development on the important natural resources of the Kenai Peninsula. This work requires organizations to make decisions: which areas are the most important for different projects, where should they devote their time and money, what are the advantages and disadvantages of different parcels they are considering for purchase? These are difficult decisions, which require both large amounts of data, and an efficient method for making use of these data.

To assist with this, in June of 2012, Audubon Alaska began developing a web-based tool to help organizations with this kind of decision-making, and to improve the speed and efficiency with which an organization can identify priority areas for different species or resources. This allows for greater flexibility and responsiveness within a single organization, and greater collaboration between groups, which can now discuss their different priorities within the context of a shared framework.

Introduction

This project began with the collection and creation of over 100 resource data types relevant to the Kenai Peninsula. We then worked with our partners in this area to identify the most essential layers: the natural resource, boundary, and infrastructure data most useful for decision-making in this region. Finally we began development of a web-based tool that would allow our partners to set priorities dynamically in order to identify the most important places in the Kenai for any combination of values. Throughout this process, we have worked with our partners to ensure that this tool would be relevant and useful to their work on the peninsula.

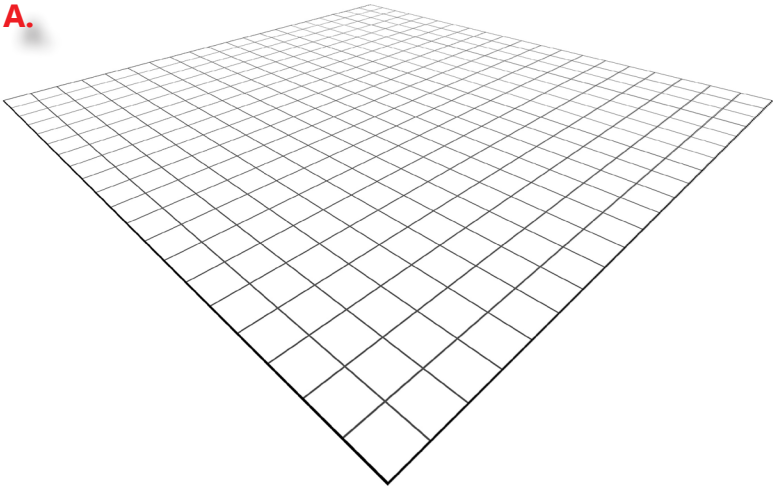
The primary scales of this tool (the areas being evaluated) are the watershed and subwatershed level. Additional capabilities have also been built into the tool allowing decision makers to identify land parcels of interest within high priority watersheds. Additionally, this tool has been designed to work in two directions, either by starting from the entire region and identifying a small number of watersheds or parcels, or by starting from a previously identified parcel or watershed, and querying the resource values of this area.

This entire tool has been built into a web interface, to simplify access to a wider range of decision-makers. It is our hope that this tool will be broadly useful for a wide variety of conservation work and land planning on the Kenai Peninsula.

This user manual is intended, first to give a broad overview of the methods being used in the tool, followed by a specific description of how to use the tool. Finally, it offers detailed information on all the data layers being used in the tool.

We would like to thank our funders for this project: the U.S. Fish and Wildlife Service Alaska Coastal Program - Southcentral, and the Bullitt Foundation. We would also like to thank the following groups for providing data and other assistance with this project: the Alaska Department of Fish and Game, the Alaska Department of Natural Resources, the Alaska Natural Heritage Program, Cook Inletkeeper, the Environmental Protection Agency, the Homer Soil and Water Conservation District, the Kachemak Heritage Land Trust, the Kenai National Wildlife Refuge, the Kenai Peninsula Borough, the Kenai Watershed Forum, the Natural Resources Conservation Service, the U.S. Fish and Wildlife Service, and the U.S. Geological Survey.

A.



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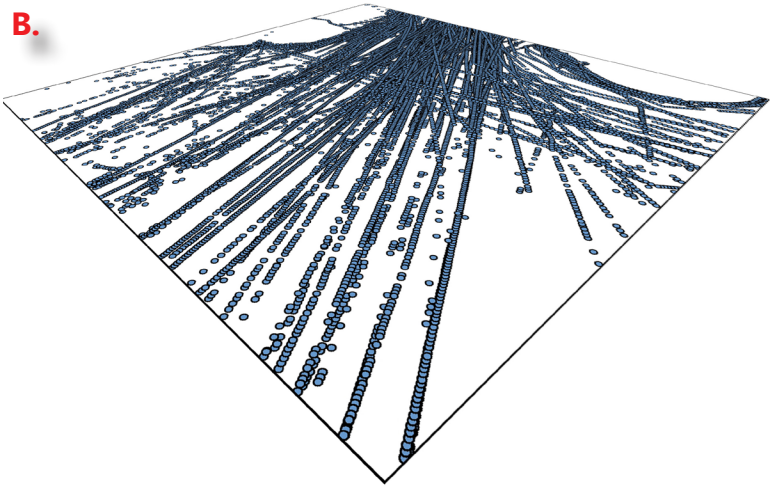

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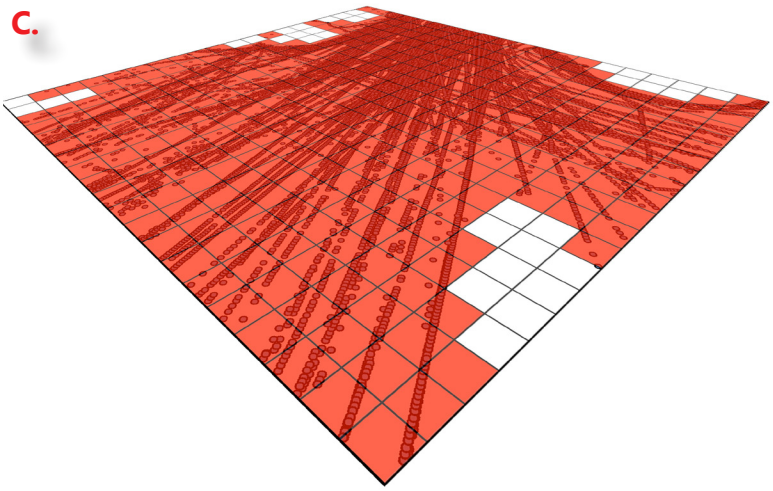

Decision-Making With Spatial Data: Presence/Absence

There are many ways of making decisions using spatial data, but all require, at a minimum, two elements: an area being evaluated, and data to evaluate it with. As a simple example here, we have a grid (Figure A), and some point data (Figure B).

If we wanted to evaluate these grid cells, the easiest way would be using presence/absence. In Figure C, the cells that have points within them are represented in red, while those without are white.

In many situations, this may be all the information that is required. For example, we might want to know whether a parcel of land intersects a stream, or whether a watershed is known to contain salmon habitat. These are simple yes/no questions that could be answered easily using spatial analysis.

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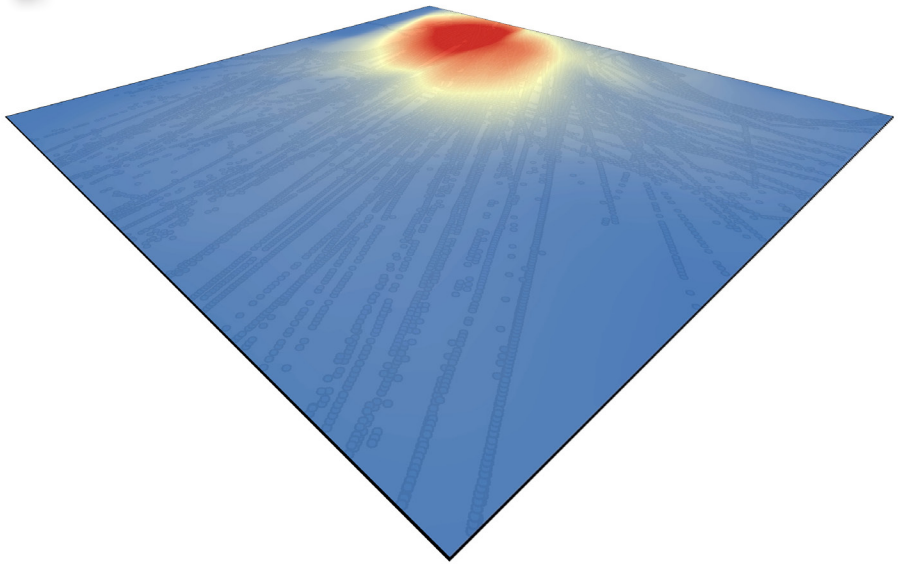
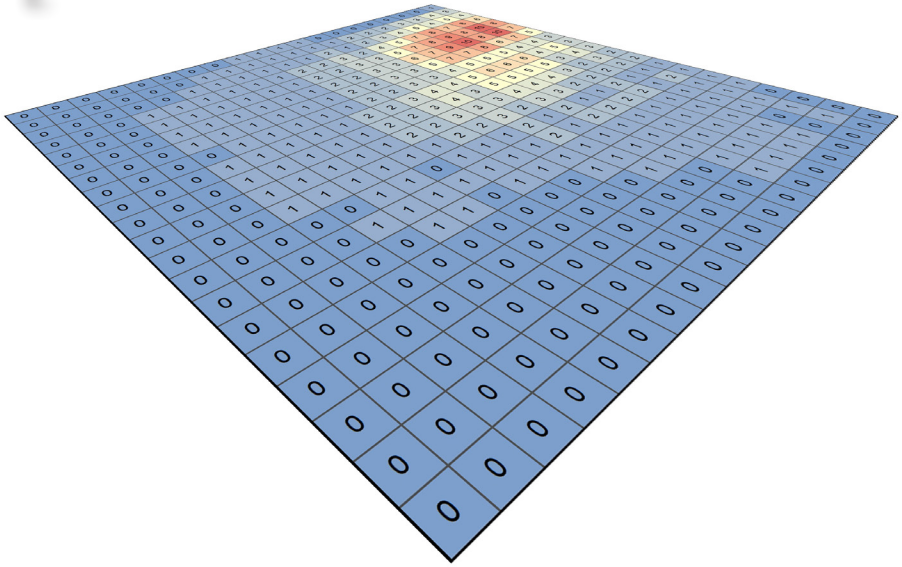


E.

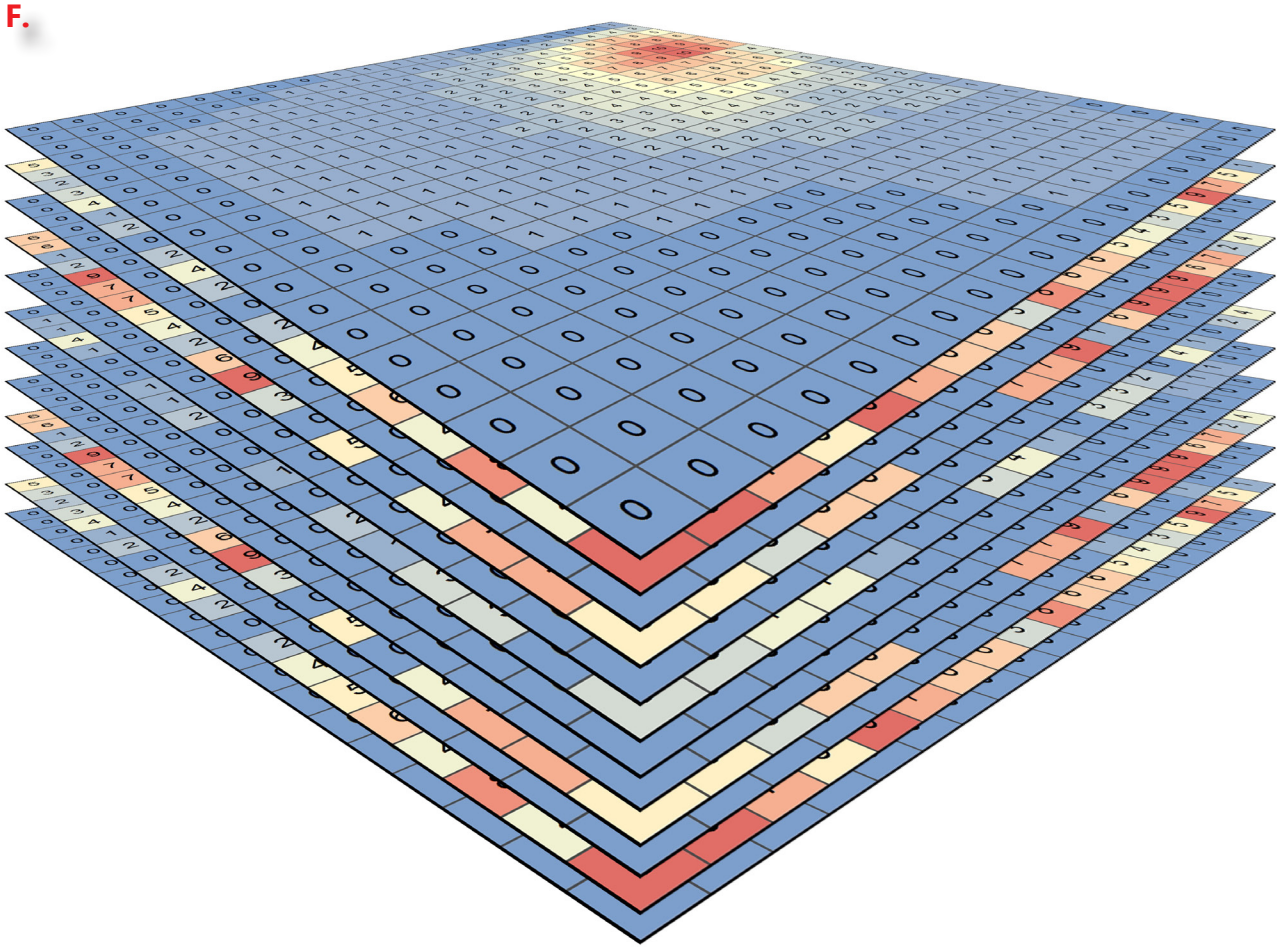


Decision-Making With Spatial Data: Density/Abundance

In the next example, it is not merely the presence or absence of sandhill cranes that is of interest; we want to know how the abundance of cranes in one area compares with the abundance in another. For example, we might create a density map of sandhill crane observations (Figure D), where the red areas represent locations with many cranes, and the blue areas represent locations with few or none.

The next step would then be to convert these values to a format more conducive to decision-making. We do this first by overlaying a grid and averaging the crane density within each grid cell. Next, because a density of 22.21 cranes/sq km is not readily useful for decision-making, we convert this to a standardized scale (shown on Figure E, a scale from 0 to 100, where a 100 represents the grid cells with the highest density, and 0 the lowest). This type of scoring system makes it easier to identify high-priority areas for conservation work, for a particular species or resource.

F.



Decision-Making With Spatial Data: Multiple-Resource Evaluation

On many occasions, we don't only want to find the grid cells with the most sandhill cranes, but also the ones with the most salmon, wetlands, and watchlist birds. Figure F shows an example of this: note that cells with high values (in red) for one resource might correspond to low values (in blue) for another resource.

In cases like this, choosing the best area becomes more complicated. We could simply add up all the values corresponding to each cell. On the other hand, we might decide that we care much more about the rating of an area for salmon than the rating for cranes; in this case, we might want to give double weight to our scores for salmon, so that the result will prioritize resources that we value more highly.

One solution to this is to assign weights to the different layers, and score them accordingly. For example, we might decide that 50% of our score should come from salmon habitat, 30% from crane habitat, and 10% each from wetlands and watchlist birds. We would then apply those weights to the scores, such that a high score for salmon would influence our final decision five times as much as a high score for wetlands (Figure G).

G.

Resource	Score ×	Weight =	Adjusted Score
Salmon	9	25%	2.25
Crane	7	25%	1.75
Wetlands	1	25%	0.25
Watchlist Birds	3	25%	0.75
Sum of Adjusted Scores			**5**

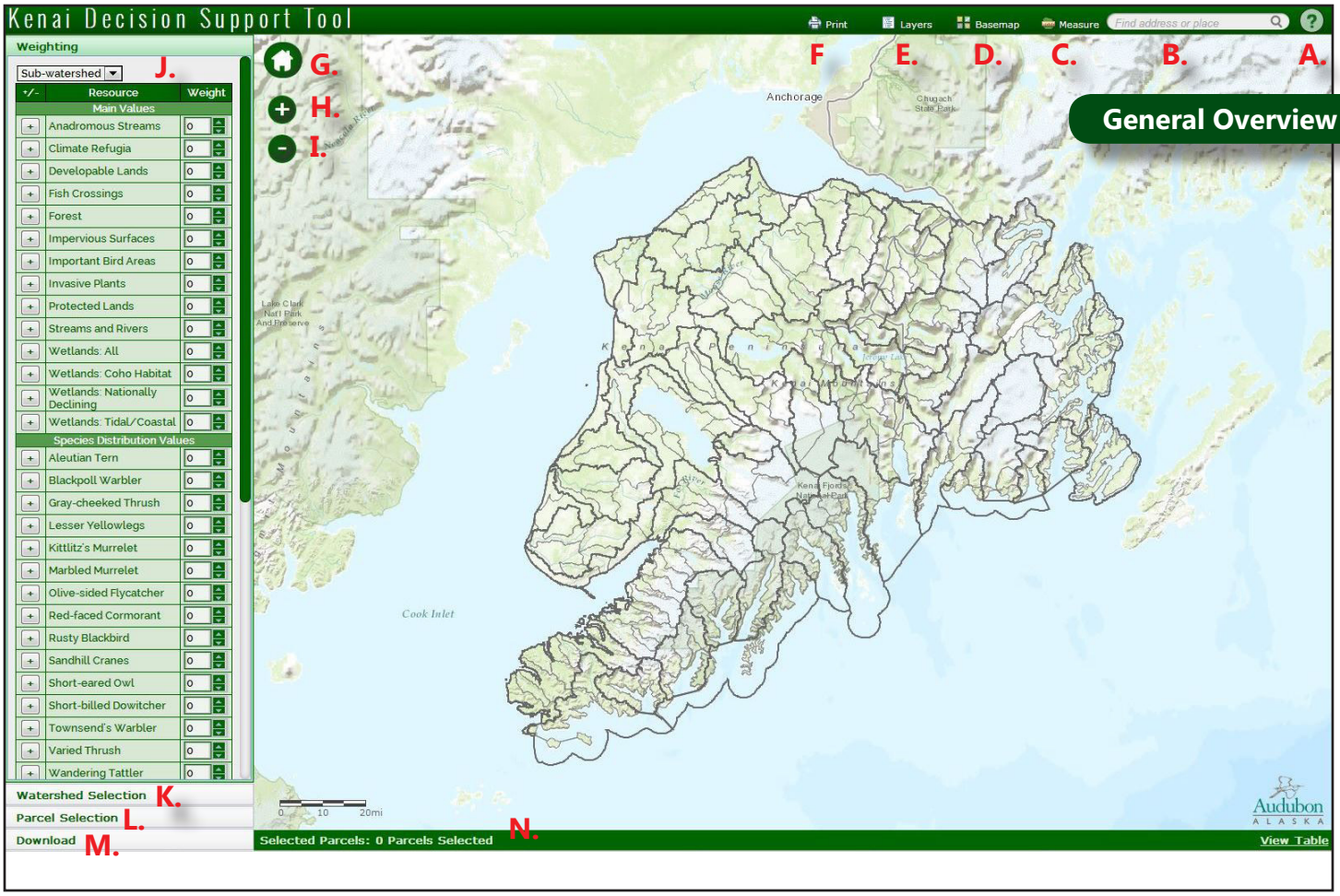
Resource	Score ×	Weight =	Adjusted Score
Salmon	9	50%	4.5
Crane	7	30%	2.1
Wetlands	1	10%	0.1
Watchlist Birds	3	10%	0.3
Sum of Adjusted Scores			**7**

Decision-Making With Spatial Data: Setting Priorities

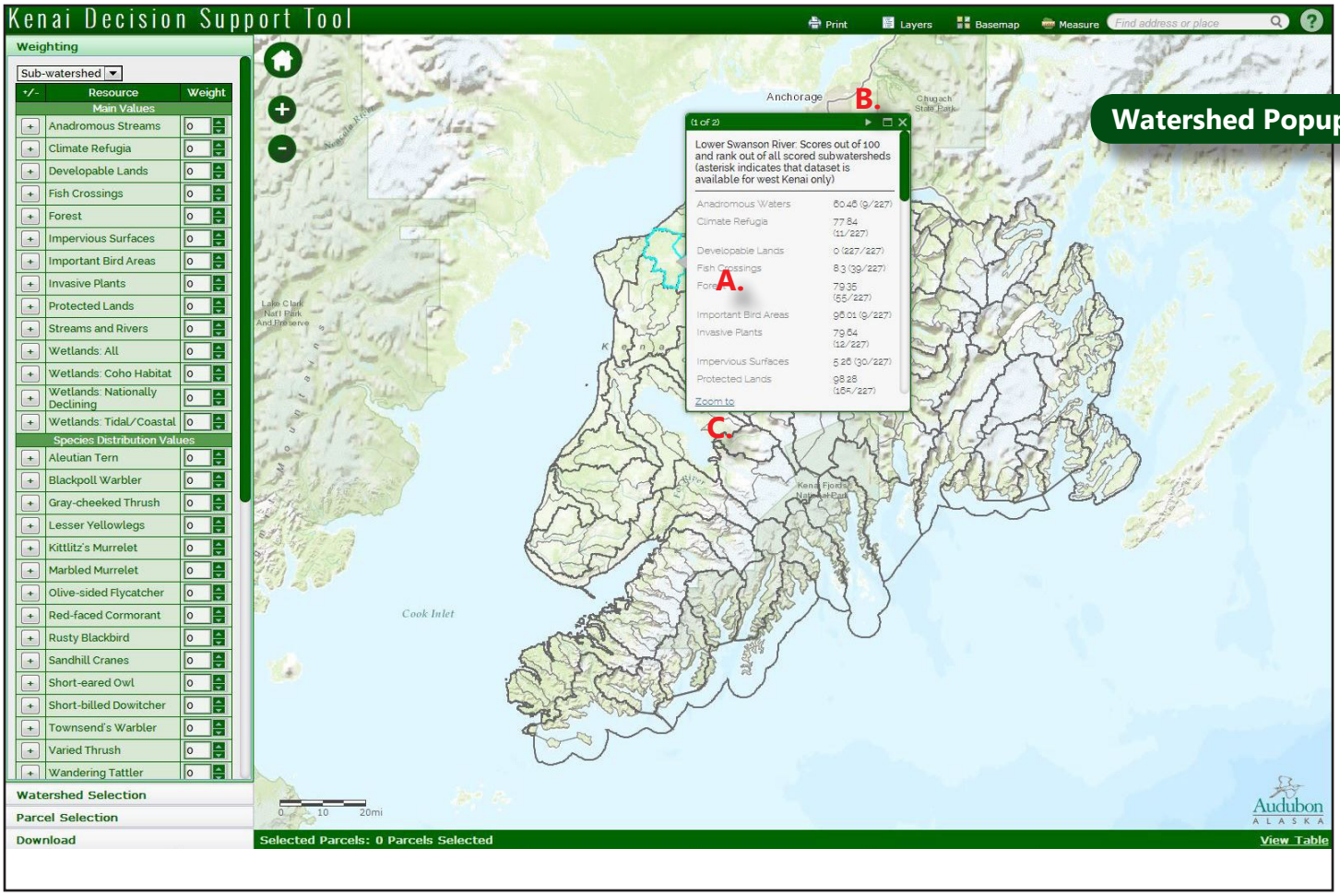
Figure G gives an example of how different weights might be assigned to a grid cell, and how the same area receives a different rating depending on how the weights are set. This makes the setting of these weights one of the most essential elements for any prioritization process. These weights can be selected based on discussion between partner organizations and other researchers, or they may be set by a single individual, through experimentation with the results given by different weights.

In either case, the process can be sped up considerably though the use of a tool. A decision support tool improves collaboration by allowing different groups to come up with their own recommended weights independently, then combine these together following discussions between groups. Alternately, it allows a single individual or organization to experiment between a wide range of alternatives, to see which areas are highlighted based on a variety of input weights.

The tool we developed, described in the following pages, follows the basic methods described above, but allows users to complete this kind of prioritization in a much faster and more effective manner. The following pages will walk through the steps in using the tool, from setting weights and identifying priority watersheds, to finding priority parcels in these watersheds, and downloading the results.

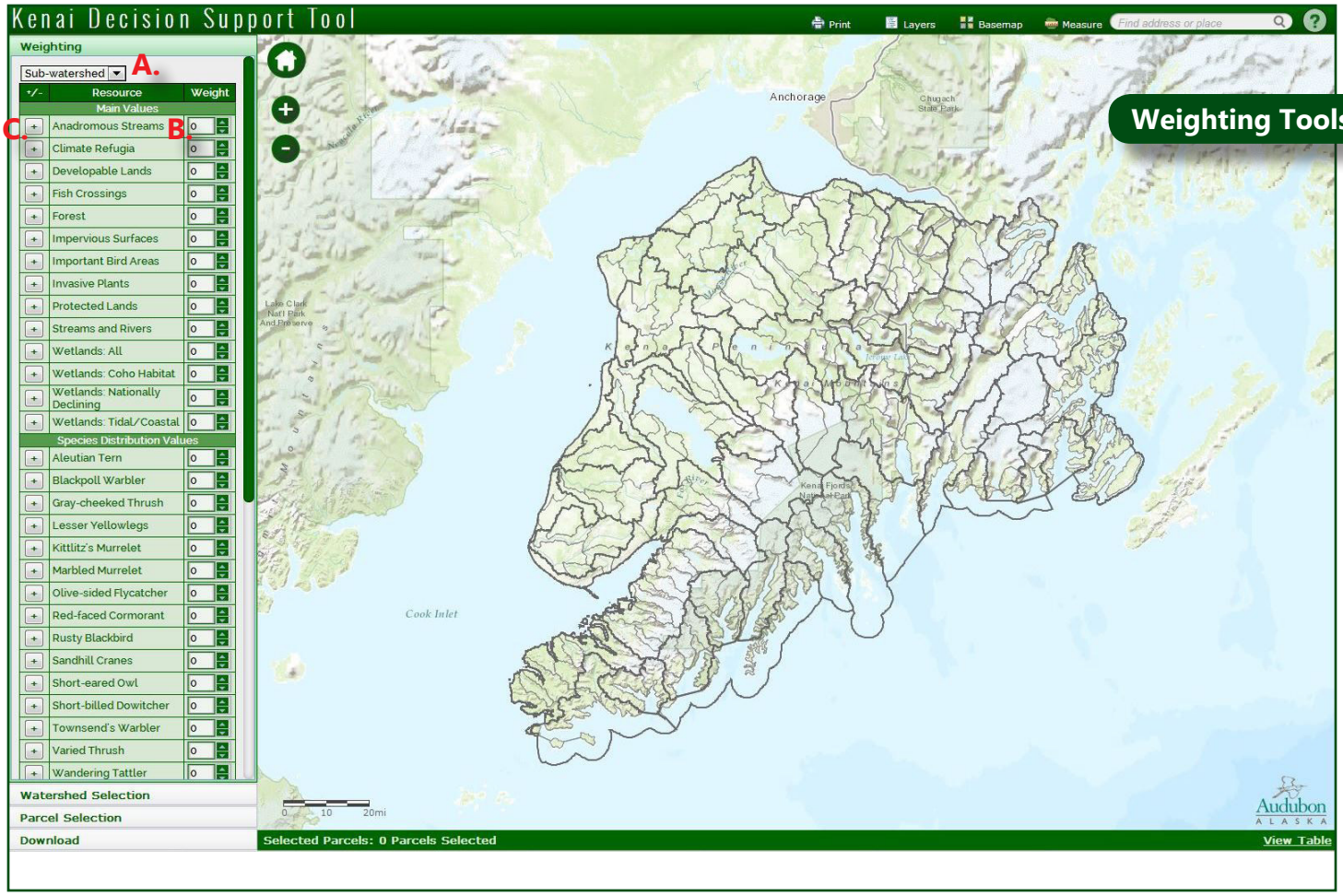


Letter	Tool Name	Tool Purpose
A	Help	Open the user manual.
B	Location Search	Type an address or place in this box to zoom to that location.
C	Measure	Measure a line or area, or find the coordinates of a point.
D	Basemap	Change the background (for example to satellite imagery, street maps, etc.).
E	Layers	Turn supporting data layers on and off.
F	Print	Export map as jpeg or pdf for printing.
G	Zoom Home	Zoom to original map extent.
H	Zoom In	Zoom in (may also be done using your mousewheel, or by shift-clicking and dragging).
I	Zoom Out	Zoom out (may also be done using your mousewheel).
J	Weighting	Change weight given to each value being considered, summarized by watershed or subwatershed (see pages 9-11).
K	Watershed Selection	Select watersheds based on scores, ranks, or names (see page 12).
L	Parcel Selection	Select parcels using watershed scores or parcel attributes (see pages 13-14).
M	Download	Download identified watersheds and parcels (see page 17).
N	Parcel Table	View attributes for selected parcels (see pages 15-16).

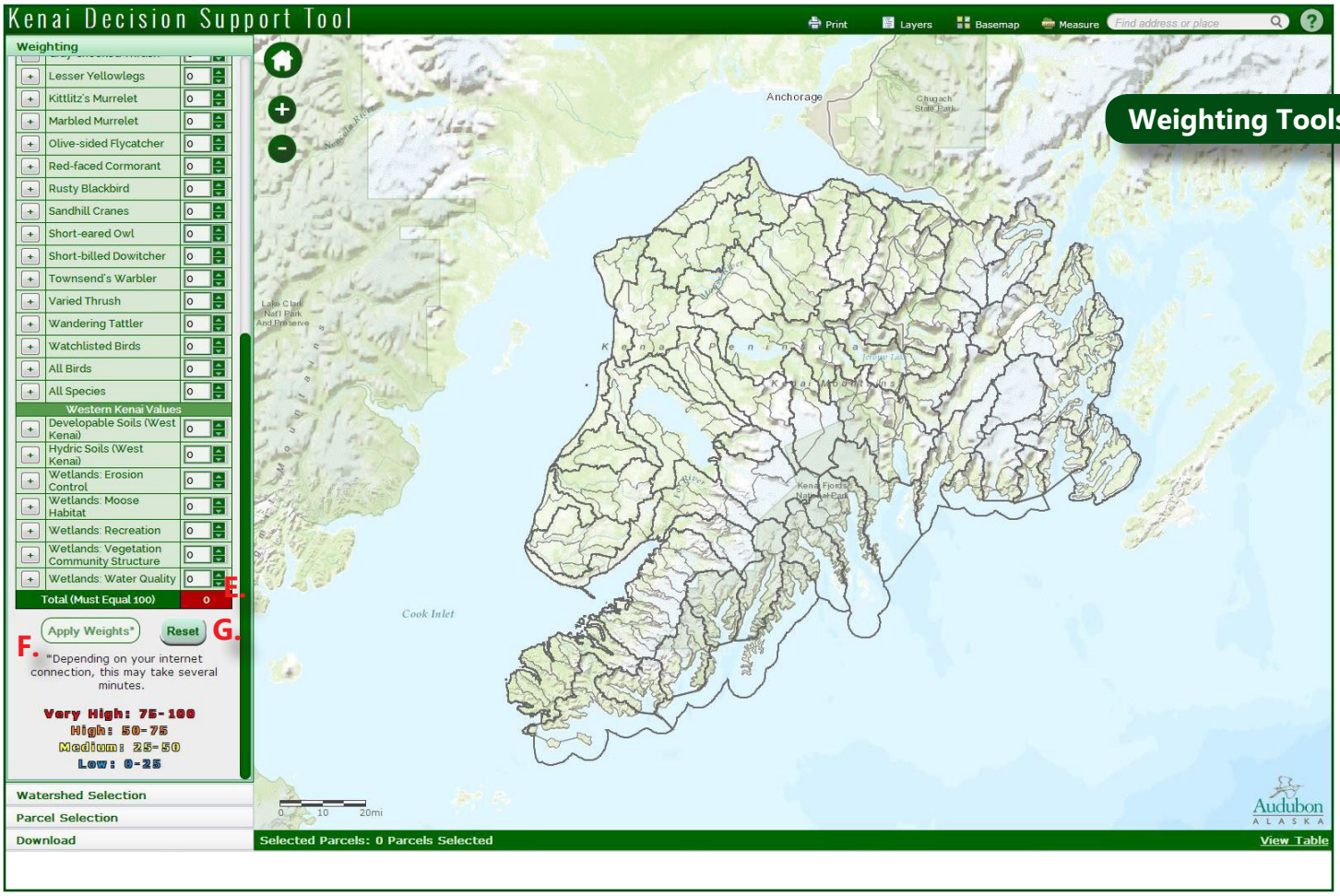


Watershed Popup

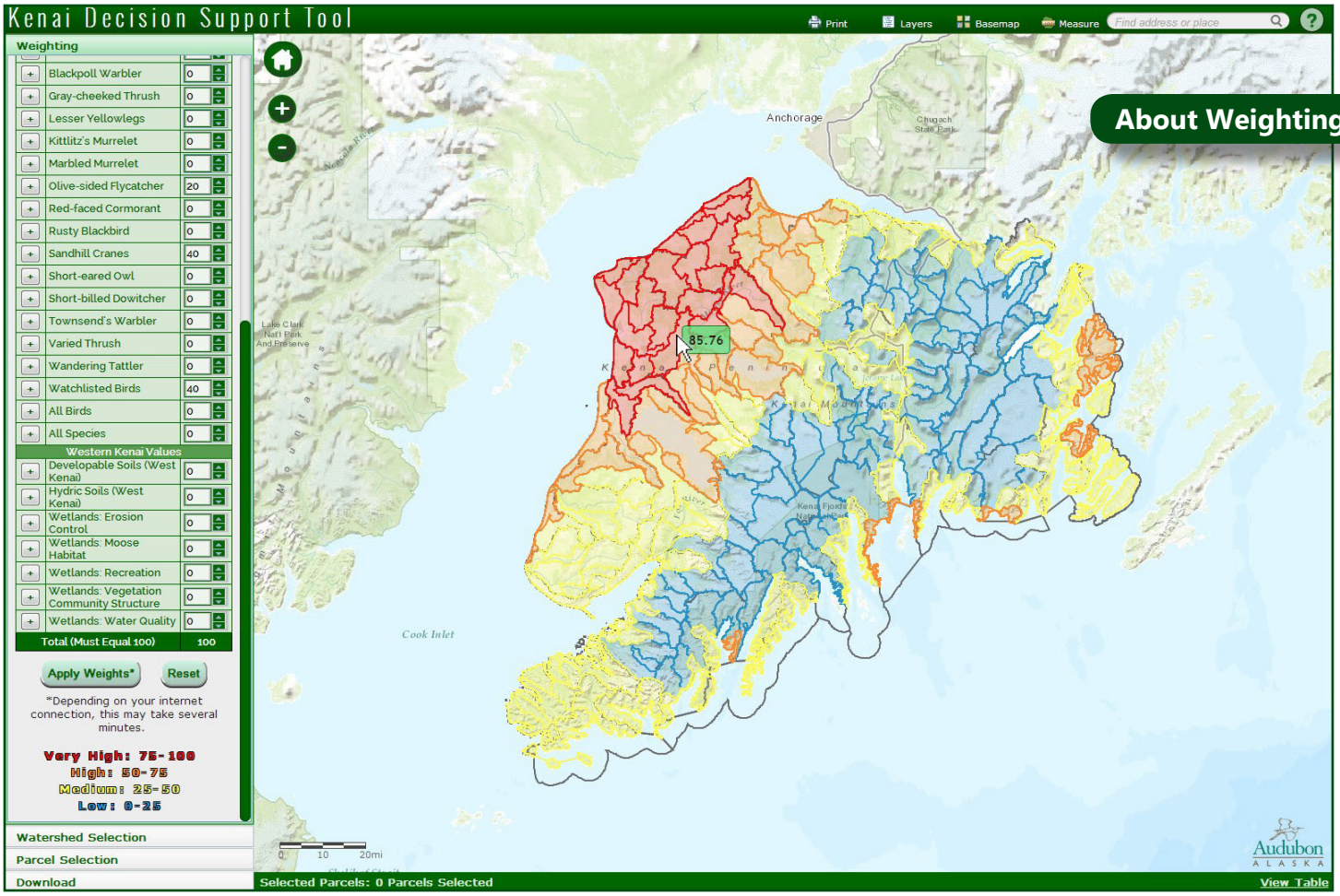
Letter	Tool Name	Tool Purpose
A	Popup	Click on a watershed to bring up a popup with information about that area. This includes the name of the watershed, and its score and rank for a variety of different resource values. For example, the Lower Swanson River subwatershed (shown above) has a score of 60.47 out of 100 on 'anadromous waters', which gives it a rank of 9 out of 227 subwatersheds (that is, there are only eight subwatersheds with a higher density of anadromous waters). Scores for each resource are shown here on a scale from 0 to 100, where 100 equals the highest recorded value for that resource, and 0 is the lowest. Some of the supporting layers in the layers menu also have popups available, giving more information on these features.
B	Next/Previous Arrows	For overlapping features, click on the right arrow to proceed to the next feature (for example, from watershed to subwatershed). Click on the back arrow to go to the previous feature.
C	Zoom To	Zoom to selected watershed/subwatershed.



Letter	Tool Name	Tool Purpose
A	Analysis Scale	Set scale of resource weighting to (5th level) watersheds or (6th level) subwatersheds.
B	Resource Weight	Use this to apply weights to resources of interest, out of a total of 100. For example, to set 100% of the weight on Important Bird Areas, you would enter '100' in the IBA field: see page 11 for more information on setting weights.
C	Positive/ Negative Weight	Use this to invert the weights applied. For example, if you wanted to identify watersheds without developed impervious surfaces, you could set the weight for Impervious Surfaces to '100,' then click on this icon. The '+' icon indicates that watersheds containing the resource will be prioritized; the '-' icon indicates that watersheds lacking the resource will be prioritized.



Letter	Tool Name	Tool Purpose
E	Total Weight	This indicates the total of the weights entered; this number must equal 100 before you can proceed.
F	Apply Weights	This applies the weights at the selected scale. It may take several minutes for the watersheds to complete drawing, depending on your internet connection.
G	Reset	Reset all values to defaults.



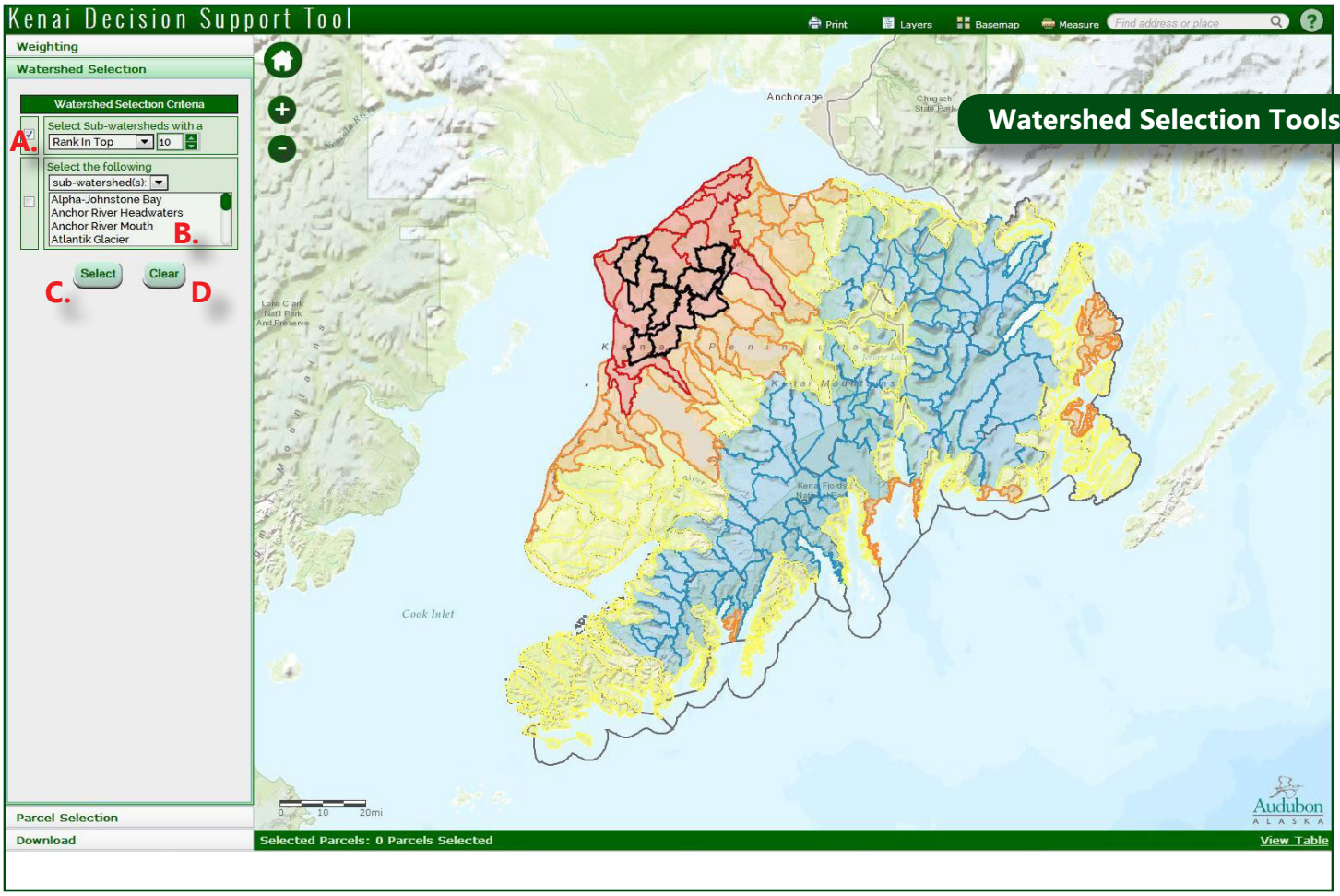
Color	Score
Red	75-100
Orange	50-74
Yellow	25-49
Blue	0-24

Watershed Prioritization

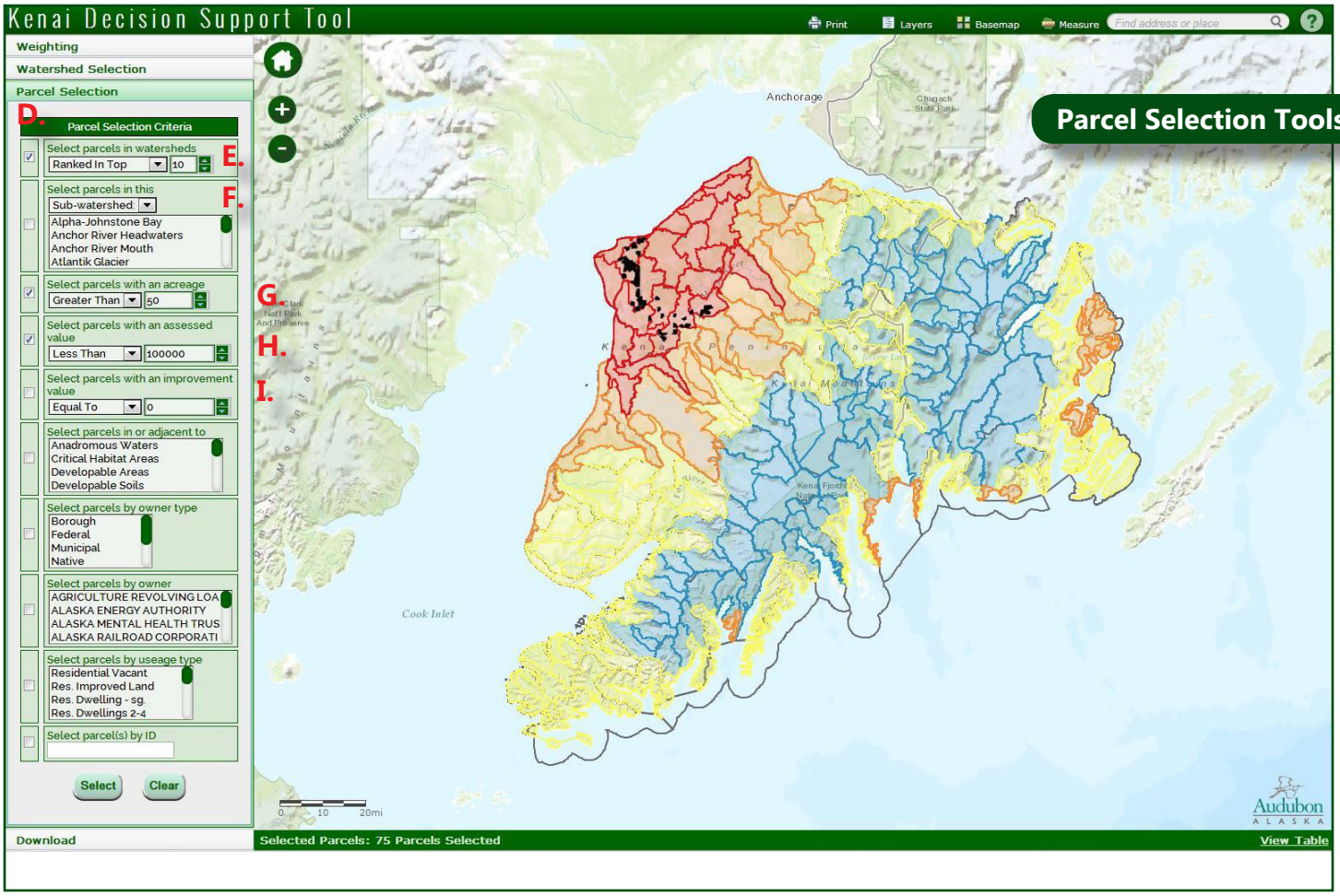
To start, each watershed is scored from 0 to 100 on each of 39 resources. For example, if all watersheds have between 20 and 60 km of streams, the watershed with 20 km of streams would be given a 0, the watershed with 60 km would be given a 100, and a watershed with 40 km (halfway between 20 and 60) would be given a 50. Likewise, watersheds are scored on total area of wetlands, total value of sandhill crane habitat (added up across all pixels, by watershed), etc. Using these 0-100 scores for each of the 39 resources, we then multiply each of these scores by the user-entered weights.

For example, if 50% of the weight was assigned to Important Bird Areas (IBAs) and 50% to sandhill cranes, and a watershed had a value of 86 for IBAs and a value of 32 for sandhill cranes, then (86 × 0.5) + (32 × 0.5) = 59. This watershed would therefore be assigned a score of 59, and would be colored in orange on the map. On the other hand, if we give 80% of the weight to IBAs and 20% to sandhill cranes, then (86 × 0.8) + (32 × 0.2) = 75.2 for the final score, giving that watershed the color red.

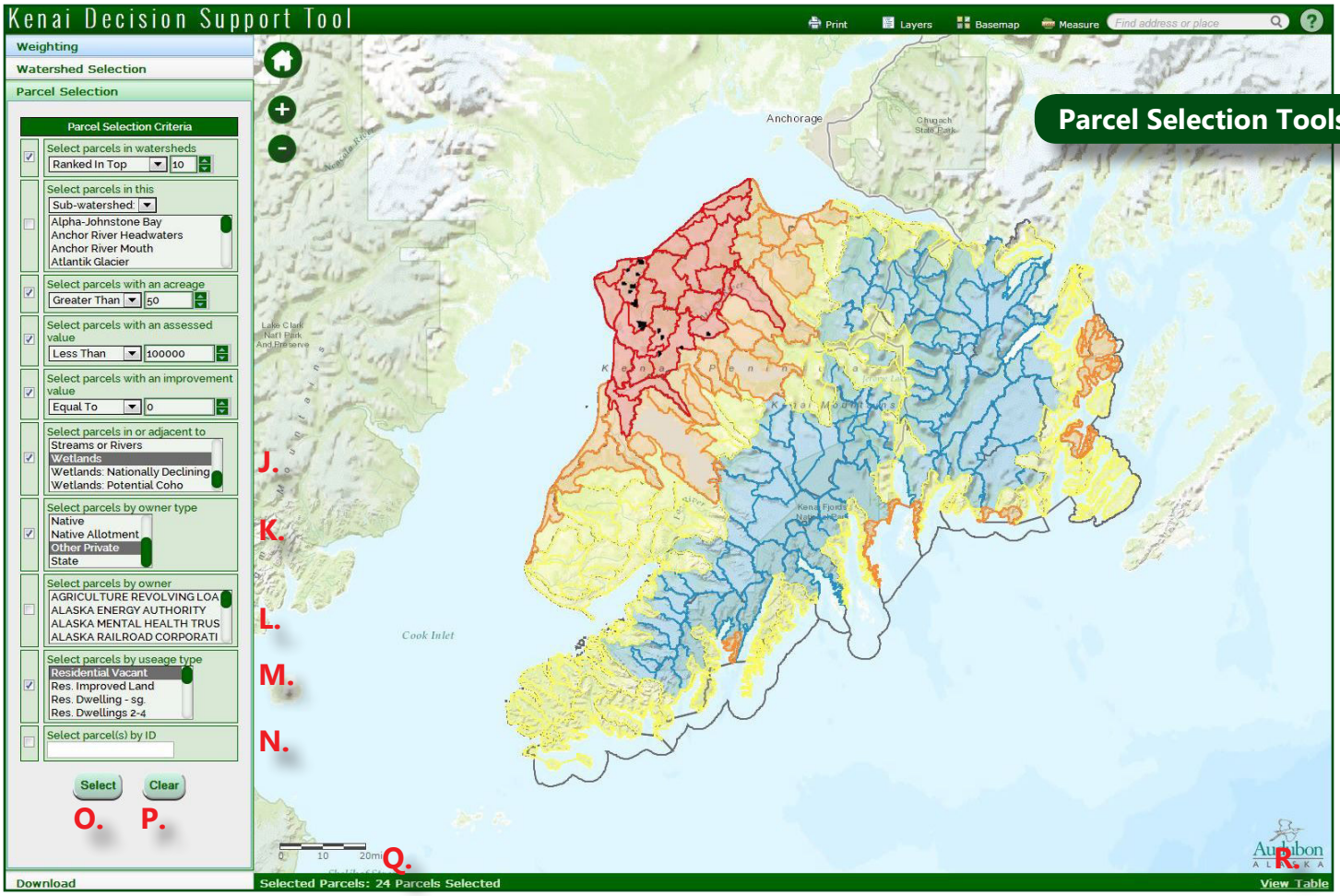
Hovering over individual watersheds with the mouse pointer will reveal the score in each watershed. You can experiment with different weights, and see how the scores and colors change in different areas. Repeat this process until you're satisfied with the results, then click 'Selection' to open the Selection window, to further refine specific areas of interest.



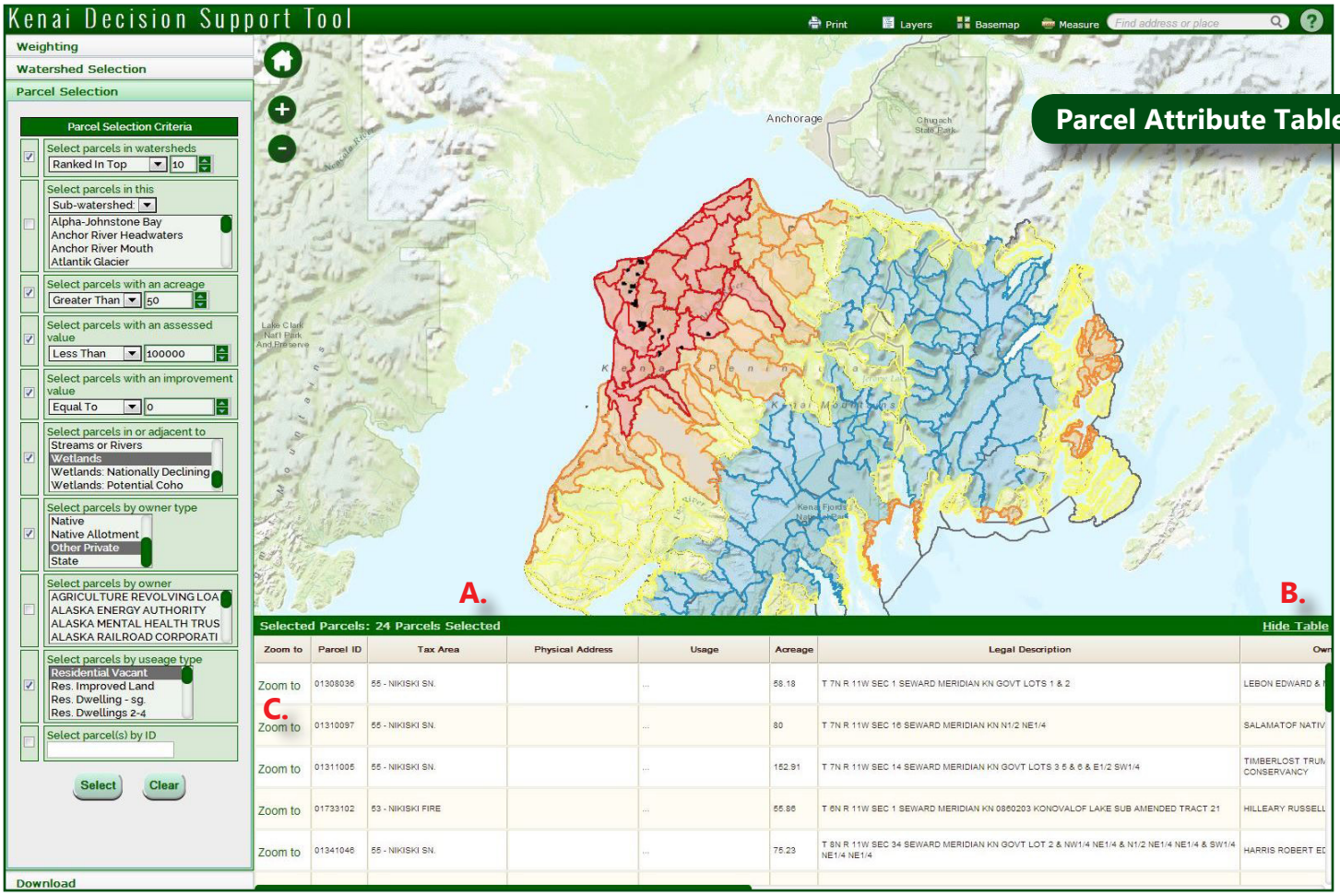
Letter	Tool Name	Tool Purpose
A	Select by Scores/Ranks	The next step is to identify the particular watershed of interest, based on the criteria you have applied. There are four selection types: 'score above,' 'score below,' 'rank in top,' and 'rank in bottom.' The first two identify watersheds based on their scores (for example, all watersheds with a score above 60); the second two identify watersheds based on their ranks (i.e. the top 5 ranked watersheds are those five with the highest score based on the identified criteria). For example, you might want to find the number one watershed based on the criteria you have identified, or the top ten (as shown above in black).
B	Select by Name	The other option is to select a watershed by name: for example, if you wanted to see the location of the Anchor River watershed, or the Anchor River Mouth subwatershed, you can select the appropriate area using this tool.
C	Select	Select watersheds based on the score, rank, or name.
D	Clear	Remove selection.



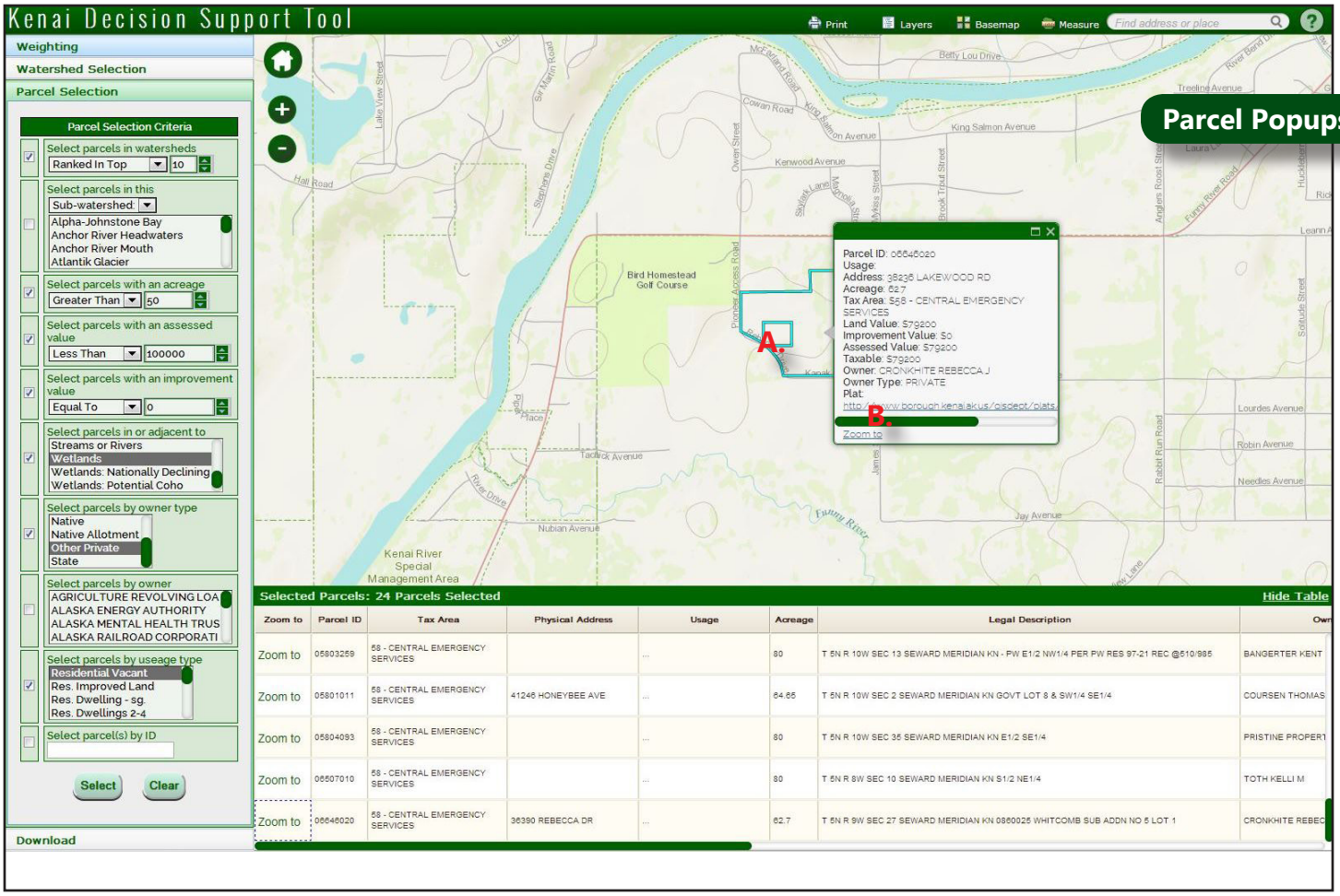
Letter	Tool Name	Tool Purpose
D	Parcel Selection Criteria	Depending on the type of question you're trying to answer, knowing the top watersheds for a set of values on the Kenai Peninsula may be all the information you need. On the other hand, your primary interest might be in particular parcels within the watersheds. To select parcels, you can use the selection criteria in this panel; to add or remove criteria from your selection, check and uncheck the boxes to the left of the criteria.
E	Select Parcels By Watershed Score	To identify parcels within high-scoring watersheds, repeat your watershed criteria here (for example, you can select parcels in watersheds with a score above 60, or parcels in the top 10 watersheds).
F	Select Parcels by Watershed Name	To identify parcels within specific watersheds, select watershed or subwatershed, then select a name from the list (for example, Anchor River watershed).
G	Select Parcels By Acreage	Use this to select only parcels with a size greater or less than the entered value (for example, shown in black here: all parcels of more than 50 acres).
H	Select Parcels By Assessed Value	Select only parcels with an assessed value greater or less than the entered value (shown here: all parcels with an assessed value of less than $100,000).
I	Select Parcels By Improvement Value	Identify parcels with an improvement value greater than, less than, or equal to some value (shown here: all parcels with an improvement value equal to $0; i.e. those lacking structures, driveways, or other infrastructure).



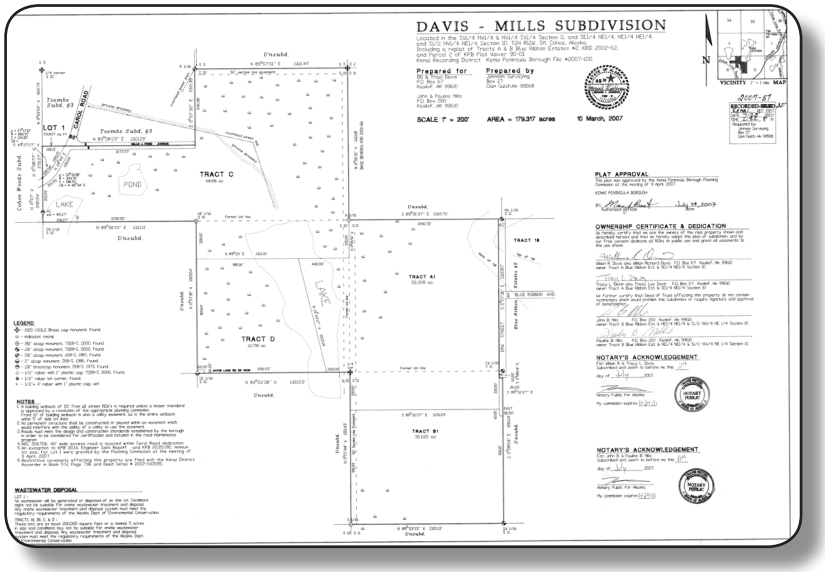
Letter	Tool Name	Tool Purpose
J	Select Parcels In or Adjacent To	Identify parcels adjacent to (within 300 feet of) values of interest: protected lands, anadromous waters, etc. (for example, shown here: all parcels intersecting wetlands).
K	Select Parcels By Ownership Type	Identify parcels by ownership type: state, federal, municipal, borough, native, or other private (non-native) lands (shown here: all non-native private lands).
L	Select Parcels By Owner Name	Select parcels by owner. This includes federal and state agencies, etc., but excludes private land owners (for example, you might use this to identify all Alaska DNR lands, FWS lands, etc.).
M	Select Parcels By Usage Type	Use this to select parcels by usage type: for example 'residential vacant' (shown here), 'general farm/agricultural,' etc.
N	Select Parcels by ID	Select parcels based on the parcel ID; multiple ID's may be entered as a comma-separated list (e.g. '02514101, 01311005').
O	Select	Create a parcel selection based on the criteria identified above.
P	Clear	Remove selection
Q	Parcel Count	Gives number of parcels in current selection
R	View Attribute Table	Click here to view the attribute table (see page 15).

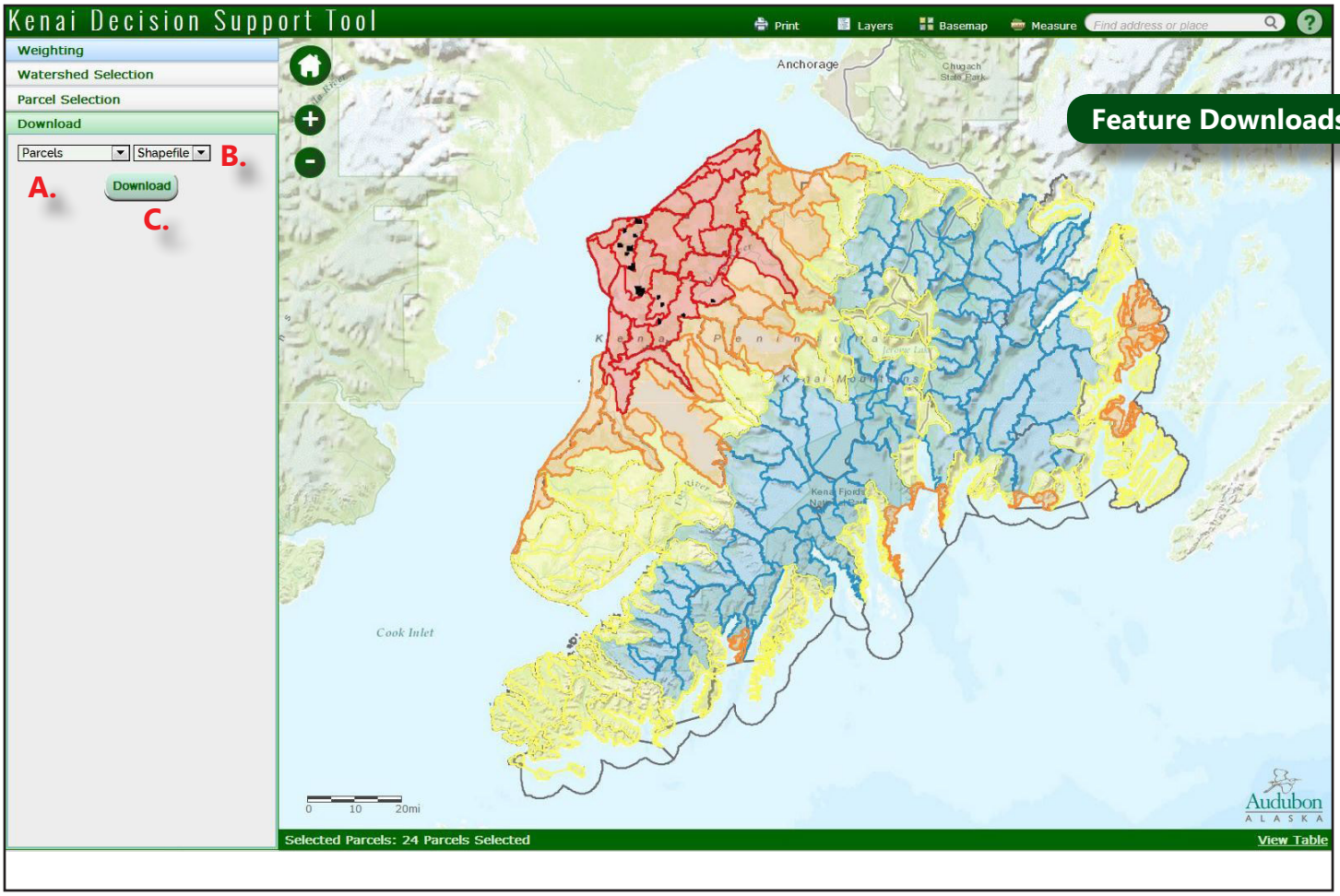


Letter	Tool Name	Tool Purpose
A	Attribute Table	This table provides attribute information on the selected parcels, including acreage, assessed value, legal description, ownership, and plat maps where available.
B	Hide Table	Click here to close the attribute table.
C	Zoom to	Click here to zoom to a particular parcel.



Letter	Tool Name	Tool Purpose
A	Popup	You can also see information on a parcel by clicking the parcel on the map; this will bring up a popup window with the various attributes.
B	Plat Link	Some parcels may have a plat image available (example below); to see this, just click on the 'View' link, either in the attribute table or the popup window.





Letter	Tool Name	Tool Purpose
A	Feature Type	Select your desired feature type to download: either watersheds, subwatersheds, or parcels. Note that before downloading features, you must have features of the chosen type selected.
B	Download Format	Choose your desired download format, either File Geodatabase or Shapefile. If you'd like to look at this information as a spreadsheet, you can download the data as a shapefile, then open the .dbf file in Excel by right-clicking and selecting Open With>Excel.
C	Download	Click here to download the selected features in the indicated format.

The table below lists all the data layers used in the creation of this tool, and indicates how each is used. 'Layers' indicates that the display of this layer can be turned on and off in the Layers menu (Page 7); 'Weights' indicates that this layer can be used for watershed weighting (pages 9-11), and that scores for this layer appears in the watershed popups (page 8); 'Parcels' indicates that this layer can be used to identify parcels adjacent to (within 300 feet of) these features (page 14). Resource layers marked with an asterisk (*) are available only in the West Kenai Peninsula, and are given null values for the purpose of weighting and ranking in areas with no data for this resource.

Resource Layer	Source	Resource Layer Description	Year	Layers	Weights	Parcels
Anadromous Streams	Alaska Department of Fish and Game	Streams containing anadromous fish species; summarized by stream length. (Note: streams with multiple fish species are counted the same as streams with a single species).	2013	X	X	X
Climate Refugia	Kenai National Wildlife Refuge	Dataset indicating the number of different models that are in agreement of a particular spot remaining a climate refugia, based on vegetation types: higher values indicate greater agreement between models.	2013		X	
Developable Lands	Kachemak Heritage Land Trust	Lands classed as Developable, based on municipal and borough planning documents: possible indicator of future development.	2011		X	X
Fish Crossings	Kenai Watershed Forum	Culverts and other locations where anadromous fish streams are known to cross roads.	2007	X	X	X
Forest	Kenai National Wildlife Refuge	Polygons from KNWR vegetation classification corresponding to forested vegetation types.	2002		X	
Impervious Surfaces	U.S. Geological Survey, Kachemak Heritage Land Trust	Impervious surfaces data compiled by KHLT from National Hydrography Dataset (USGS) website; roads, structures, and other impervious surfaces.	2011	X	X	
Important Bird Areas	Audubon Alaska	Known Important Bird Areas on the Kenai Peninsula, meeting global, continental, or state abundance thresholds.	2013	X	X	X

Resource Layer	Source	Resource Layer Description	Year	Layers	Weights	Parcels
Invasive Plants	Alaska Natural Heritage Program	Invasive plant information from the Alaska Exotic Plants Information Clearinghouse; watershed score is based on the sum of the exotic plant rank codes (instead of just getting a count of the number of exotic plants by watersheds, this weights scores towards more invasive species). Non-invasive exotic plants were given a score of 1 to distinguish watersheds without any exotic plants from those without any invasives.	2012	X	X	X
Land Cover	Kenai National Wildlife Refuge	Land cover types, as assessed by KNWR, for the entire peninsula.	2002	X		
Land Status	Alaska Department of Natural Resources	Generalized Land Status: indicates whether land is owned by Refuge, Park, Forest Service, State, etc.	2013	X		
Priority Corridors	Kenai National Wildlife Refuge	Anadromous streams identified by KNWR as priority corridors connecting the Refuge to the sea.	2013	X		X
Protected Lands	Kachemak Heritage Land Trust	Lands already protected, including protected lands with private, municipal, state, and federal ownership.	2011		X	X
Soils: Developable*	Natural Resources Conservation Service	Soils capable of being developed, for buildings with basements (all polygons with attribute 'basements not limited').	2002		X	X
Soils: Hydric*	Natural Resources Conservation Service	Soil polygons with 'All Hydric' attribute.	2002		X	X

Resource Layer	Source	Resource Layer Description	Year	Layers	Weights	Parcels
Species Layers: Predicted Habitat Quality	Kenai National Wildlife Refuge	Species habitat quality, based on KNWR models for Kenai Peninsula, for individual species identified as potential conservation priorities. Includes the following species: Sandhill Cranes; Townsend's Warbler.	2013		X	
Species Layers: Predicted Suitable/ Nonsuitable	Alaska Natural Heritage Program	Individual species habitat models (predicted suitable/ nonsuitable) for species identified as being of interest (selected Watchlist species; Alaska Shorebird Conservation Plan priority species; North American Wetland Conservation Act priority species, species of conservation concern, etc.). Includes the following species: Aleutian Tern; Blackpoll Warbler; Gray-cheeked Thrush; Lesser Yellowlegs; Kittlitz's Murrelet; Marbled Murrelet; Olive-sided Flycatcher; Red-faced Cormorant; Rusty Blackbird; Short-eared Owl; Short-billed Dowitcher; Varied Thrush; Wandering Tattler.	2013		X	
Species Layers, Synthesis	Alaska Natural Heritage Program; Audubon Alaska	Sum of scores (0/1 presence/absence) for all Watchlist Birds, All Birds, and All Species, based on Alaska Natural Heritage Program's habitat models.	2013		X	
State Critical Habitat Areas	Alaska Department of Natural Resources	Legislatively Designated Areas on the Kenai Peninsula, designated as critical habitat areas, to protect important fish and wildlife habitat, as well as recreational opportunities related to these.	2008	X		X
Streams and Rivers	U.S. Geological Survey; Kachemak Heritage Land Trust	Rivers and streams on the Kenai Peninsula, compiled from National Hydrography Dataset by KHLT in 2011.	2011	X	X	X
Streams by Temperature (Predicted Refugia Streams)	Cook Inletkeeper	For selected streams, indicates whether stream is a cold-water or warm-water stream, and how sensitive that temperature is to climate changes; streams that have both cold water and a low sensitivity to change are those predicted to remain as refugia streams, under climate change.	2013	X		X

Resource Layer	Source	Resource Layer Description	Year	Layers	Weights	Parcels
Wetland Classes: All	Kenai Watershed Forum; U.S. Fish and Wildlife Service	Combines wetland data from KWF, where available, with lower resolution National Wetlands Inventory (USFWS) data elsewhere on the peninsula.	2012		X	X
Wetland Classes: Nationally Declining	Kenai Watershed Forum; U.S. Fish and Wildlife Service	Subset of All Wetlands dataset, representing wetland types classified as nationally declining by the USFWS. There are seven nationally declining types: estuarine intertidal emergent, estuarine intertidal forested, estuarine intertidal scrub-shrub, marine intertidal, palustrine emergent, palustrine forested, and palustrine scrub-shrub.	2012		X	X
Wetland Classes: Potential Coho Habitat	Kenai Watershed Forum; U.S. Fish and Wildlife Service	Subset of All Wetlands dataset, representing open-water wetlands connected to streams known to contain coho, either directly (intersecting known coho streams), or indirectly (intersecting networks of streams and open water wetlands connected to coho streams).	2012		X	X
Wetland Classes: Tidal/Coastal	Kenai Watershed Forum; U.S. Fish and Wildlife Service	Subset of All Wetlands dataset, representing tidal or coastal wetland types (classified as 'Estuarine Marine Deepwater' or 'Estuarine and Marine Wetland' [USFWS], or as Tidal [KWF]).	2012		X	X
Wetland Scores: Erosion Control Areas*	Homer Soil and Water Conservation District	Wetlands assigned a score of 40 out of 40 by the Homer Soil and Water Conservation District for "Erosion Control/Shoreline Stabilization (wetlands adjacent to streams, lakes and ponds. Those with more developed vegetation are more effective at stabilization)." Scores of 40 indicate riverine wetland polygon or forest/shrub dominated wetland polygon adjacent to open water.	2013		X	

Resource Layer	Source	Resource Layer Description	Year	Layers	Weights	Parcels
Wetland Scores: Moose Habitat Areas*	Homer Soil and Water Conservation District	Wetlands assigned a score of 40 out of 40 by the Homer Soil and Water Conservation District for "Significant late winter moose habitat (wetlands at lower elevations or with significant willow cover are important for winter moose habitat)." Scores of 40 indicate lowlands under 600 ft elevation, riverine zones/ discharge slopes with willows, or wetlands within the Anchor River/Fritz Creek Critical Habitat Areas.	2013		X	
Wetland Scores: Recreation Areas*	Homer Soil and Water Conservation District	Wetlands assigned a score of 40 out of 40 by the Homer Soil and Water Conservation District for "Potential for Recreation." Scores of 40 indicate that the wetland is on state land classified as Habitat, Recreation, State Park, or Kenai River Special Management Area; is classified by KPB as campground, fairground, park, or recreation; is city-owned with designation of Conservation, Recreation, Park, or Bridge Creek Watershed; or is owned by a conservation entity.	2013		X	
Wetland Scores: High Vegetation Community Structure Areas*	Homer Soil and Water Conservation District	Wetlands assigned a score of at least 5 out of 13 by the Homer Soil and Water Conservation District for "Vegetation community structure (diversity indicator). Identifies forms (vegetation layers) for each community type in subject wetland. Forms include trees, low and high shrubs, herbaceous vegetation, and moss. Particular form must cover at least 10% of site. The number of forms was obtained using the Kenai Lowlands Wetland Mapping and Classification. To establish the number of forms in each map component, the number of forms in the most common plant communities found there were averaged. After the map components were added, the number of forms was rounded to the nearest whole number." Score of at least 5 indicates that wetland has at least 5 different vegetation layers.	2013		X	

Resource Layer	Source	Resource Layer Description	Year	Layers	Weights	Parcels
Wetland Scores: Water Quality Improvement Areas*	Homer Soil and Water Conservation District	Wetlands assigned a score of 40 out of 40 by the Homer Soil and Water Conservation District for "Water Quality (Includes both those wetlands that improve water quality and those that have an elevated opportunity to do so)." Score of 40 indicates riverine/peatland wetland polygon or adjacent to riverine wetland polygon; additionally, wetland is not a discharge slope, a late snow plateau, a wetland/upland complex, or a disturbed area.	2013		X	
Wetland Scores: All Scores*	Homer Soil and Water Conservation District	Scores for western Kenai wetlands on all categories rated by HSWCD.	2013	X		

References

Gracz, M., K. Noyes, P. North, and G. Tande. 2008. Wetland mapping and classification of the Kenai Lowland, Alaska. http://www.kenaiwetlands.net/.

Homer Soil and Water Conservation District, and Kenai Peninsula Wetlands Working Group. 2013. Kenai peninsula wetlands, a guide for everyone: get to know your wetlands, including their functions & values. https://sites.google.com/site/kenaipeninsulawetlandwiki/documents/kenai-peninsula-wetlands-a-guide-for-everyone.

Kirchhoff, M. 2010. Alaska WatchList: Highlighting Declining and Vulnerable Bird Species in Alaska. Audubon Alaska, Anchorage, AK.

Magness, D. R., and J. M. Morton. 2013. Using convergent signals to increase certainty of land cover conversion in a rapidly changing climate on the Kenai Peninsula, Alaska. Journal of Fish and Wildlife Management.

Shapiro, N. 2011. GIS notes for 2011 parcel prioritization project. Kachemak Heritage Land Trust.

Smith, M., N. Walker, C. Free, M. Kirchhoff, N. Warnock, A. Weinstein, T. Distler, and I. Stenhouse. 2012. Marine Important Bird Areas in Alaska: Identifying Globally Significant Sites Using Colony and At-sea Survey Data. Audubon Alaska, Anchorage, Alaska.