Appendix A

1. The Puget Sound Watershed Characterization Project Volume 2 Part 4: Marine Shoreline Habitats Assessment

2. WDFW Data Intersect

Part 4:
Marine Shoreline Habitats Assessment

4.1. Conceptual Model

A conceptual model is a simplified representation of a complex system that emphasizes the interrelationship of the major elements rather than the details of each element. The conceptual model forms the basis for the components and structure of the quantitative model.

4.1.1. Conceptual Foundation

We begin with a conceptual model of ecosystems in which processes and structures[15] interact to manifest functions (Figure 4.1; Goetz et al. 2004, Simenstad et al. 2006b). Maintaining both process and structure is essential to the maintaining healthy nearshore ecosystems. The composition and organization of biological communities in nearshore ecosystems is caused by processes such as wave exposure, sediment suspension, and freshwater flows, and by "structures" such as beach topography, beach sediments, and salinity. The structure of nearshore ecosystems is both the consequence of and an influence on the action of ecosystem processes (Goetz et al. 2004). For instance, beach topography is the result of wave action but beach topography also influences wave action.

In this assessment we focus on a specific set of nearshore ecosystem functions: the habitats for nearshore flora and fauna (Figure 4.2). The habitat functions of nearshore ecosystems are highly integrated and hierarchical. For example, the ecosystem function of herring[16] habitat depends in part on the presence of a particular vegetative structure, eelgrass (*Zostera marina*), and the ecosystem function of eelgrass habitat depends largely on the structure provided by beach sediments (Figure 4.3).

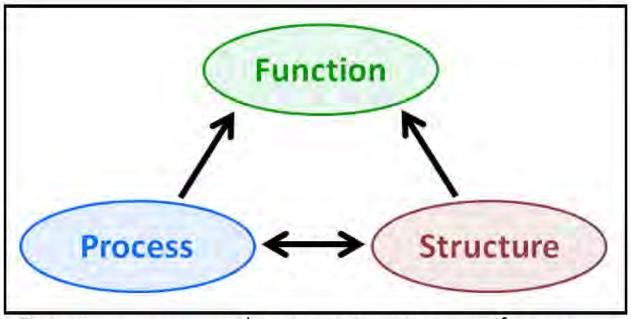

Figure 4.1. Ecosystem processes and structures interact to manifest ecosystem functions such as the provision of habitat (Goetz et al. 2004).

Habitat Shaping Processes and Structures

The dominant physical process along the shorelines of Puget Sound is the movement of sediments. Sediment movement occurs within spatially distinct littoral drift cells. Drift cells are comprised of

[15] Other ecosystem conceptual models separate structure into structure and composition. We consider composition to be an attribute of structure.

[16] Scientific names of animals listed in Appendix E.

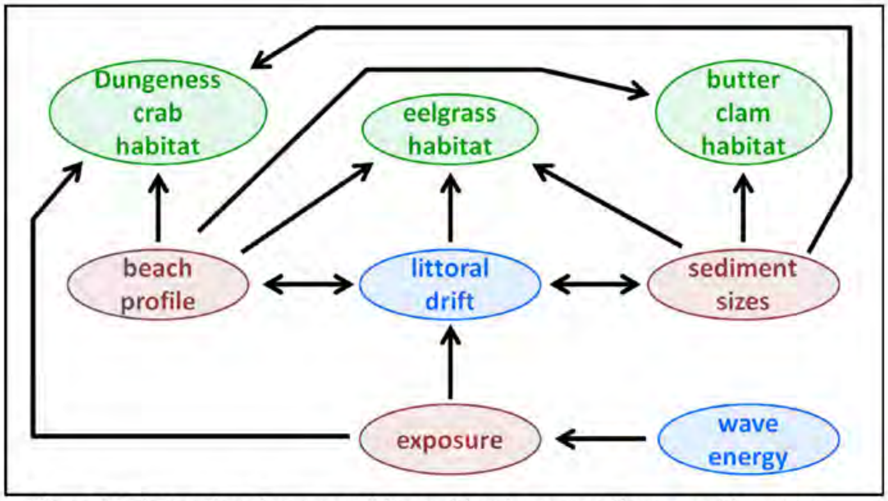

Figure 4.2. Interaction of processes (blue ovals) and structures (brown ovals) produce habitat functions (green ovals). Each species has different habitat requirements that are met by different interactions among processes and structures.

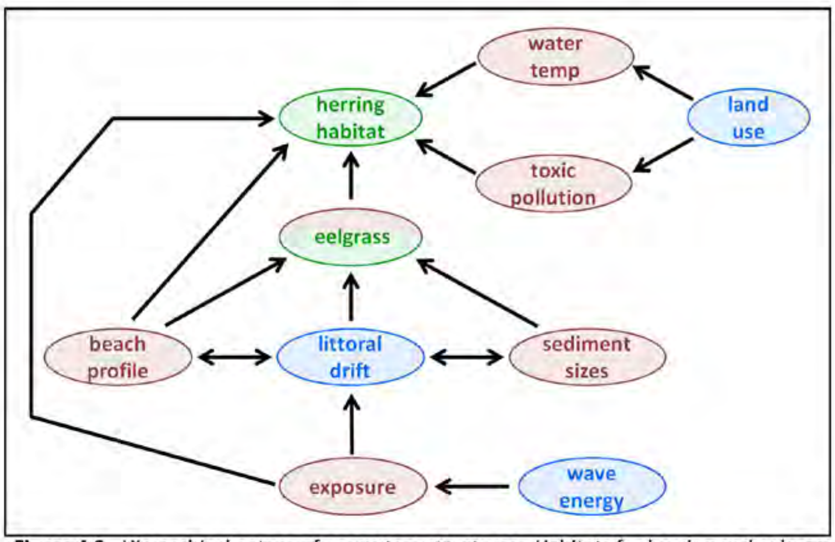

Figure 4.3. Hierarchical nature of ecosystem structures. Habitats for herring and eelgrass depend on the interaction of processes (blue oval) and structures (brown ovals). Eelgrass depends on the structure provided by sediments and beach profile (i.e. topography). Herring depend on the structure provided by eelgrass. Hence, eelgrass represents both an ecosystem function (i.e., a habitat function) and a structure.

sediment sources, typically bluffs, where erosion provides sediment for beaches, sediment sinks, where sand and gravel accumulate, and transport reaches where littoral drift connects sources to sinks (Figure 4.4). Puget Sound's shorelines are comprised of 812 drifts cells with an average length of 3.7 miles and a maximum of length 60 miles.

Within drift cells, variation in wave exposure, sediment sources, and local geomorphology create a variety of shoreforms (Table D5), such as bluff-backed beach, barrier estuary, open coastal inlet, and rocky shore (Shipman 2008). Many bluff-backed beaches are sediment sources, barrier beaches and barrier estuaries are sediment sinks, and all beaches play a role in sediment transport. Shoreforms provide a variety of environmental settings for fish and wildlife habitats. At a finer spatial scale, ecosystem structures have been mapped as shorezones (Berry et al. 2001b). Shorezones classify shorelines according to sediment type, slope, and wave exposure (*sensu* Dethier 1990 and Howes et al. 1994).

Figure 4.4. The physical process of sediment movement within littoral drift cells along the shorelines of Puget Sound (from Simenstad et al. 2006a)

Littoral drift is the dominant process for shaping and maintaining shoreline habitats. Therefore, in order to fully assess the quality of shoreline habitats, the integrity of drift cells must also be assessed. *Ecological integrity* has been defined as the ability of an ecological system to support and maintain a community of organisms that has species composition, diversity, and functional organization comparable to those of natural habitats within a region (Parrish et al. 2003). An ecological system has integrity when its dominant ecological characteristics (i.e., structures, processes, and functions) occur within their natural ranges of variation and can withstand and recover from most perturbations imposed by natural environmental dynamics or human disruptions.

Littoral drift is not the only ecosystem process affecting habitat functions along the shorelines of Puget Sound. For instance, within the nearshore zone species may be directly affected by wave exposure, and just outside the nearshore, species are affected by upwelling currents. Structures in close proximity to the nearshore zone may also influence habitat quality along shorelines. For instance, rocky reefs in subtidal areas affect foraging habitat quality for white-winged scoter and patches of large trees in upland areas affect nesting habitat quality for great blue herons. Assessing the condition or presence of the myriad structures and processes that affect habitats in the nearshore zone was beyond our capability. Therefore, we assessed the quantity of habitat functions as indicated by the presence of species.

Habitat Functions

A vital ecosystem function is the provision of habitats. Habitats are specific to each species. Although there is considerable overlap in the habitat characteristics of some species, e.g., red sea urchins and green sea urchins, the full multi-dimensional characteristics of habitat are unique for every species and sometimes unique to a particular population of a species (Morrison et al. 1992). The behavioral and evolutionary processes that manifest a species' habitats are highly complex: individuals integrate multiple factors when selecting habitat, exhibit a wide range of habitat preferences, respond differently to habitats with different qualities, and populations are adaptable to changing habitat conditions. Hence, for many species our understanding of habitat is simplistic, and consequently, our ability to model species' habitats, habitat quality, or habitat functions is limited and replete with uncertainty.

Mapping species-specific habitats is technically challenging, but mapping the presence of a species is not (although is it fiscally challenging), and considerable expense has been invested in mapping the presence of certain marine species, in particular, harvested and imperiled species. By definition, the presence of a species establishes the presence of that species' habitat. In other words, if a species is present at a site, then that site is serving a habitat function. However, habitat quality cannot be determined by species presence alone, and the functions (e.g., breeding, rearing, resting) served by that habitat may not be discernible through species presence. Furthermore, species absence does not establish the absence of habitat; species absence may be due to survey error, patterns of seasonal use, or declining population size. Nevertheless, considering the dearth of species-specific habitat models, the presence of a species is our most reliable indicator of habitat.

Collection of empirical data by WDFW and other agencies on the locations of fish or wildlife species generally focuses on imperiled or harvested species. For the vast majority of other species, site-scale location data are based on incidental observations or incomplete surveys. These data have a high rate of omission error, i.e., false negatives. For many vertebrate species comprehensive data on locations are available as range maps (e.g., Wahl et al. 2005), but these can be highly inaccurate at spatial scales of about 4 square miles or more.

4.1.2. A Model for Relative Conservation Value

Of the three habitat assessments conducted for the Puget Sound Partnership's Watershed Characterization Project – terrestrial, freshwater, and marine shorelines – the fish, wildlife, and habitat data for marine shorelines are the most comprehensive and very likely the most accurate. This can be attributed to the one-dimensional nature of shorelines and their relatively small spatial extent – 2,468 miles of marine shoreline in Puget Sound compared to over 50,000 miles of rivers and streams in Puget Sound Basin.

Given the quality of the data, we believed an assessment based on the presence of species would provide a credible indicator of conservation value. The overarching assumption of that belief is that the relative value of shorelines for the conservation of fish and wildlife habitats is predominantly a function of the presence of the species and habitats for which we collect occurrence data. In general, we collect occurrence data for certain species or habitat types because 1) humans harvest those species, 2) we are concerned about the status of those species or habitats (e.g. threatened or endangered species), or 3) we are concerned about the management of those species or habitats (e.g., species highly sensitive to human disturbances). In other words, we collect data on those species and habitats we care most about. Therefore, an assessment based on these data should indicate those places we should care most about for the conservation of fish and wildlife habitats.

Another major assumption is that the relative value of a place for the conservation of fish and wildlife habitats can be accurately quantified. And, more specifically, that relative value can be expressed through a single comprehensive number – an index (or a small set of indices). Furthermore, we assumed that the index is a linear function – the weighted linear combination of normalized biological data. Better relationships between relative conservation value and the biological data may exist, but lacking any practical means to determine those relationships we chose the most parsimonious formulation – a linear equation.

4.2. Methods

4.2.1. Spatial Framework

Puget Sound has been divided into 7 oceanographic sub-basins based on bathymetry and circulation patterns, however, these sub-basins also reflect regional patterns in shoreline geology, geomorphology, and wave environment (Shipman 2008). For instance, the South Puget Sub-basin contains no rocky shoreforms (rocky platform/ramp or plunging rocky) but 47% of shorelines in the San Juan Sub-basin are rocky. Over half of all closed lagoon marsh shoreforms are in the North Central Sub-basin but the South Central, Hood Canal, Whidbey, and South Puget sub-basins have no closed lagoon marshes. Also, 37% of shorelines in the Whidbey Sub-basin are located in river deltas but all other sub-basins have 6% or less of their shorelines in river deltas. These regional differences in shoreforms manifest regional differences in biological communities. Given these and other regional differences in shoreforms, we minimized comparisons of dissimilar communities by doing the assessment within sub-basins.

Puget Sound has 2,468 miles of marine shoreline. For purposes of analysis, this shoreline must be broken into smaller spatial units. We intersected the shoreform (Shipman 2008) and shorezone (Berry et al. 2001a, 2001b) classification systems to produce a shoreline composed of 10,178 segments (Table D6). Demarcations between segments correspond to observed changes in shoreform (e.g., barrier estuary, bluff-backed beach), morphology (e.g. flat, platform, ramp), or substrate (rock, gravel, sand), all of which significantly influence plant, fish, and wildlife habitats. Across the entire Puget Sound, the mean segment length was 0.24 miles and 75% of segments were less than 0.29 miles (Table 4.1). Mean segment lengths were different among the seven oceanographic sub-basins, with the Juan de Fuca Sub-basin having the longest (0.55 miles) lengths and the San Juan Sub-basin having the shortest (0.17 miles).

In the geographic database a shoreline is one-dimensional. Shoreline segments were converted to two-dimensional polygons for two reasons. First, for some species, such as Dungeness crab, the spatial extent of each occurrence was represented as a polygon and we wanted to maintain that two-dimensional information. Second, there were fish and wildlife occurrence data, such as those for bald eagle nests, that did not intersect the shoreline but were in close proximity to it and we wanted to associate those data with the shoreline. To accomplish both objectives we buffered the shoreline by approximately ¼ mile[17] in the landward direction and by approximately ¼ mile or extreme low tide, whichever was farther, in the seaward direction (Figure 4.5). The National Wetlands Inventory (USFWS 1989, Cowardin et al. 1979) inter-tidal polygons were used to delineate the location of extreme low tide. Biological data outside the ¼ mile buffer were excluded from the analysis.

One-quarter mile was chosen as the buffer width because we believed it would encompass most fish and wildlife resources that might be impacted by shoreline development. One-quarter mile[17] is approximately the recommended management zone around bald eagle nests and roosts (Watson and Roderick 2000) and ¼ mile is roughly the distance at which shoreline development might disturb seal and sea-lion haul outs (S. Jeffries, WDFW, pers. commun.). Furthermore, for at least 90% of the Puget Sound shoreline, ¼ mile encompasses the entire nearshore zone (< 10 m depth, *sensu* Simenstad et al. 2011) and most shallow subtidal areas.

[17] The actual distance was exactly 400 m. We describe it as approximately ¼ mile in order to consistently use English units of measure throughout this report. ¼ mile equals 402 m.

Table 4.1. Summary of shoreline segment sizes by oceanographic sub-basin. Units in miles.

sub-basin	N	Mean	min	1st qtr	median	3rd qtr	max
Juan de Fuca	372	0.55	0.029	0.12	0.29	0.67	6.75
San Juan	4353	0.17	0.003	0.04	0.09	0.19	8.24
Hood canal	874	0.28	0.004	0.09	0.17	0.34	3.61
Whidbey	1014	0.34	0.004	0.10	0.21	0.38	7.36
North Central	393	0.32	0.010	0.12	0.24	0.42	2.44
South Central	1482	0.25	0.004	0.09	0.18	0.31	1.99
South Sound	1690	0.26	0.005	0.09	0.17	0.34	3.86
ALL	10178	0.24	0.003	0.07	0.14	0.29	8.24

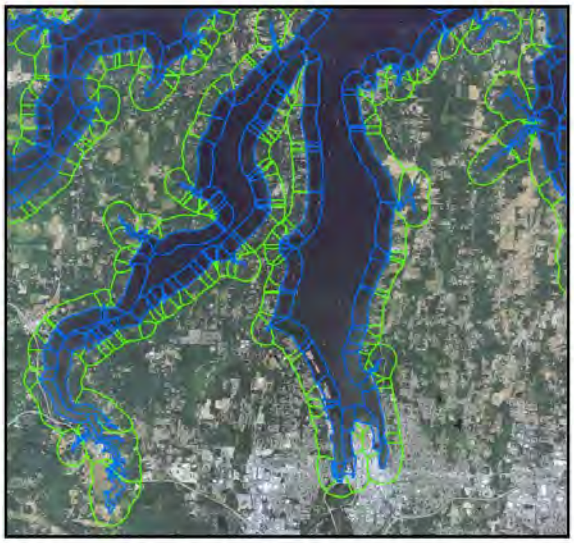

Figure 4.5. Spatial framework for the shoreline habitats assessment. Blue and green polygons are seaward and landward assessment units, respectively. This example depicts Totten, Eld, and Budd Inlets (left to right) in the South Sound Oceanographic Sub-basin.

4.2.2. Data and Data Processing

The Biological Data

We are limited by breadth, precision, and accuracy of the biological data. The data's breadth, i.e., the variety of species and habitats for which occurrence data are available, is relatively broad: eight shellfish[18] species or species groups of commercial/recreational interest, urchins, three forage fish species, eight salmonid species, numerous bird species, pinnipeds, kelp, eelgrass, surfgrass, and wetlands (Figure 4.6). The measurement precision for most of these data is at the level of presence/absence. Only PSAMP bird survey data enable an estimate of local density. The accuracy of our data is affected by the data's age and the methods of data collection. Some data sets are over 20 years old (e.g., WDF 1992). Most data were collected through field surveys, but some data in certain datasets are "based on 'best professional judgment' of the biologist."

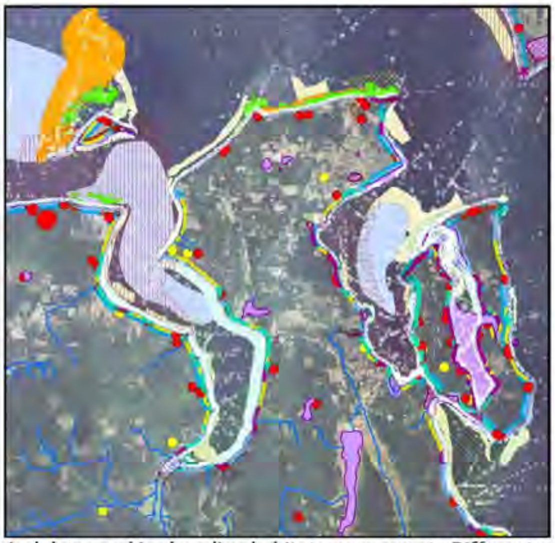

Figure 4.6. Biological data used in shoreline habitats assessment. Different polygon colors and fill patterns and different line colors represent different plant, fish, or wildlife species. White dots are observations of PSAMP bird surveys. This example depicts Discovery Bay and Port Townsend Bay.

We reviewed all biological datasets managed by WDFW for their relevance to marine shorelines in Puget Sound and their likely accuracy. Our subjective evaluation of likely accuracy considered the dataset's age, how the data were collected, and the detectability of the taxa surveyed. Occurrence data for fish and wildlife are more prone to false negatives than to false positives, and hence, we were particularly concerned about the potential frequency of false negatives in each dataset. We settled on 41 data sets (Tables 4.2 and 4.3). Most data sets mapped the occurrences of single species (i.e., Dungeness crab, herring). Some data sets mapped the simultaneous occurrence of multiple species (i.e., shorebird and

[18] Shellfish includes both mollusks such as butter clam, and crustaceans such as Dungeness crab.

waterfowl concentrations). For some data sets which were likely to have a high rate of false negatives we developed models for relative likelihood of occurrence (explained below). Table D1 lists known data sets that were excluded from the assessment.

With a few exceptions the fish and wildlife species included in the assessment were priority species as designated by WDFW's Priority Species and Habitats program (PHS; WDFW 2008). Priority species require protective measures for their survival due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or cultural importance. Priority species include State Endangered, Threatened, Sensitive, and Candidate species; and animal aggregations considered vulnerable (e.g., heron colonies, shorebird concentrations).

We also included a subset of the "bio-band" data from DNR's shorezone database (Berry et al. 2001b). These data are referred to as bio-bands because certain plants and animals create a well-defined series of cross-shore color bands. Each bio-band is named for the most prominent species in the band or by the general description of the species assemblage. The abundance of each band is recorded as either absent, patchy, or continuous, which we translated to 0, 1, or 2. We included bio-bands for species of concern (e.g., eelgrass, kelp) and excluded common species (e.g., barnacles, sand dollars).

The highest quality data utilized in our assessment was that collected by the Puget Sound Ambient Monitoring Program (PSAMP; Nysewander et al. 2005). PSAMP has conducted highly systematic aerial surveys of birds on Puget Sound since 1992. The complete data set contained 381,214 observations; over half the observations are of multiple birds. We removed records that were older than 1995, summer surveys, non-marine birds (e.g., common raven, northern flicker), or extremely abundant birds (e.g., glaucous-winged gull). This filtering process reduced the data set to 196,312 observations and included 65 bird species (Table D2) and observations for 31 categories of partially identified birds (e.g., "Unidentified Diving Duck"; Table D3). We summarized the data by calculating two indices. First, for the years 2000 to 2009, we calculated the median density of birds for each shoreline polygon. Second, for "at-risk" species (Table D4) we calculated average density per shoreline polygon over the years 2005 to 2009.

Relative Likelihood of Occurrence

We believed the spatial data for some species likely had a high rate of false negatives. We were particularly concerned about data collected by the Washington Department of Fisheries in the 1980s (WDF 1992). To compensate for the shortcomings of these data we developed relative likelihood of occurrence (LO) models. The shoreform-shorezone classification system was treated as habitat types and we calculated L(S|H), the relative likelihood that a species is present given the presence of a particular habitat type.

We had hoped to develop probability of occurrence models which would provide more robust estimates of species occurrences, however, the data precluded such models because: 1) the species data were not collected through a random sampling of shorelines, and 2) the data do not record negative surveys, and hence, there is no way to distinguish between species absence at a location and a lack of survey effort at that location. Each relative likelihood model is effectively a "presence/absence index" based on a species' degree of association with each habitat type.

Table 4.2. Summary of fish and wildlife data used in the indices.

Taxon	PHS[1]	Occur. model	Description	Units	Source
Northern abalone	X	X	documented occurrences	Square feet	WDF 1992
Clams; intertidal hardshell	X	X	beds that could be commercially harvested or have significant recreational usage		WDF 1992
Clams; subtidal	X	X			
Dungeness Crab	X	X			
Pacific oyster	X	X	non-native *Crassostrea gigas*		WDF 1992
Geoduck	X	X	beds that could be commercially harvested		WDF 1992
Pandalid shrimp	X	X	pink, coonstripe, and spot shrimp		WDF 1992
Sea Urchins	X	X	documented occurrences of red and green sea urchins		WDF 1992
Herring Holding Areas	X		where adults congregate each winter prior to spawning	Square feet	WDFW 1992
Herring Spawning Areas	X		regular surveys over 10 years		WDFW 2000-2009
Surf smelt	X	X	data represent more than 30 years of spawning beach surveys	feet	WDFW 1972-2008
Pacific Sand lance	X	X			WDFW 1972-2008
Bull Trout	X		number of stream mouths inhabited by species that intersect shoreline segment	count	WDFW Fishdist
Chinook Salmon	X				
Chum Salmon	X				
Coastal Cutthroat	X				
Coho Salmon	X				
Pink Salmon	X				
Sockeye	X				
Steelhead Trout	X				
Bald Eagle Communal roosts	X		zone around roost site; radius = 400 m	Square feet	WDFW WSDM[2]
Bald Eagle nest	X		zone around nest site; radius = 200 m		
Great Blue Heron colonies	X		zone around occurrence point; radius = 1000 ft		
Black Oystercatcher nests			survey data from 2010	count	
Shorebird	X		large regular concentrations	Square feet	
Waterfowl	X		large regular concentrations		
Important Bird Areas (IBA)			support species of concern or high densities of birds		Audubon 2001
Bird Density			median density of all birds from 2000 to 2009 (Tables D3 & D4)	birds / km^2	WDFW PSAMP[3]
"At-Risk" Bird density			density of "at risk" birds from 2005 to 2009 (Table D5)		
Seal/sea lion haul-out	X		both natural (e.g., islands) and artificial (e.g., buoys) haul outs for harbor seals and California sea lions	count within 400 m of shore	WDFW WSDM

[1] PHS: Is on the WDFW's priority habitat and species list
[2] WDSM: WDFW's Wildlife Survey Data Management
[3] PSAMP: Puget Sound Ambient Monitoring Program

Table 4.3. Summary of plant and wetland data used in the indices.

Taxon	Description	Units	Source
dune grass	salt-tolerant grasses, dominated by *Leymus mollis*	Amount = shoreline length x bioband density Density 0 = Absent; 1 = 0-50% cover; 2 = 50-100% cover	DNR Shorezone (Berry et al. 2001a, 2001b)
sedges	brackish/ freshwater wetlands assemblages; found at freshwater streams and river mouths		
high salt marsh	brackish/ freshwater wetlands assemblages; *Triglochin/Salicornia/ Deschampsia/Distichlis*		
low salt marsh	dominated by *Salicornia*		
surfgrass	*Phyllospadix* spp. of lower intertidal		
eelgrass	*Zostera marina* and introduced *Z. japonica*		
brown kelp	large bladed *Laminaria / Saccharina* spp.		
chocolate brown kelp	*Laminaria setchellii, Eisenia* and/or *Pterygophora, Hedophyllum, Egregia*		
bull kelp	*Nereocystis luetkeana*		
giant kelp	*Macrocystis spp.*		
wetlands (NWI)	all wetlands except marine sub-tidal	square feet	USFWS 1989

The shoreform-shorezone data are a complete census of the Puget Sound shoreline. Therefore, the probability of a particular shoreform-shorezone habitat type, H, occurring at a randomly selected shoreline segment is:

$$P(H) = n_H / M \qquad (4.1)$$

where M is the total number of shoreline segments in Puget Sound and n_H is the number of shoreline segments in Puget Sound classified as habitat type H. The relative likelihood that a species is present given the presence of a particular habitat type is:

L(S | H) = (relative frequency of species S in habitat H) / (relative frequency of species S in Puget Sound)

which is calculated as:

$$L(S \mid H) = (n_{SH}/n_H) / (n_S/M) \qquad (4.2)$$

where n_S is the number of shoreline segments in Puget Sound where species S is recorded as present and n_{SH} is the number of shoreline segments that were classified as habitat type H and species S is recorded as present.

We developed LO models for 10 species (Table 4.2). The relative likelihood of occurrence was based on only one variable – the habitat types created through the intersection of shoreforms (Shipman 2008) and the habitat types (Dethier 1990) in the DNR shorezone data (Berry et al. 2001b). Our simple LO models are unlikely to make highly accurate predictions of species occurrences. In fact, we believed that the LO models would be highly biased toward false positives, i.e., predicting a habitat association where there is none. However, we also believed that a simple model with a high rate of false positives was preferable to inaccurate data with a high rate of false negatives. Using the model was a precautious approach.

The LO model results were merged with the occurrence data; empty records in the occurrence data were substituted with the relative likelihood of occurrence and data records with known presence were set to a likelihood of 1.

Data Normalization

Our species data come in numerous forms: linear units, areal units, counts, density, presence/absence, and categorical (Tables 4.2 and 4.3). To avoid unintended weighting of one variable more than another when combining these data we must convert them to commensurate units. The first conversion was to density – data in linear or areal units were divided by the length or area, respectively, of their corresponding shoreline segment. Salmon and seal/sea lion haul-out occurrence data were not converted to density; they remained as counts. Data for species that had LO models remained in likelihood units. The second conversion was a normalization. In effect, we converted data which were originally in nominal, interval, and ratio scales to a common form of ratio scale. These densities, counts, or likelihoods were normalized from 0 to 1 within oceanographic sub-basins using the following equation:

$$N(v_{Sj}) = (v_{Sj} - V_{min}) / (V_{max} - V_{min}) \qquad (4.3)$$

where v_{Sj} is the value for species or species group *S* at shoreline segment *j*, V_{min} is the smallest value for species S in the sub-basin, and V_{max} is the largest value for species *S* in a sub-basin.

4.2.3. The Index

Indices of Conservation Value

We want to quantify the relative habitat value of marine shorelines. There are myriad formulations for a quantitative index, each with their own particular advantages and disadvantages. We limited our assessment to two simple formulations based on two perspectives of relative conservation value that reflect the quantity versus quality dichotomy. One perspective is that conservation value is best determined by a place's total contribution to habitat conservation, i.e., the quantity a place contributes. The other perspective is that value is best determined by a place's most significant contribution, i.e., the quality a place contributes.

The first perspective can be implemented by summing the amount of habitats at each shoreline segment. That is, summing the normalized counts or densities of each species or species group for each shoreline segment. The *composite index* of relative habitat value for a shoreline segment *j* is:

$$AV_j = \sum_{S=1}^{T} w_S N(v_{Sj}) \qquad (4.4)$$

where w_S are subjective weights that determine the relative contribution of a species or species group *S* to the index, $N(v_{Sj})$ is the normalized value for a species *S* at shoreline segment *j*, and *T* equals 41 the total number of components (i.e., species or species groups) included in the assessment. The weights are normalized so that they sum to 1, and therefore, the index is effectively a weighted average. The resulting average score was renormalized within sub-basins so that the maximum value equaled 1.

All weights in equation 4.4 were equal. We could have assigned larger weights to species or habitats that we thought were more important, such as federally listed salmon species or eelgrass, but that involves making value judgments that we wished to avoid in this assessment. Such value judgments should be informed by the opinions of stakeholders and policy makers.

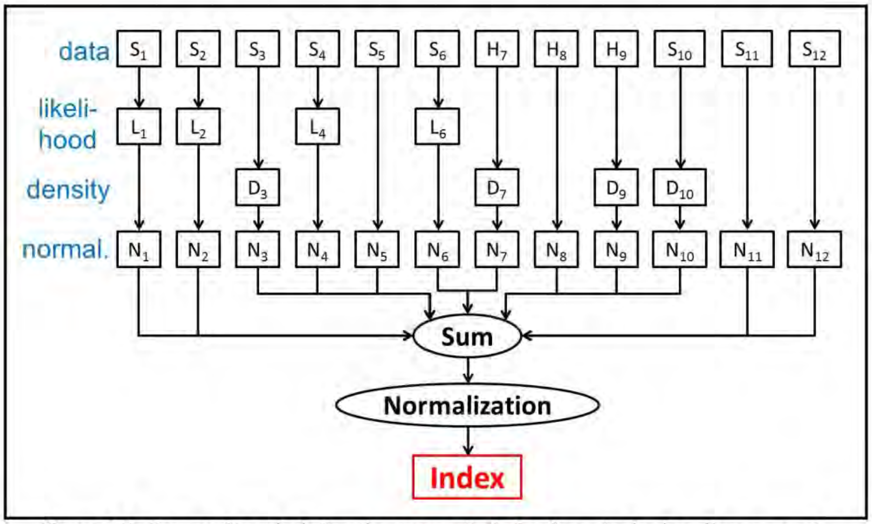

Figure 4.7. Process for calculating the composite index for a single shoreline segment. Using species (S) and habitat (H) data a relative likelihood of occurrence model (L) was generated for some species and a density (D) was calculated for other species and habitats. All values were normalized (N) from 0 to 1 relative to other segments in the same sub-basin. The normalized values are summed and then renormalized so that the maximum sum equals 1 within each sub-basin.

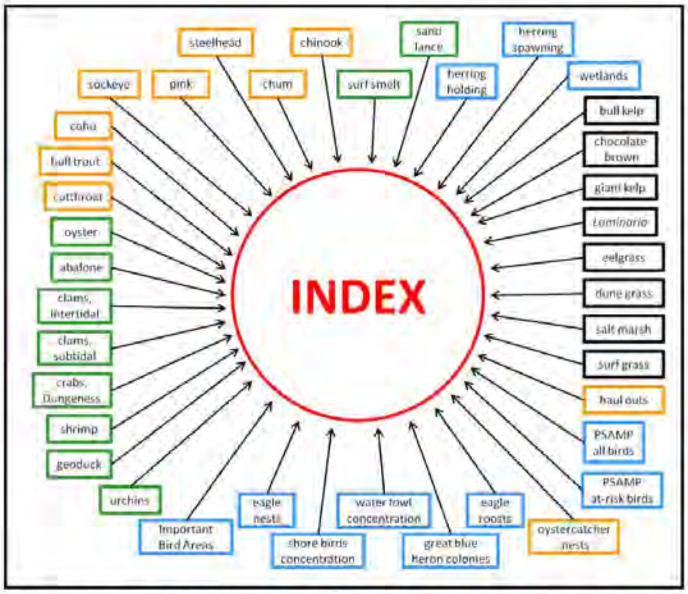

Figure 4.8. Data used in the calculation of conservation value indices. Forty-one types of data contributed to the indices. Salt marsh box includes sedges, high salt marsh, and low salt marsh (Table 4.3). Different data come in different forms: green = relative likelihood of occurrence models, orange = counts; blue = density; black = amount.

The average value produced by equation 4.4 can obscure sites that are relatively important for a single species or species group but relatively unimportant for most other species. Managers and planners need to be aware of such sites, and hence, a second index compensates for this shortcoming of the composite index. The second perspective, i.e., that value is best determined by a place's most significant contribution, can be implemented by taking the maximum value of $N(v_{sj})$ for each segment *j*. Because many of the data are presence/absence, 78% of shoreline segments had at least one $N(v_{sj})$ equal to 1. Hence, to obtain a more informative index that would more clearly discriminate among shoreline segments we chose to average the five largest $N(v_{sj})$ at each segment. The resulting score was renormalized so that the maximum value in each sub-basin equaled 1. We called this the *top-5 index*.

Given the many subjective judgments necessary to develop the index, we opted for parsimonious indices. One simplification was assigning equal influence to every component. We could have elicited expert opinions on the relative importance of each component, which would necessarily involve both technical and policy experts, but we did not. Another simplification was the index's structure. Our composite index had a flat structure (Figure 4.8). An alternative structure is hierarchical in which similar components are grouped together and the groups are assigned weights that determine their relative influence. In both instances, relative influence of components and the index structure, we chose to minimize subjective judgments, which led to equal influence and the flat structure.

Larger Grain Assessment Summaries

Our assessment units for the shoreline habitats assessment are the intersection of shoreform types and shorezone types. These spatial units represent real differences in geomorphology, topographic slope, and substrate – characteristics which we associate with shoreline habitat types. The units, which have an average length of 0.24 miles, are an appropriate grain for site-level and many local planning activities. However, for the purposes of guiding regional protection and restoration actions, our assessment units are too small. Larger grain assessment summaries were formed in two ways. First, we calculated the average composite index for PSNERP shoreline process units, which have an average length of 3.6 miles. Second, we calculated an average composite index for each shoreline segment using a 2-mile wide moving window which assigns to each shoreline segment the average value of all segments within 1 mile to either side of the segment.

Index Properties

We examined the index through various statistical and graphical analyses, evaluated the index's sensitivity to each component, and explored the potential effects of uncertainty on the index.

The index has 41 components. We examined the average contribution of each component to the composite index. The contribution of component *S* to the composite index at shoreline segment *j* is:

$$C_{j} = {w_S N(v_{Sj})} \big/ {AV_j} \qquad (4.5)$$

and the average contribution of a component to the composite index is

$$\bar{C} = \frac{1}{M}\sum_{j=1}^{M} C_j \qquad (4.6)$$

A sensitivity analysis was done to understand the relative influence of each component on the index. For the composite index, we defined sensitivity as:

$$C_j = {\Delta AV_j} \big/ {\Delta[w_s N(v_{sj})]} \qquad (4.7)$$

Sensitivity analysis was done by calculating the composite index for all shoreline segments with the weights set to 1, recalculating the composite index after altering a single weight by a small amount (e.g., 5%), and applying equation 4.7 to each shoreline segment. The process was repeated for each component. The index score of each shoreline segment is effectively a separate model output, and hence each segment has its own sensitivity to each component. A mean sensitivity was calculated for each component by averaging over the separate sensitivities of all segments.

Uncertainty analysis was done by assigning a uniform or triangular probability distribution to each of the 41 weight parameters in equation 4.4. The distributions spanned the range of reasonable values for each parameter, but the mean and median of every distribution equaled 1. Parameter values were randomly selected from the 41 distributions and the index was recalculated for each shoreline segment. This was repeated for 200,000 iterations. The composite index score of each segment is effectively a separate model output, and hence each segment has its own distribution of index scores. The uncertainty associated with each segment's index score was represented as a histogram and the interval containing 90% of all index scores was determined for each segment.

4.3. Results

4.3.1. Index Components

Relative Likelihood of Occurrence

We constructed LO models for 10 species (Table D7). The models were simplistic, but nevertheless, the results generally conformed to our knowledge of these species' habitat associations (Simenstad et al. 1991, Dethier 2006). The relative likelihoods of occurrence for abalone and urchin (Figure 4.9), for instance, are highest on boulder, bedrock, and cobble substrates. The relative likelihoods of occurrence for surf smelt and sand lance are highest for sand and gravel and lowest for bedrock and boulder substrates.

Normalized Values

The composite index has 41 components and the properties of the components varied. For instance, commonness varied among components. For components without an LO model, the percent of shoreline segments with non-zero values reflects the commonness of that component in Puget Sound. For instance, eagle nests occur near 19% of segments but black oystercatchers nests occur on only 1% of segments (Figure 4.10). Components with an LO model had many more shoreline segments with non-zero values than components without LO models. According to the LO model for Dungeness crab, that species could occur (relative likelihood > 0) on 95% of shoreline segments. In contrast, bald eagle communal roosts, which did not have an LO model, occur near only 1% of segments.

The distributions of normalized values were also different among components. For instance, the distribution of normalized non-zero values for waterfowl concentration areas were uniformly distributed but normalized non-zero values for eagle nests were right-skewed, i.e., more segments with low values than high values (Figure 4.11). Also, normalized non-zero values for wetlands were approximately unimodal but normalized non-zero values for sedge were bimodal, i.e., high proportions of segments with high values or low values and lower proportion of segments with intermediate values.

Correlations among normalized values (Table D8) were mostly low, with 87% of correlations less than 0.2. Six percent of correlations among normalized values were moderate ($0.2 \leq \rho < 0.6$). This analysis indicates that nearly all components add unique information to the index. The highest correlations ($\rho >$ 0.75) were among salmon species because many species co-occur in the same streams.

Mean and median number of habitat functions (i.e., number of non-zero components) per shoreline segment were 10.5 and 11, respectively. The maximum number of habitat functions amongst all segments was 25. Correlation of the composite index score with number of habitat functions per segment was 0.56. Hence, the composite score was not based solely on the number of functions per segment. The quantity of certain functions in each segment, such as the area of eagle nest sites or the amount of eelgrass, affected the composite score.

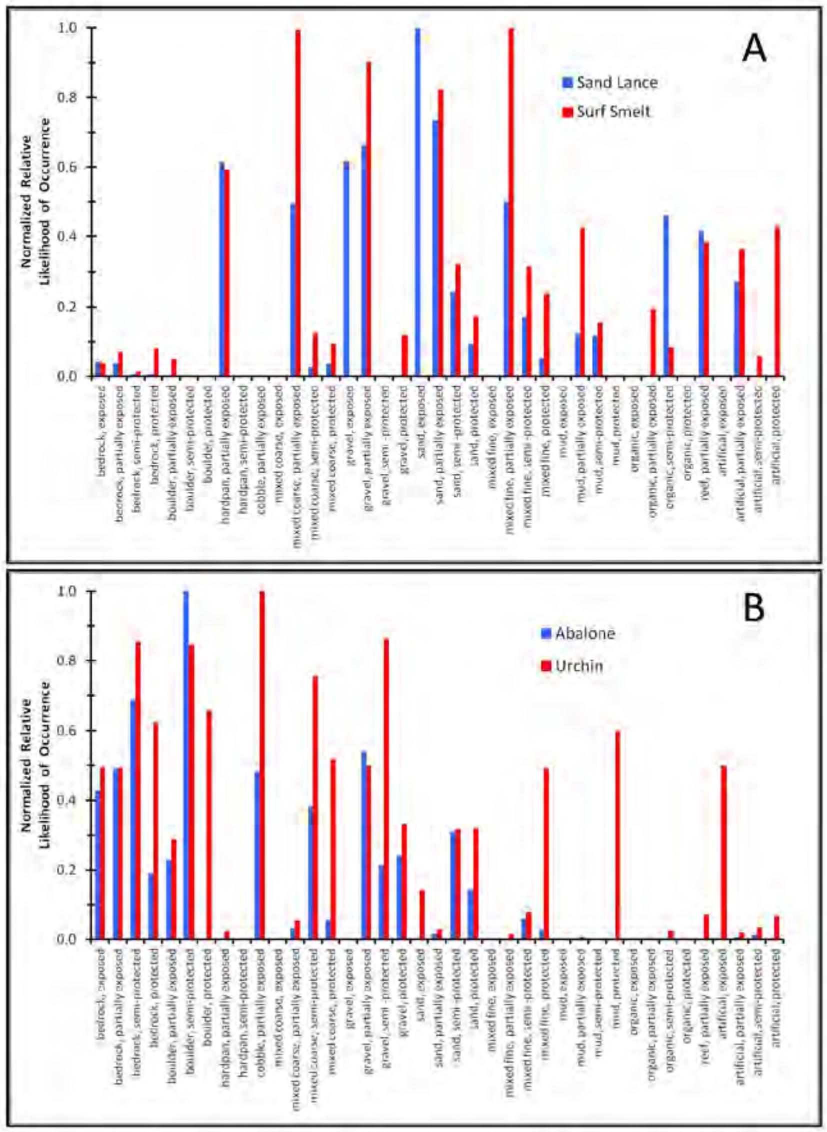

Figure 4.9. Results of relative likelihood of occurrence models for two species of forage fish which prefer sandy-gravelly substrates (A) and for two species, abalone and sea urchin, known to prefer rocky substrates (B).

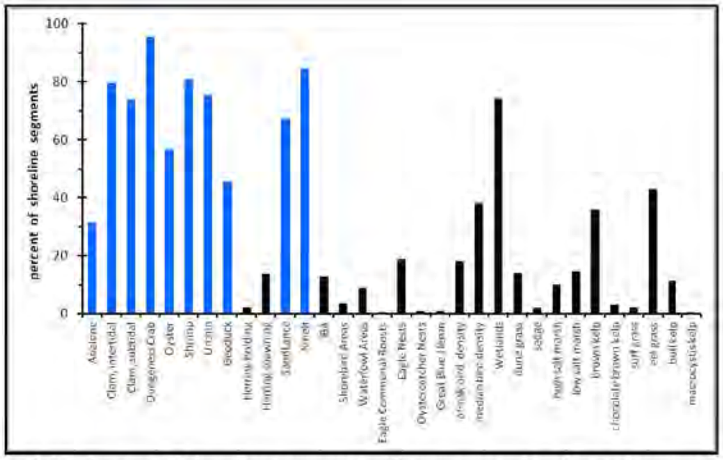

Figure 4.10. Percent of shoreline segments with non-zero values for each component of the composite index. Blue bars indicate components with a relative likelihood of occurrence (LO) model.

4.3.2. Indices of Relative Conservation Value

The basic results of the shoreline habitats assessment are maps (e.g., Figure 4.12). The map shows the relative value of every shoreline segment. In many places the index scores conform to our expectations. For instance, the relatively intact mouths of the Nisqually and Skokomish rivers have high index values and the degraded shorelines of Olympia and Shelton have low index scores. This pattern is repeated throughout the Puget Sound – the shorelines along large urban areas (Tacoma, Seattle, Bremerton, Everett) tend to have low scores and shorelines along areas known to have high ecological value (e.g., , Semiahmoo Spit, mouth of Dungeness River) have high scores. Two notable exceptions to these patterns are the mouths of the Puyallup and Duwammish Rivers. These river mouths are heavily degraded but the presence of many salmon species results in these shorelines having high relative value. Compared to the best shoreline segments in each sub-basin, the majority of segments have relatively low scores – 68 percent of shoreline segments had scores between 0.1 and 0.4.

Scores for the composite index have a right-skewed normal distribution (Figure 4.13) with a mean of 0.28 and about 1% of shoreline length being above 0.9 and 12% being below 0.1. The distribution of index scores varied by sub-basin (Figure 4.16). For instance, the distribution was skewed right in the San Juan Sub-basin with a mean of 0.15, but more symmetric for the Whidbey Sub-basin with a mean of 0.31.

The composite index and top-5 index were highly correlated, $\rho = 0.81$, but there are obvious differences between the two indices (Figures 4.12 and 4.14). The distribution of the composite index is highly skewed with only 11% of shoreline length having index values greater than 0.5. In contrast, the distribution for the top-5 index is more uniform with 49% of shoreline length having index values greater than 0.5. Also, almost 10% of shoreline length had scores greater than 0.9 for the top-5 index. Hence, the top-5 index indicates that a high proportion of shorelines length has moderate to high score for at least several components of the index.

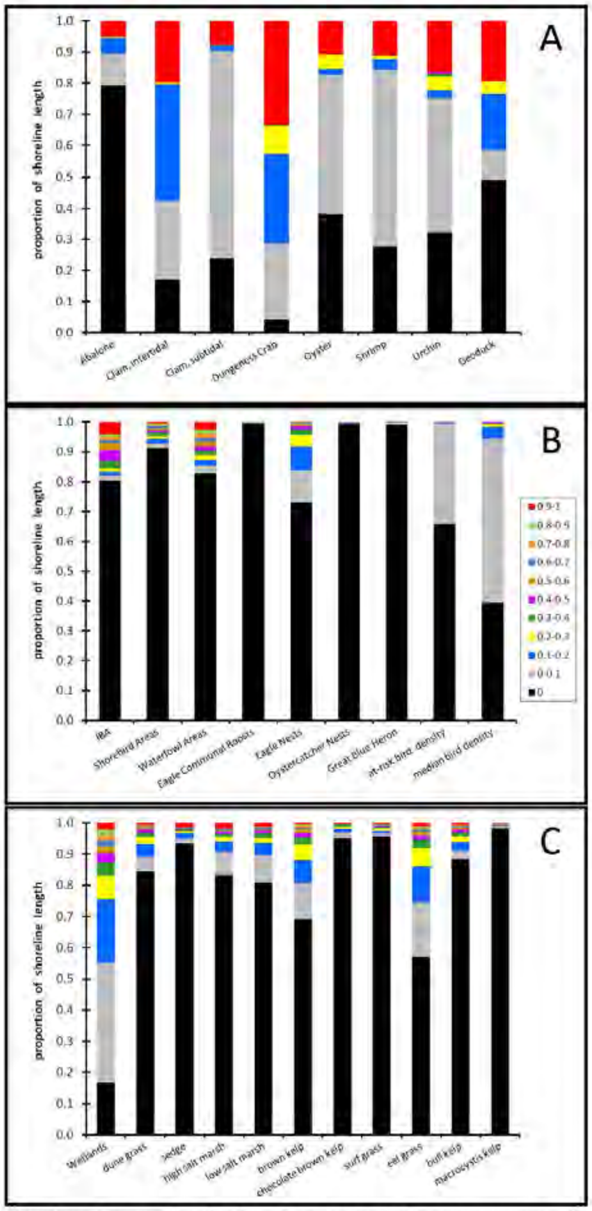

Figure 4.11. Distribution of normalized values for various index components: A) shellfish, B) birds, and C) wetlands and shoreline vegetation. Relative likelihood of occurrence models were used for all shellfish species. Zero value indicates the component is not present in the shoreline segment. Component values normalized from 0 to 1 within sub-basins.

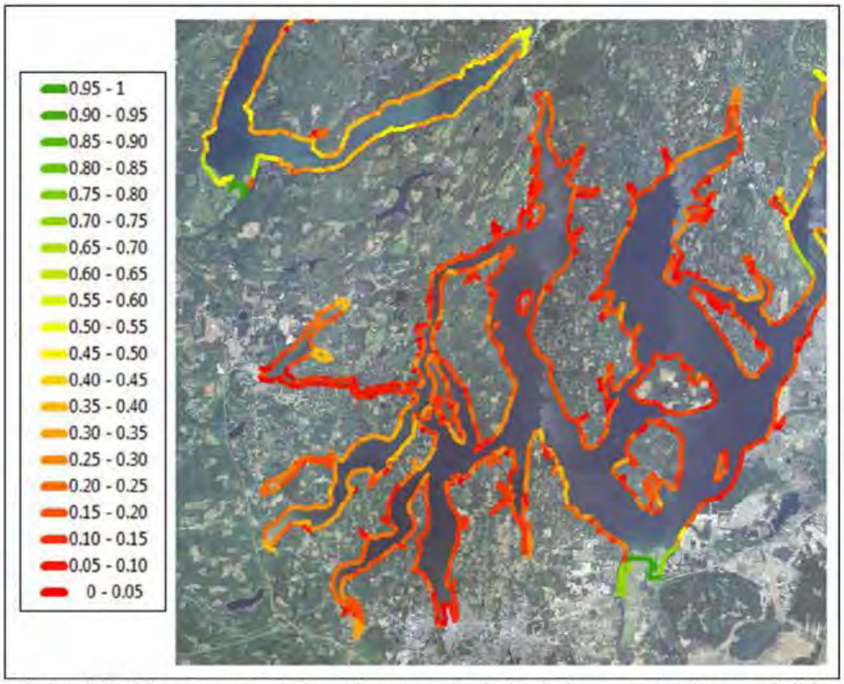

Figure 4.12. The Composite Index. The composite index is the normalized mean of all 41 components. Highest relative habitat value is dark green and lowest relative value is dark red. This example depicts South Sound Sub-basin and part of the Hood Canal Sub-basin (upper left hand corner). Index scores were normalized within oceanographic sub-basins.

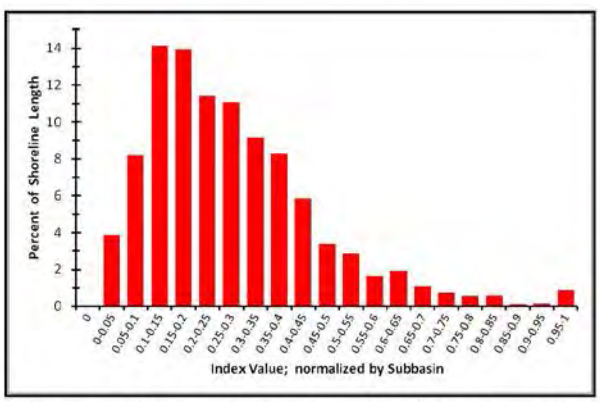

Figure 4.13. Distribution of composite index scores for all Puget Sound shorelines. Mean weighted by segment length equals 0.28.

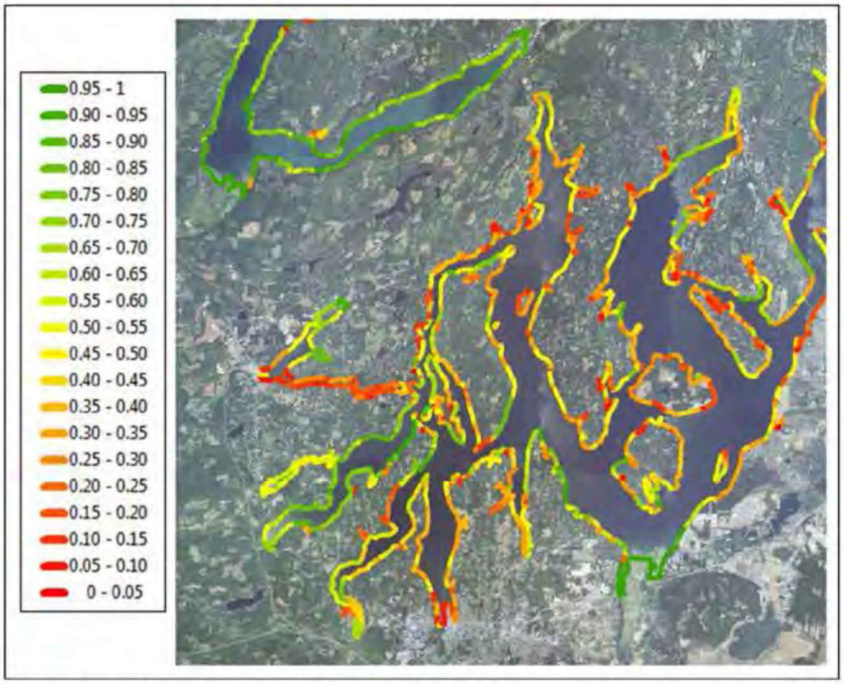

Figure 4.14. The top-5 Index. The top 5 index is the normalized mean of the five highest components in each shoreline segment. Highest relative habitat value is dark green and lowest relative value is dark red. This example depicts South Sound Sub-basin and part of the Hood Canal Sub-basin (upper left hand corner). Index scores were normalized within oceanographic sub-basins.

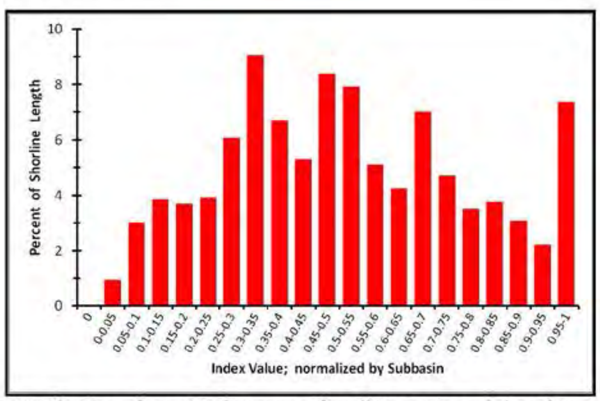

Figure 4.15 Distribution of top-5 index scores for all Puget Sound shorelines. Mean weighted by segment length equals 0.51.

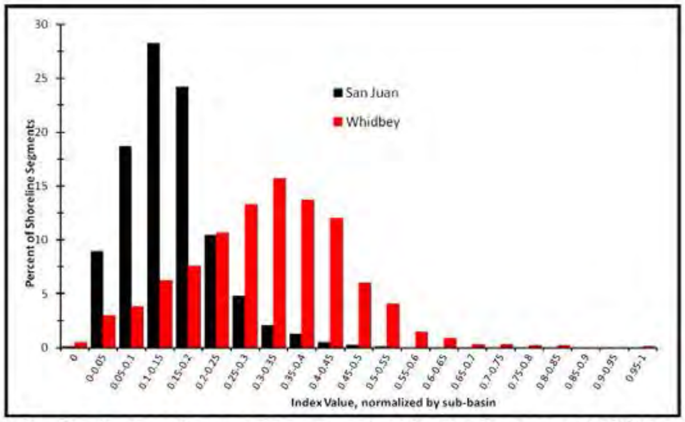

Figure 4.16. Distribution of composite index scores for the San Juan and Whidbey oceanographic sub-basins.

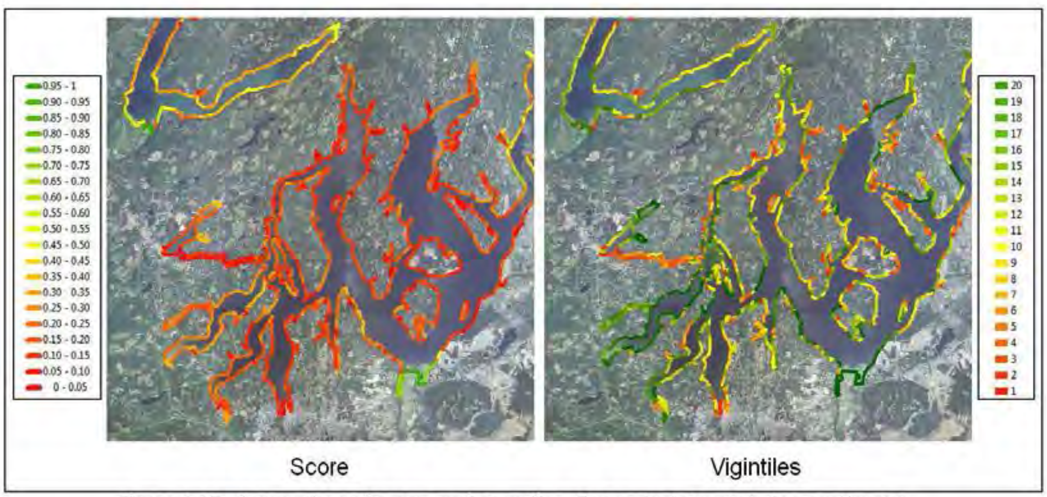

Figure 4.17. Comparison of scores and quantiles. For easier interpretation continuous index scores (left panel) were converted to 20 quantiles (i.e., vigintiles; right panel). Highest relative habitat value is dark green and lowest relative value is dark red. This example depicts South Sound Sub-basin and part of the Hood Canal Sub-basin (upper left hand corner of each map). Index scores were normalized within sub-basins.

The components most often comprising the top-5 index, in decreasing order of frequency, were: Dungeness crab, surf smelt, hardshell clams, urchin, wetlands, pandalid shrimp, geoduck, northern abalone, and Pacific oyster. For more than 20% of shoreline segments, at least one of these species or species groups contributed to the top-5 index. Dungeness crab contributed to the top-5 index for 81% of shoreline segments.

The previous results are for the magnitude of the index. In many practical applications we only need to know the rank of shoreline segments. That is, we only need to know which segments have higher or lower index scores than other segments. To examine ranks, we converted the continuous index score into 20 quantiles (i.e., vigintiles; Figure 4.17). Think of each quantile as a binning of ranks into categories. Each vigintile contains 5 percent of the shoreline length in its respective sub-basin. In other words, 5 percent of the shoreline will have the highest rank category and 5 percent will have the lowest rank category, and the remaining 90 percent of the shoreline is evenly distribution among the other 18 rank categories.

When comparing the composite index with the quantized composite index (Figure 4.17) we see that places with extreme low (Olympia, Shelton) or extreme high (mouths of Nisqually and Skokomish rivers) index scores are also in lowest and highest quantiles, respectively. Places with more moderate values for the composite index are distributed among the intermediate quantiles. As a result, some segments with relatively low index scores may have high ranks (i.e., are in a high quantile).

The assessment also enables us to compare the relative habitat value of shoreforms and habitat types. River deltas, barrier beaches, and bluff-backed beaches tend to have above average mean scores for the composite index (Figure 4.18). Artificial shoreforms had higher average scores than anticipated because many of them are associated with river mouths (i.e., Puyallup and Duwwamish Rivers) where all salmonid species are present. Pocket beaches, barrier lagoons, and open coastal inlets have below average mean scores, which is contrary to our intuitions about their habitat value. The pattern of mean relative habitat value for shoreforms was different among sub-basins. Mean scores exhibited little difference across shoreforms in the San Juan Sub-basin. In contrast, deltas had mean scores much greater than other shoreforms in the South Puget Sub-basin. Among the Dethier (1990) habitat types partially exposed types tended to have higher mean scores than semi-protected types (Figure 4.19). Habitat types with organic substrates tended to have much higher mean scores than other substrates. Organic substrates were often located at river mouths and river mouths have relatively higher index scores because all salmonid species are present at most major river mouths.

The larger grain assessments can guide regional protection and restoration actions. There was a high level of concurrence between the two larger grain assessments (Tables 4.4 and 4.5). In five of the seven oceanographic sub-basins, river mouths were among the top five places. This is especially true in the Juan de Fuca and Hood Canal sub-basins where river mouths are still relatively undeveloped. According to the moving window average, spits were another feature commonly among the top 5 places for most sub-basins.

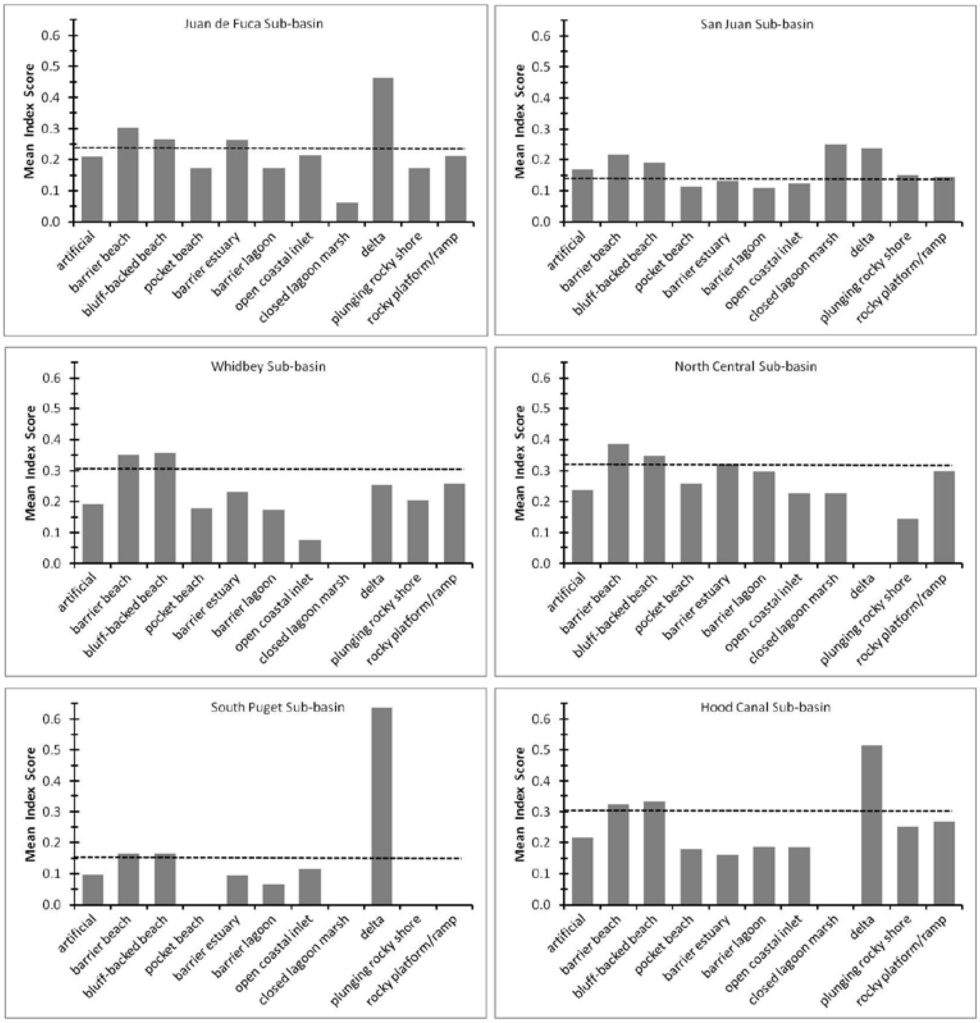

Figure 4.18. Mean composite index of relative habitat value for shoreforms for six of the seven sub-basins. Dashed line is average score (not weighted by segment lengths) for all shoreforms within each sub-basin. No bar means the habitat type does not exist in that sub-basin.

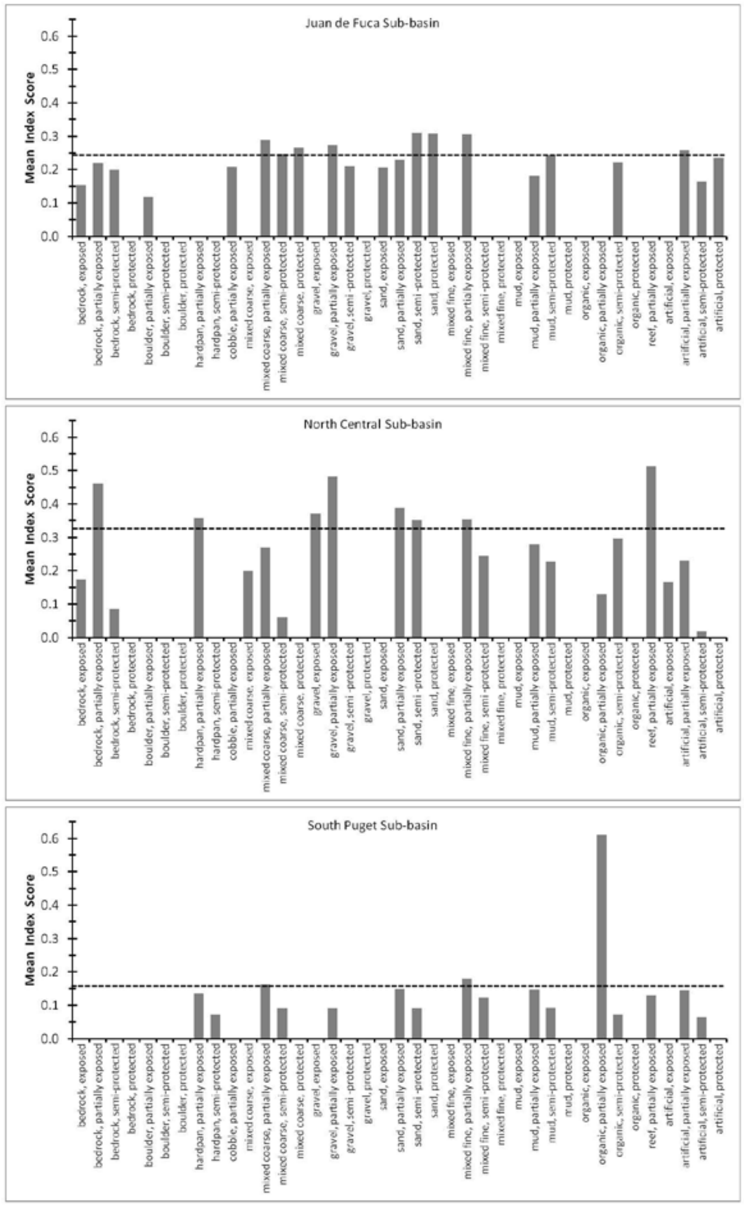

Figure 4.19. Mean composite index of relative habitat value for Dethier (1990) habitat types for three of seven sub-basins. Dashed line is average value (not weighted by segment lengths) for all habitat types within each sub-basin. No bar means the habitat type does not exist in that sub-basin.

Table 4.4. PSNERP shoreline process units with the highest mean composite index scores in each sub-basin. A succinct geographic description of each place is provided, but process unit identification numbers should be used for exact location.

Sub-basin	Process Unit ID	Geographic Description
Juan De Fuca	• 9016	mouth of Dungeness to Kulakala Point
	• 1028	from Slip Point almost to Pillar Point
	• 1023	inside of Dungeness Spit
	• 9017	mouth of Elwha
	• 1024	inside Dungeness Spit
San Juan	• 9002	mouth of Nooksack
	• 7166	northeast side of March Point
	• 7167	north end of March Point
	• 7143	Birch Point to Semiahmoo Spit
	• 7168	Crandall Spit, north end of March Point
North Central	• 5015	Indian Island, northeast shore
	• 5016	Indian Island, north shore
	• 5036	Indian Island, south tip and southeast shore
	• 5017	Indian Island, north shore
	• 5026	Kuhn Spit to Old Fort Townsend in Port Townsend Bay
Whidbey	• 6057	Gedney Island, north end
	• 6027	Ben Ure spit and south of spit
	• 6046	Camano Head, west side
	• 6060	Gedney Island, northeast side
	• 6051	Sundins and Jupiter Beaches near mouth of Stillaguamish River
Hood Canal	• 9014	mouth of Dosewallips River
	• 9011	mouth of Skokomish River
	• 9015	Quilcene Bay, from Indian George Creek to Camp Discovery
	• 2047	mouth of Duckabush River
	• 2028	Twanoh State Park
South Central	• 4065	Burke Bay
	• 4148	mouth of Duwammish River
	• 4128	Agate Point
	• 4147	Agate Pass, east shore
	• 4064	Burke Bay
South Puget	• 9009	mouth of Nisqually River
	• 3065	southeast shoreline of Totten Inlet
	• 3013	north of Dogfish Bight; south shore of Nisqually Reach
	• 3094	Chapman Cove off Oakland Bay
	• 3067	just north of Gallagher Cove in Totten Inlet

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Table 4.5. Shorelines with the highest average composite index score in each sub-basin based on 2 mile moving window average. Where shorelines did not have an official place name we succinctly describe the location.

Sub-basin	Places with Highest Index Value
Juan De Fuca	• mouth of Dungeness River • from Slip Point to almost Pillar Point • Dungeness Spit • Travis Spit at Sequim Bay • mouth of Elwha
San Juan	• mouth of Nooksack River • Semiahmoo Spit • east side of March Point • island between Samish River and Edison Slough • Crandall Spit in Fidalgo Bay
North Central	• north and northeast shores of Indian Island • Harrowstone Island, north and south of Mystery Bay • Indian Island, south of Bishops Point • Indian Island, embayment wetland north shore of Oak Bay • isthmus between Indian and Harrowstone islands
Whidbey	• mouth of Snohomish • mouth of Stillaguamish • mouth of Skagit • south of Ben Ure Spit • south end of Camano Island
Hood Canal	• mouth of Skokomish River • mouth of Dosewallips River • mouths of Big and Little Quilcene Rivers • mouth of Duckabush River • east shore of Dabob Bay, from Camp Discovery to 2 miles south
South Central	• Burke Bay • near Old Man House State Park (Agate Pass) • north of Agate Pass Bridge on Bainbridge Island (Agate Pass) • mouth of Puyallup River • mouth of Duwammish River
South Puget	• mouth of Nisqually River • shoreline north of Nisqually River estuary • Kennedy Creek estuary • mouth of Deer Creek at head of Oakland Bay • south shore of Totten Inlet, near its mouth

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4.3.3. Index Properties

Sound wide, the components that made the largest contribution on average to the composite index were Dungeness crab, urchins, surf smelt, intertidal clams, and wetlands (Figure 4.21). Twenty-four of the 41 components each comprised, on average, ≤ 1% of the composite index , and of those, 3 components each comprised ≤ 0.1% of the composite index on average. However, the components with small average contributions (≤ 1%) still made contributions ranging from 24 to 100% at individual segments. The components' contributions varied by sub-basin (Figure 4.22). For instance, the biggest contributors in the Juan de Fuca Sub-basin were urchins, Dungeness crab, and important bird areas (IBA). In contrast, the biggest contributions to the composite index in the South Puget Sub-basin were intertidal clams, geoduck, and surf smelt.

The sensitivity analysis showed that the composite index is most sensitive to the components that have LO models (Figure 4.23). This sensitivity is caused by the high proportion of shoreline segments that have non-zero values for LO models. The model output was also sensitive to the salmonid species data and had about the same degree of sensitivity to all 8 salmonid species. The sensitivity of the index to a component was moderately correlated ($\rho = 0.49$) with the component's average contribution to the index.

The uncertainty analysis indicates that a large proportion of shoreline segments with different index values may not be significantly different. That is, given the assumptions of our simple uncertainty analysis, the relative habitat value of many shoreline segments is effectively the same. In the Juan de Fuca Sub-basin, for example, the 200 shoreline segments with average index scores between approximately 0.2 and 0.4, are not significantly different from each other (Figure 4.24). How confident we can be about identifying the highest value segments differs amongst sub-basins. For instance, in the Hood Canal Sub-basin, the top two segments are significantly different than nearly all other segments in the top 40 (Figure 4.25). In contrast, the top two segments in the South Central Sub-basin are not significantly different than any other segments in the top 40.

Greater uncertainty does not mean that a shoreline segment has lesser value than that estimated by this assessment. Greater uncertainty means that the actual relative habitat value could be larger or smaller than the estimated value.

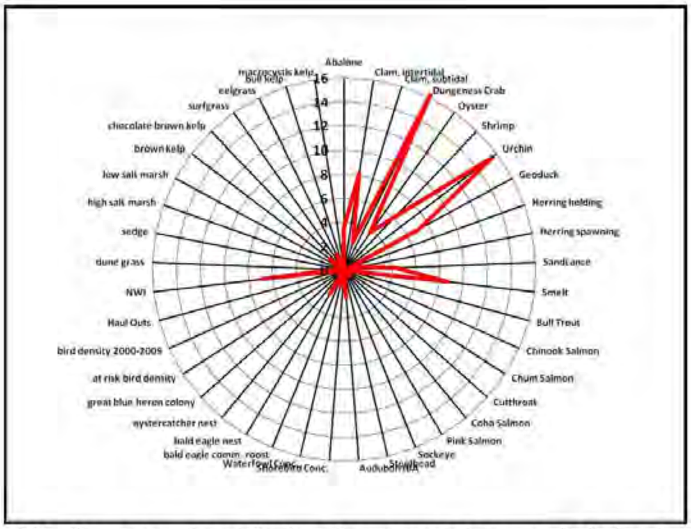

Figure 4.21. Mean percent contribution of components to composite index of relative habitat value. There is a radial axis for each of the 41 components of the composite index. NWI and IBA mean national wetlands inventory and important bird areas, respectively.

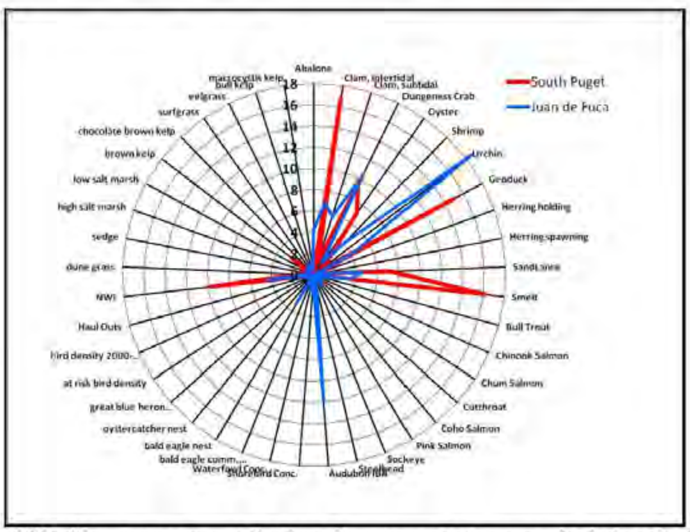

Figure 4.22. Mean percent contribution of components to composite index of relative habitat value for South Puget and Juan de Fuca sub-basins. There is a radial axis for each of the 41 components of the composite index. NWI and IBA mean national wetlands inventory and important bird areas, respectively.

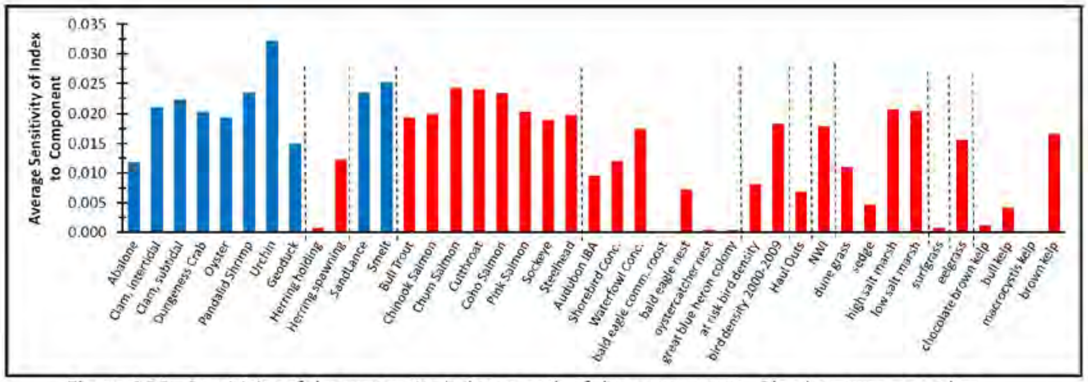

Figure 4.23. Sensitivity of the composite index to each of the components. Blue bars correspond to species with relative likelihood of occurrence (LO) models. Vertical dashed lines demark groups with similar taxonomy or functional characteristics.

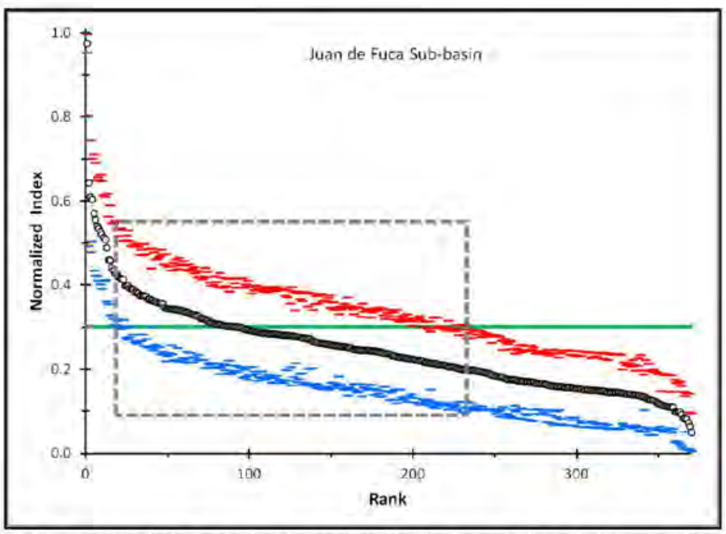

Figure 4.24. Results of the uncertainty analysis for the Juan de Fuca Sub-basin. The 372 shoreline segments in the Juan de Fuca Sub-basin are sorted from highest to lowest average composite index score. Hollow circles are average scores for each shoreline segment. Red and blue bars encompass 90% of simulation replicates. That is, the bars demark the 90% confidence interval. Green line arbitrarily set at average index = 0.3. Shoreline segments within dashed box are not significantly different according to the uncertain analysis. Segments to the left and right of the dashed box are significantly different.

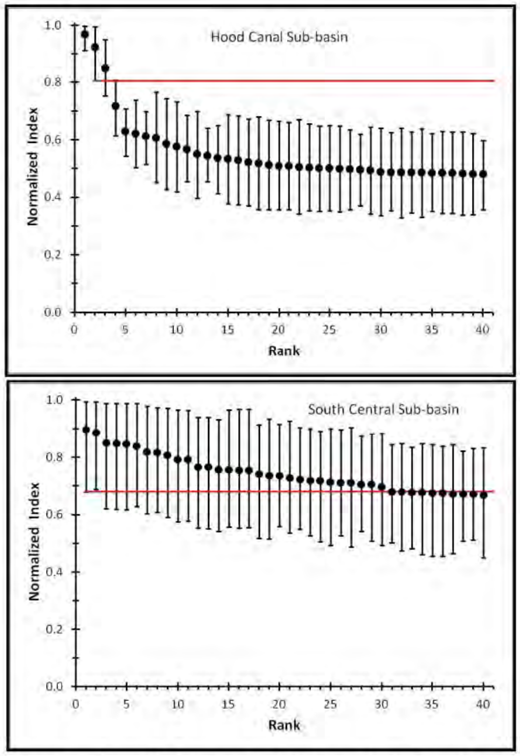

Figure 4.25. Examples of results from uncertainty analysis by sub-basin. Shoreline segments are sorted from highest to lowest component index score. Only top 40 shoreline segments in sub-basin are shown. Filled circles are average score for each shoreline segment. Error bars encompass 90% of simulation replicates. That is, the bars demark the 90% confidence interval. Red line delineates location of lower limit for particular segment: second best shoreline segment in Hood Canal and best shoreline segment in South Central. Upper limits below the red line indicate a significant difference.

4.4. Discussion

The main products of the marine shoreline habitats assessment are two indices that summarize disparate data on the occurrence or abundance of 41 species, species groups, and habitat types. The indices indicate the *relative value* of marine shoreline segments based on habitat functions – i.e., higher scores indicate shoreline segments with relatively more habitat functions than segments with lower scores. We developed two indices because relying on a single index would obscure important information. The composite index is a sum of 41 components, hence, it mainly reflects the quantity of habitat functions at shoreline segments. In general, shoreline segments with many habitat functions obtain the highest scores for the composite index. However, if we relied on only the composite index, then segments with a small number of habitat functions but high relative value for only a small number of functions would obtain low scores. We want to know about such places – i.e., those that have high value for a few habitat functions. The top-5 index was created to provide that information and should be used in conjunction with the composite index. A comparison of Figures 4.12 and 4.14 demonstrates the necessity of the top-5 index. The relative value of many shoreline segments is much greater in Figure 4.14 than Figure 4.12.

The intended application of the marine shoreline habitats assessment is land use plans, such as shoreline master programs, produced by local governments. City and county governments have regulatory authority over land use along marine shorelines, and the allowed land uses they designate through shoreline master programs and comprehensive plans may be the most important actions affecting the health of marine shoreline habitats. Local land use planning along marine shorelines is governed by Washington's Shoreline Management Act (SMA; RCW 90.58). The governing principles (WAC 173-26-186) of the shoreline guidelines (WAC 173-26-176) established under the SMA state, "Local [shoreline] master programs shall include policies and regulations designed to achieve no net loss of those ecological functions." Any shoreline segment with composite index score greater than zero contains or is in close proximity to at least one ecological function. According to our assessment, nearly every shoreline segment in Puget Sound (>99%), even highly degraded shorelines, has a composite index score greater than zero. When developing or revising land use plans, local governments can use this assessment to summarize the relative value of shoreline segments based on habitat functions and to create a partial accounting of habitat functions along all shorelines under their jurisdiction.

The intended application of the marine shoreline habitats assessment is quite different than the intended application of the terrestrial and freshwater habitats assessments. The main application of the terrestrial and freshwater assessments is local land use planning which is governed by Washington's Growth Management Act (GMA). Under GMA, local land use plans must accommodate projected human population growth (RCW 36.70A.110, 36.70A.115). The terrestrial and freshwater habitats assessments should be used to direct new growth away from places with relatively high habitat value and toward places with relatively low habitat value. In contrast, the SMA does not require the accommodation of human population growth, and regulations promulgated under the SMA stipulate no net loss of ecological functions. Therefore, the marine shoreline habitats assessment should *not* be used to direct new growth toward places with relatively low habitat value. The marine shoreline assessment should be used in conjunction with other information, such as PSNERP'S assessment (Cereghino et al. 2012), to direct restoration activities toward places with relatively low habitat value and to direct protection activities toward places with relatively high habitat value.

Further discussion of the assessments is provided in Part 5 of this report.

4.4.1. Validation

Validation entailed comparing the index scores against our collective knowledge of the Basin – does the index show places we believe to be relatively more important as more important and places we believe to be relatively less important as less important. In most places the index scores conform to our expectations. For instance, the relatively intact mouths of the Nisqually and Skokomish rivers have high index scores and the degraded shorelines of Olympia and Shelton, which support few habitat functions, have low index scores. This pattern is repeated throughout Puget Sound. Surprisingly, however, even some highly degraded shorelines obtained high relative values. Because eight migrating salmonid species are present there, the mouths of the Dumwamish and Puyallup rivers were amongst the highest scoring shorelines in their sub-basins. Because they are highly degraded, PSNERP's assessment (Cereghino et al. 2012) did not recommend the mouths of the Dumwamish or Puyallup rivers for protection or restoration. Nevertheless, planners should remain aware of the habitat functions at these and other degraded sites.

Comparing the results to our expectations revealed a potential shortcoming the assessment. The low mean scores for lagoons and inlets is contrary to our intuition about their habitat value. This may be due to the shortcomings of our data. For instance, our data on salmonid species presence are based mostly on adult presence. Other life stages are poorly represented in the data. Many coastal inlets are associated with small streams that do not contain adult salmon species but may support juveniles (E. Beamer, Skagit River System Cooperative, pers. com.). Furthermore, lagoons and inlets may provide sheltered foraging or resting areas for waterfowl but PSAMP bird surveys do not cover small inlets, and therefore, the presence of waterfowl or other water-dependent birds is unobserved and unrecorded. In short, the data available to us may underestimate the habitat value of lagoons and inlets.

Another form of validation is comparison to other ecological assessments of Puget Sound. During the past decade, two major efforts have published maps depicting "high priority" sites for marine habitat conservation in Puget Sound: the Washington Department of Natural Resources' priority marine sites (Palazzi and Bloch 2006) and The Nature Conservancy's nearshore conservation portfolio (Floberg et al. 2004). Both efforts were done for different purposes and used different methods. Unlike our assessment, these two other efforts did not assign scores to all shorelines. Instead, they identified a subset of shorelines that they determined to be the highest priority for conservation – Palazzi and Block (2006) identified 34 large sites and Floberg et al (2004) selected about 30% of all shorelines in Puget Sound. Palazzi and Block (2006) relied almost exclusively on expert opinion and Floberg et al (2004) used an optimization algorithm that found the most efficient set of sites for conservation. Palazzi and Block (2006) used criteria such as unusual spawning, nursery, or feeding areas; areas that include entire life history of a species; and areas that contain viable populations for which there are no empirical data; and included criteria such as adjacent to upland conservation areas, high ecological quality, and ecological connectivity which we did not include in our index. An influential factor in Floberg et al. (2004) was a cost index that directed site selection away from shorelines that were highly degraded. Given these differences between our assessment and these other assessments we expect differences in the results, Nevertheless, we also expect some congruence between our assessment's highest scoring shoreline segments and the high value sites identified by Palazzi and Block (2006) and Floberg et al (2004).

In comparing the results of our assessment to those of Palazzi and Bloch (2006) there are obvious similarities and differences (Figure 4.26). Our assessment and theirs identify the shoreline from Slip Point to Pillar Point, Kilisut Harbor, mouth of the Elwah River, mouth of Skagit River, mouth of the Nisqually River, and the Agate Pass area as conservation priorities. Our assessment assigned high index scores to the Dungeness Spit, Semiahmoo Spit, Ben Ure Spit, shorelines in Dabob Bay, mouths of Big and Little Quilcene Rivers, and the mouth of Kennedy Creek but Palazzi and Bloch (2006) did not identify these as conservation priorities. Other major differences in methods that further explain the differences in results are: 1) spatial scale – Palazzi and Block's high priority sites are many times larger than our assessment units; and 2) their assessment included all waters in Puget Sound, whereas our assessment covers only waters within 400 m of shorelines.

Figure 4.26. Priority marine sites for conservation in Puget Sound from Palazzi and Bloch (2006). Thirty four sites are shown in green.

Floberg et al. (2004) and our assessment both identify Sequim bay, Discovery Bay, Kilisut Harbor, Quilcene bay, Tarboo Bay, Agate Pass, Lynch Cove, mouths of the Skokomish and Nisqually Rivers, and mouths of Kennedy and Skookum creeks as high value sites (Figure 4.27). Floberg et al. (2004) did not identify the mouths of the Duwamish, Puyallup, and Snohomish Rivers as high value because those site have high costs for conservation. Other discrepancies between our assessment and Floberg et al. (2004) in the South Central and Whidbey sub-basins can be attributed to their cost index. Another major difference in methods that further explains the differences in results is that Floberg et al. (2004) did not divide Puget Sound into sub-basins, and therefore, their high values sites are unevenly distributed across Puget Sound and biased toward less developed portions of Puget Sound. In fact, very little shoreline in

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the Whidbey and South Central sub-basins were selected by Floberg et al. (2004), and this was due largely to the uneven distribution of their cost index across the seven sub-basins.

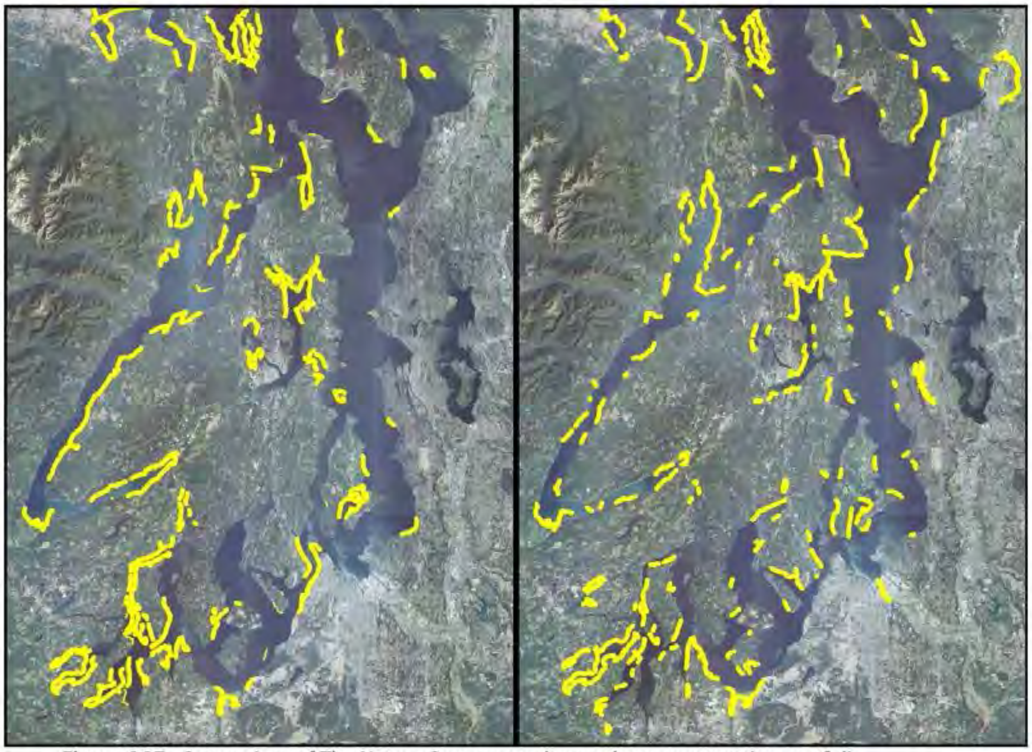

Figure 4.27. Comparison of The Nature Conservancy's nearshore conservation portfolio (Floberg et al. 2004; left panel) to our assessment (right panel). For our assessment, yellow denotes segments in the top 30% of composite index scores.

The differences between the results of this assessment and those of Palazzi and Block (2006) and Floberg et al (2004) demonstrate the folly in relying on a single assessment for planning and decision making. The three assessments serve different purposes and all three provide useful information.

4.4.2. Caveats

Our indices indicate the amount of co-occurring habitat functions for those particular species and life stages for which we collect data. In general, we collect occurrence data for particular species or habitat types because: 1) they are harvested; 2) they are rare or imperiled; or 3) they are highly sensitive to human disturbance. In other words, we collect data on those species and habitat types we are most concerned about. Therefore, we assumed that an assessment based on these data should indicate those places we should be most concerned about for the conservation of fish and wildlife. However, the occurrences of the species we used in this assessment very likely correlate with the occurrences of many

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other species. For instance, urchin and northern abalone, which were components of our index, are likely to co-occur with other species associated with rocky substrates. Nevertheless, the 41 components that comprise the indices are not a comprehensive accounting of the habitat functions for the many animal and plant species that are found along the marine shorelines of Puget Sound. We lack occurrence data for the majority of species. Other vital habitat functions, such as nearshore rearing habitat for juvenile salmonids, are not adequately addressed by our assessment.

The extent of our analysis covers the entire Puget Sound, however, we split the Sound into oceanographic sub-basins. The seven oceanographic sub-basins are based on bathymetry and circulation patterns, but these sub-basins also reflect regional patterns in shoreline geology, geomorphology, and wave environment (Shipman 2008), which manifest regional patterns in biological communities. We minimized comparisons of dissimilar biological communities by doing our assessment calculations within sub-basins. *Index scores cannot be compared across sub-basins*. Our assessment in its current form does not enable Basin-wide comparisons. Regional authorities should keep that in mind when using this assessment. The assessment may be useful for establishing regional priorities for protection and restoration of shorelines, but be aware that comparisons are only valid within sub-basins.

For most components that comprise the indices, we believed error rates in the occurrence data were acceptable. For a subset of components we believed error rates were likely to be unacceptable, and for these we developed LO models. LO models may overestimate the relative likelihood of occurrence, but we believed using a model with a high rate of false positives was more precautionary, and hence, preferable, to using data with a high rate of false negatives. Those components for which we did not develop an LO model were assumed to be equally accurate. This is unlikely to be true. Some datasets are regularly updated through annual systematic surveys (e.g., PSAMP bird surveys), while other datasets rely on the reporting and recording of incidental observations (e.g., bald eagle nests, great blue heron colonies). We could have compensated for these differences in accuracy by weighting some data sets more heavily than others, but we chose not do this because evaluating relative accuracy and assigning weights would entail numerous subjective judgments.

4.4.3. Potential Improvements

Our indices could be improved several ways. First and foremost, more up-to-date and accurate occurrence data are needed. Some of the occurrence data, in particular, those data described in WDF (1992), are decades old. The sensitivity analysis showed that the index is most sensitive to the LO models which were developed primarily for those shellfish species found in WDF (1992). Because we lack actual absence data, the accuracy of the LO models is unknowable. Future collections of occurrence data should include the locations of true negatives – i.e., locations were a species is known to be absent. Furthermore, our indices could be improved by collecting data on particular key species or species' life stages. We lack, for example, occurrence data for native Olympia oyster; our oyster occurrence data are for nonnative Pacific oyster. We also lack occurrence data for rearing areas of juvenile salmonids and Dungeness crab. The juvenile life stages of these species use different habitats than their adult life stages. Rearing habitats serve essential functions that our index does not currently capture for these species. Inaccurate or noncomprehensive data can result in the mischaracterization of high value shorelines as low value and low value shorelines as high value. Both errors lead to an inefficient allocation of resources for protection and restoration of shorelines. Hennessey et al. (2011) also recommended collecting data on fisheries; habitats, marine fish, and threatened and endangered species, including state sensitive species and state species of concern.

Second, a process of validating the index should be explored. Formal model validation entails testing the accuracy of model predictions. Statistically rigorous model validation is purely objective. However, we cannot do a rigorous validation of our current index because notions of conservation "value" are normative and the current index is based on best professional judgment. Future attempts to assess the relative habitat value of shorelines could objectify value by monetizing the ecosystem services provided by the habitat functions of marine shorelines.

Third, a marine shoreline assessment that integrates structure, process, and function should be developed. Our index of relative habitat value is based on habitat functions. Habitat functions are dependent upon properties of ecosystem structures and processes, and hence, the relationships between functions and processes or structures are sometimes obscure. A quantitative model built on these relationships would provide a fuller understanding of why a place is important and insights about how to manage that place. Until we have such a model, we will improvise an integration of this assessment, which emphasizes function, with PSNERP's assessment (Cereghino et al. 2012) which emphasizes processes.

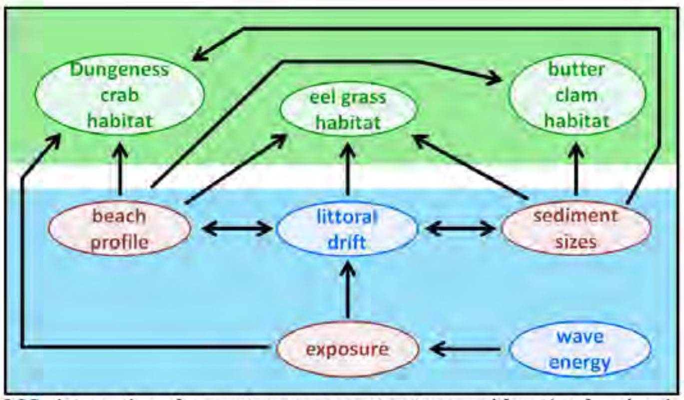


Figure 4.28. Integration of ecosystem process, structure, and function for planning and decision making. PSNERP's assessment (Cereghino et al. 2012) covers process and structure (blue area) and this assessment covers habitat functions (green area). Both assessments contribute information for understanding local shoreline ecosystems.

4.4.4. Integrating Process and Function

An assessment based solely on the occurrence on habitat functions will not provide a complete understanding of each shoreline's relative value and will neglect essential information for guiding management actions. We must also consider the ecosystem processes and structures that are responsible for creating and maintaining habitat functions (Figure 4.28). PSNERP (Cereghino et al. 2012) provides information on the condition of nearshore ecosystem processes within individual drift cells. Specifically, PSNERP assessed the relative degradation of littoral drift. In PSNERP's assessment, degradation reflects the relative loss of historical ecosystem services as indicated by landform change and shoreline modification (Table 4.6). Particular attention was given to indicators of degradation thought to be important in process dynamics.

Table 4.6. Metrics used to assess degradation of beach and barrier embayments in the PSNERP assessment (Cereghino et al. 2012).

Degradation Metrics	Degradation Index: Beach	Degradation Index: Embay-ment	Description
Lost Embayment Length		■	Loss of length was calculated as the total length of current embayment landform subtracted from the total length of historical embayment landforms within a site. While some change in length was attributed to mapping error, this metric provided a measure of gross physical change in the system to complement presence of linear stressors and nearshore zone development in barrier embayment sites.
Nearshore Impervious	■	■	The percentage of land area within 200 m of the shoreline with impervious surfaces estimated as greater than 10% was used to describe the intensity of development at a site. Development indicated by impervious surface was assumed to indicate the combination of intensive use, chronic pollution, modified hydrology, and loss of native vegetation.
Parcel Density	■		The mean number of parcels per 100m in a shoreline process unit was used to characterize both challenges and costs of negotiating protection or restoration of sediment supply and transport under complex parcel ownership, as well as chronic impacts from high density residence on vegetation and drift wood.
Sediment Supply Degradation	■	■	The sediment input degradation metric was developed by Schlenger et al. (2011) to predict the effect of overlapping stressors on the degradation of sediment input. In shoreline process units, this metric calculated the percentage of bluff-backed beach landforms located in a drift cell component showing either divergence or transport (i.e. DZ, LtR or RtL) that was covered by either fill, armoring, railroads, roads or an artificial landform, all of which PSNERP anticipated to potentially affect sediment supply budgets.
Tidal Flow Degradation		■	The tidal flow degradation metric was developed by Schlenger et al. (2011) to predict the effect of overlapping stressors on the degradation of tidal flow in embayments and river deltas. Within shoreline process units, tidal flow degradation was estimated as the percent of embayment landform length with either tidal barrier, fill, railroad, or an artificial landform.

PSNERP used their degradation assessment to develop management strategies. There were separate PSNERP strategies for deltas, coastal inlets, beaches, and barrier embayments. PSNERP mapped 16 major river deltas in Puget Sound. Because the ecological functions (existing, historical, and potentially restorable functions) of river deltas and their estuaries are universally recognized as essential and irreplaceable, deltas have been a focus of considerable attention in Puget Sound, and will continue to be a focus for the foreseeable future. Our assessment has little to contribute to the many comprehensive and detailed plans for the restoration and management of river deltas (e.g., Beamer et al. 2005, USFWS 2005, WDFW 2008b, NOAA 2009).

There are 266 coastal inlets. Human activities at coastal inlets affect their habitat functions, but activities within the inlet's entire drainage area may also have a significant impact on habitat functions. Therefore, effective management of coastal inlets must also consider land use activities far removed from the inlet's location. This will require integration of this assessment, PSNERP's assessment, and the freshwater habitats, terrestrial habitats, and water flow assessments that are part of the Puget Sound Partnership's Watershed Characterization Project. That complex process is beyond the scope of this report. Volume 3 of the Watershed Characterization Project will provide guidance for integration of multiple assessments.

The connections between shoreline habitat functions and drift cell processes are probably strongest along beaches and barrier embayments. There are 812 drift cells in Puget Sound, so some system is needed to simplify and thereby facilitate the integration of the PSNERP strategies with the results of our assessment. *Protect* is recommended for the least degraded drift cells, *enhance* for the most degraded drift cells, and *restore* for those drift cells in between (Table 4.7). To simplify the PSNERP strategies we combined the beach and barrier embayment strategies by comparing the two recommendations for each drift cell and taking the recommendation with the minimum level of degradation. To facilitate integration of the PSNERP strategies with our assessment, we calculated the mean composite index for each drift cell and then divided the drift cells into three groups by terciles. The three groups correspond to three levels of mean relative habitat value – high, medium, and low (Figure 4.29).

The integration scheme uses PSNERP's three management recommendations and the three levels of relative habitat value. The combination of the PNSERP strategy and habitat value should help to further refine management priorities within sub-basins. Where relative habitat value and the level of degradation are congruent (i.e., highest habitat & lowest degradation, intermediate habitat & intermediate degradation, lowest habitat & highest degradation), which occurs for about one-third of drift cells, then site-level management decisions should be straightforward. That is, a drift cell recommended for protection with high relative habitat value should be a higher priority for protection than drift cell recommended for protection with a medium or low relative habitat value. Likewise, a drift cell recommended for restoration with high habitat value should be a higher priority for restoration than drift cell recommended for restoration with a medium or low value.

When the assessments are not congruent, what is the management recommendation? For instance, how should we manage shorelines that have are highly degraded shoreline processes (enhance recommendation) but high relative habitat value (which describes about 11 percent of drift cells)? "Enhance" signifies a low priority for protection or restoration but high habitat conservation value contraindicates that recommendation. Site-level management decisions for these drift cells will require further analysis and a reappraisal of conservation objectives. Local information is important for all site-level decisions, but will be especially important under these circumstances.

Why would the assessments be incongruent? For instance, why would a drift cell have high degradation and high habitat value or low degradation and low habitat conservation value? There are several potential explanations. First, there may be time lags in the responses of fish, wildlife, and plant species to the degradation of nearshore processes. In other words, it may take some time for a degraded drift cell to lose its habitat functions. Second, certain fish and wildlife species may be responding to ecosystem structures and processes other than those related to littoral drift. For instance, they may be responding to the proximity of nearby rocky reefs, upwelling currents, or local fetch. Third, species could be responding to structures or processes that occur at spatial scales different than those of our assessment. And finally, the two assessments may be incongruent because one or both of them are wrong. Even the best models are occasionally wrong, and hence, there will be portions of the Puget Sound shoreline (hopefully very small portions) where the assessments are wrong.

Table 4.7. Relationship between drift cell degradation and management recommendations from the Puget Sound Nearshore Ecosystem Restoration Project (PSNERP; Cereghino et al. 2012).

Low Degradation	Moderate Degradation	High Degradation
Protection	**Restoration**	**Enhancement**
Site likely provides substantial ecosystem services in its existing state. The primary goal of management is to prevent and substantial loss of ecosystem processes or functions.	Site where indicators of degradation suggest the opportunity to substantively increase ecosystem services through restoration.	Site where the level of degradation appears to be so intense that restoration of self-sustaining and resilient ecosystem services may be severely compromised. Focus on enhancement of critical habitat functions.

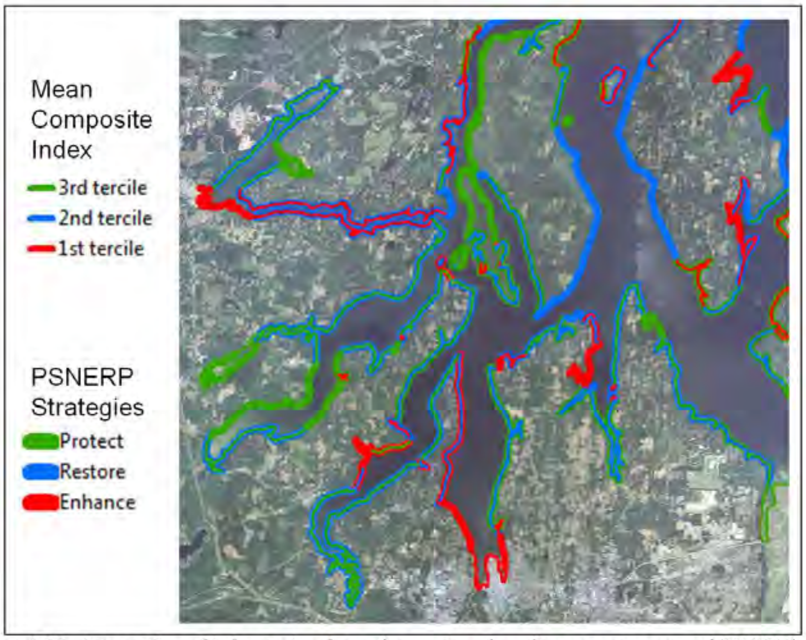


Figure 4.29. Integration of information from the marine shoreline assessment and PSNERP's assessment (Cereghino et al. 2012). Overlay of mean composite index onto the PSNERP strategies for beaches and embayments. The composite index was averaged over each drift cell. Terciles for mean composite index (thinner center line) were calculated for each sub-basin. Green is highest relative habitat value and red is lowest relative value. Beach and embayment strategies (thicker line) were combined by comparing strategies for each drift cell and taking the recommendation with the minimum level of degradation: protect < restore < enhance. Management recommendations for deltas (Nisqually and Deschutes rivers) not shown.

SUB_AREA_I	FID_PAT_SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_ShoBas	ShoBas_ID	SZUnit_ID	P3SPU1	P3SPU2	New_SAU	Beach_ft	SumAll	AvgTop5	vig_SumAll	ter_SumAll	vig_AvgTop	Large_1	Large_2	Large_3	Large_4	Large_5
1	11	61922.35044	10401918.63050	111964872.44000	4406	3345	2624	4015	0	4032	3517.23153	0.44545	0.56067	14	2	17	1	1.00000	0.33333	0.25000	0.22000
1	11	61922.35044	10401918.63050	111964872.44000	4407	3342	2621	4015	0	4032	580.70116	0.38410	0.51600	11	2	15	1	1.00000	0.31000	0.22000	0.05000
1	11	61922.35044	10401918.63050	111964872.44000	4418	3365	2639	0	4016	4034	1453.65510	0.54662	0.61667	16	3	18	1	0.75000	0.66667	0.50000	0.16667
1	11	61922.35044	10401918.63050	111964872.44000	4419	3380	2651	4019	0	4039	716.45455	0.28366	0.33800	8	2	10	1	0.19000	0.19000	0.19000	0.12000
1	11	61922.35044	10401918.63050	111964872.44000	4420	3378	2650	0	4018	4037	783.23919	0.50459	0.65200	15	3	18	1	1.00000	1.00000	0.15000	0.11000
1	11	61922.35044	10401918.63050	111964872.44000	4421	3374	2646	0	4018	4037	1563.66396	0.27242	0.31556	7	2	8	1	0.17778	0.15000	0.14000	0.11000
1	11	61922.35044	10401918.63050	111964872.44000	4427	3390	2658	4021	4022	4044	1147.07611	0.25847	0.31600	7	1	8	1	0.19000	0.19000	0.12000	0.08000
1	11	61922.35044	10401918.63050	111964872.44000	4434	3355	2630	0	4016	4034	3106.32926	0.29637	0.33556	8	2	10	1	0.19000	0.19000	0.17778	0.12000
1	11	61922.35044	10401918.63050	111964872.44000	4435	3354	2630	0	4016	4034	125.13066	0.21820	0.27800	6	1	7	1	0.12000	0.11000	0.09000	0.07000
1	11	61922.35044	10401918.63050	111964872.44000	4436	3356	2631	0	4016	4034	140.19030	0.13573	0.15400	3	1	4	0	0.19000	0.19000	0.12000	0.08000
1	11	61922.35044	10401918.63050	111964872.44000	4437	3348	2626	4015	0	4032	3513.17611	0.40762	0.50081	12	2	15	1	1.00000	0.19000	0.19000	0.12403
1	11	61922.35044	10401918.63050	111964872.44000	4442	3331	2613	4015	0	4032	1201.50362	0.38226	0.47600	11	2	13	1	1.00000	0.17000	0.11000	0.10000
1	11	61922.35044	10401918.63050	111964872.44000	4443	3335	2615	4015	0	4032	3421.40934	0.59891	0.62133	17	3	18	1	0.75000	0.66667	0.50000	0.19000
1	11	61922.35044	10401918.63050	111964872.44000	4444	3334	2615	4015	0	4032	281.73287	0.28651	0.34200	8	2	10	1	0.21000	0.19000	0.19000	0.12000
1	11	61922.35044	10401918.63050	111964872.44000	4445	3341	2620	4015	0	4032	349.99006	0.52208	0.56667	16	3	17	1	1.00000	0.33333	0.25000	0.25000
1	11	61922.35044	10401918.63050	111964872.44000	4446	3339	2619	4015	0	4032	1720.69870	0.41922	0.50400	12	2	15	1	1.00000	0.19000	0.19000	0.14000
1	11	61922.35044	10401918.63050	111964872.44000	4447	3357	2631	0	4016	4034	475.51310	0.22551	0.27634	6	1	7	1	0.12000	0.11000	0.08000	0.07172
1	11	61922.35044	10401918.63050	111964872.44000	4448	3386	2655	4021	4020	4042	426.68022	0.37768	0.48400	11	2	14	1	1.00000	0.17000	0.14000	0.11000
1	11	61922.35044	10401918.63050	111964872.44000	4449	3388	2656	4021	4020	4042	361.61749	0.25931	0.31000	7	1	8	1	0.17000	0.14000	0.13000	0.11000
1	11	61922.35044	10401918.63050	111964872.44000	4450	3384	2654	4021	4020	4042	311.80943	0.39760	0.49200	12	2	14	1	1.00000	0.17000	0.15000	0.14000
1	11	61922.35044	10401918.63050	111964872.44000	4451	3387	2656	4021	0	4043	126.79463	0.26425	0.32400	7	1	9	1	0.19000	0.19000	0.12000	0.12000
1	11	61922.35044	10401918.63050	111964872.44000	4452	3375	2647	0	4018	4037	2289.59081	0.47954	0.57047	15	3	17	1	1.00000	0.43678	0.25556	0.16000
1	11	61922.35044	10401918.63050	111964872.44000	4453	3372	2645	4017	0	4035	607.93118	0.34326	0.38600	10	2	12	1	0.50000	0.16000	0.14000	0.13000

SUB_AREA_I	FID_PAT_SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_ShoBas	ShoBas_ID	SZUnit_ID	P3SPU1	P3SPU2	New_SAU	Beach_ft	SumAll	AvgTop5	vig_SumAll	ter_SumAll	vig_AvgTop	Large_1	Large_2	Large_3	Large_4	Large_5
1	11	61922.35044	10401918.63050	111964872.44000	4454	3366	2640	0	4016	4034	2439.89471	0.44431	0.42000	14	2	13	1	0.33333	0.26667	0.25000	0.25000
1	11	61922.35044	10401918.63050	111964872.44000	4455	3373	2645	0	4018	4037	3436.02738	0.30862	0.35178	9	2	11	1	0.28000	0.18889	0.15000	0.14000
1	11	61922.35044	10401918.63050	111964872.44000	4459	3338	2618	4015	0	4032	4345.00817	0.42812	0.52489	13	2	16	1	1.00000	0.24444	0.19000	0.19000
1	11	61922.35044	10401918.63050	111964872.44000	4462	3332	2613	4015	0	4032	1212.32116	0.38650	0.48000	11	2	14	1	1.00000	0.19000	0.12000	0.09000
1	11	61922.35044	10401918.63050	111964872.44000	4463	3340	2620	4015	0	4032	509.09484	0.35150	0.39067	10	2	12	1	0.33333	0.25000	0.25000	0.12000
1	11	61922.35044	10401918.63050	111964872.44000	4466	3440	2703	4015	0	4032	2680.80225	0.29288	0.32889	8	2	9	1	0.19000	0.19000	0.14444	0.12000
1	11	61922.35044	10401918.63050	111964872.44000	4467	3333	2614	4015	0	4032	1396.33733	0.54350	0.58333	16	3	17	1	0.66667	0.50000	0.50000	0.25000
1	11	61922.35044	10401918.63050	111964872.44000	4468	3330	2612	4015	0	4032	659.39138	0.13767	0.14200	3	1	3	0	0.17000	0.14000	0.11000	0.10000
1	11	61922.35044	10401918.63050	111964872.44000	4470	3389	2657	4021	0	4043	4751.59159	0.38460	0.48200	11	2	14	1	1.00000	0.19000	0.12000	0.10000
1	11	61922.35044	10401918.63050	111964872.44000	4471	3360	2634	0	4016	4034	597.89944	0.53449	0.65467	16	3	18	1	1.00000	0.75000	0.33333	0.19000
1	11	61922.35044	10401918.63050	111964872.44000	4472	3367	2641	0	4016	4034	2587.11970	0.34560	0.36578	10	2	11	1	0.28889	0.19000	0.19000	0.16000
1	11	61922.35044	10401918.63050	111964872.44000	4474	3362	2636	0	4016	4034	1173.82174	0.38024	0.42867	11	2	13	1	0.50000	0.33333	0.17000	0.14000
1	11	61922.35044	10401918.63050	111964872.44000	4475	3371	2644	0	4016	4034	637.12262	0.17775	0.18000	5	1	5	0	0.18000	0.16000	0.14000	0.13000
1	11	61922.35044	10401918.63050	111964872.44000	4476	3370	2643	0	4016	4034	733.55933	0.17756	0.18000	5	1	5	0	0.18000	0.16000	0.14000	0.13000
1	11	61922.35044	10401918.63050	111964872.44000	4477	3368	2642	0	4016	4034	362.76197	0.19237	0.21200	5	1	5	0	0.18000	0.16000	0.14000	0.13000
1	11	61922.35044	10401918.63050	111964872.44000	4478	3369	2642	0	4016	4034	1608.42948	0.35564	0.39867	10	2	12	1	0.37000	0.33333	0.15000	0.14000
1	11	61922.35044	10401918.63050	111964872.44000	4492	3439	2702	4015	0	4032	676.05933	0.24908	0.30000	6	1	7	1	0.15000	0.14000	0.11000	0.10000
1	11	61922.35044	10401918.63050	111964872.44000	4493	3347	2625	4015	0	4032	962.65535	0.48311	0.55467	15	3	17	1	1.00000	0.33333	0.25000	0.19000
1	11	61922.35044	10401918.63050	111964872.44000	4494	3346	2625	4015	0	4032	198.44685	0.40869	0.50200	12	2	15	1	1.00000	0.19000	0.19000	0.13000
1	11	61922.35044	10401918.63050	111964872.44000	4495	3358	2632	0	4016	4034	3153.54279	0.38178	0.47800	11	2	14	1	1.00000	0.19000	0.12000	0.08000
1	11	61922.35044	10401918.63050	111964872.44000	4500	3336	2616	4015	0	4032	3886.87833	0.44454	0.54867	14	2	16	1	1.00000	0.43333	0.19000	0.12000
1	11	61922.35044	10401918.63050	111964872.44000	4501	3382	2652	4019	4020	4040	2404.82361	0.16566	0.16467	4	1	4	0	0.19000	0.19000	0.13333	0.12000

SUB_AREA_I	FID_PAT_SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_ShoBas	ShoBas_ID	SZUnit_ID	P3SPU1	P3SPU2	New_SAU	Beach_ft	SumAll	AvgTop5	vig_SumAll	ter_SumAll	vig_AvgTop	Large_1	Large_2	Large_3	Large_4	Large_5
1	11	61922.35044	10401918.63050	111964872.44000	4502	3359	2633	0	4016	4034	658.30168	0.41967	0.51200	12	2	15	1	1.00000	0.25000	0.19000	0.12000
1	11	61922.35044	10401918.63050	111964872.44000	4503	3377	2649	0	4018	4037	1502.80262	0.40262	0.49000	12	2	14	1	1.00000	0.19000	0.15000	0.11000
1	11	61922.35044	10401918.63050	111964872.44000	4504	3376	2648	0	4018	4037	1365.75567	0.46568	0.55667	14	3	17	1	1.00000	0.33333	0.30000	0.15000
1	11	61922.35044	10401918.63050	111964872.44000	4506	3350	2627	4015	0	4032	2904.14808	0.35301	0.46000	10	2	13	1	1.00000	0.11000	0.10000	0.09000
1	11	61922.35044	10401918.63050	111964872.44000	4515	3337	2617	4015	0	4032	3030.88888	0.40815	0.49533	12	2	14	1	1.00000	0.19000	0.16667	0.12000
1	11	61922.35044	10401918.63050	111964872.44000	4525	3383	2653	0	4020	4041	468.09456	0.23034	0.26903	6	1	7	0	0.19000	0.19000	0.19000	0.12000
1	11	61922.35044	10401918.63050	111964872.44000	4526	3364	2638	0	4016	4034	3883.61648	0.44742	0.49133	14	3	14	1	0.50000	0.43333	0.33333	0.19000
1	11	61922.35044	10401918.63050	111964872.44000	4527	3361	2635	0	4016	4034	1907.17548	0.39527	0.48422	12	2	14	1	1.00000	0.19000	0.12000	0.11111
1	11	61922.35044	10401918.63050	111964872.44000	4528	3385	2654	0	4020	4041	2129.44912	0.47059	0.53241	15	3	16	1	1.00000	0.28205	0.19000	0.19000
1	11	61922.35044	10401918.63050	111964872.44000	4551	3349	2627	4015	0	4032	455.81594	0.18084	0.25048	5	1	6	1	0.13000	0.08000	0.04241	0.00000
1	11	61922.35044	10401918.63050	111964872.44000	4552	3352	2628	4015	0	4032	248.86175	0.32682	0.38867	9	2	12	1	0.33333	0.30000	0.17000	0.14000
1	11	61922.35044	10401918.63050	111964872.44000	4553	3351	2628	4015	0	4032	829.95146	0.42200	0.52449	13	2	15	1	1.00000	0.33333	0.15914	0.13000
1	11	61922.35044	10401918.63050	111964872.44000	4554	3353	2629	4015	0	4032	946.43135	0.52945	0.66200	16	3	18	1	1.00000	1.00000	0.19000	0.12000
1	11	61922.35044	10401918.63050	111964872.44000	4555	3344	2623	4015	0	4032	2222.96053	0.16172	0.22400	4	1	6	1	0.09000	0.01000	0.01000	0.01000
1	11	61922.35044	10401918.63050	111964872.44000	4556	3343	2622	4015	0	4032	2343.85942	0.16172	0.22400	4	1	6	1	0.09000	0.01000	0.01000	0.01000
1	11	61922.35044	10401918.63050	111964872.44000	4557	3381	2651	4019	4018	4038	793.56131	0.27745	0.32800	7	2	9	1	0.19000	0.17000	0.14000	0.14000
1	11	61922.35044	10401918.63050	111964872.44000	4558	3379	2650	4019	4018	4038	1035.84364	0.39728	0.49400	12	2	14	1	1.00000	0.18000	0.16000	0.13000
1	11	61922.35044	10401918.63050	111964872.44000	4559	3363	2637	0	4016	4034	1065.70025	0.38932	0.44267	11	2	13	1	0.50000	0.33333	0.19000	0.19000
2	20	41188.03212	6530220.73442	70290429.82410	4396	3292	2581	4013	0	4029	1421.46572	0.39266	0.49800	11	2	15	1	1.00000	0.19000	0.19000	0.11000
2	20	41188.03212	6530220.73442	70290429.82410	4397	3293	2582	4013	0	4029	845.50388	0.40381	0.49651	12	2	14	1	1.00000	0.19000	0.19000	0.10256
2	20	41188.03212	6530220.73442	70290429.82410	4399	3294	2582	4013	0	4029	661.86082	0.26755	0.31400	7	1	8	1	0.19000	0.17000	0.11000	0.10000
2	20	41188.03212	6530220.73442	70290429.82410	4405	3286	2578	4013	0	4029	198.69490	0.39799	0.49200	12	2	14	1	1.00000	0.19000	0.17000	0.10000
2	20	41188.03212	6530220.73442	70290429.82410	4422	3290	2580	4013	0	4029	2437.33093	0.48294	0.53754	15	3	16	1	1.00000	0.30769	0.19000	0.19000
2	20	41188.03212	6530220.73442	70290429.82410	4423	3284	2576	4013	0	4029	1334.16300	0.40160	0.49990	12	2	15	1	1.00000	0.19000	0.17949	0.13000
2	20	41188.03212	6530220.73442	70290429.82410	4424	3289	2580	4013	0	4029	278.17581	0.40047	0.49200	12	2	14	1	1.00000	0.19000	0.17000	0.10000
2	20	41188.03212	6530220.73442	70290429.82410	4429	3288	2579	4013	0	4029	795.94163	0.39476	0.49200	12	2	14	1	1.00000	0.19000	0.19000	0.08000
2	20	41188.03212	6530220.73442	70290429.82410	4433	3327	2610	0	4014	4031	848.49000	0.39661	0.47251	12	2	13	1	1.00000	0.15000	0.11000	0.10256

SUB_AREA_I	FID_PAT_SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_ShoBas	ShoBas_ID	SZUnit_ID	P3SPU1	P3SPU2	New_SAU	Beach_ft	SumAll	AvgTop5	vig_SumAll	ter_SumAll	vig_AvgTop	Large_1	Large_2	Large_3	Large_4	Large_5
2	20	41188.03212	6530220.73442	70290429.82410	4438	3287	2578	4013	0	4029	2388.53922	0.46315	0.53754	14	3	16	1	1.00000	0.30769	0.19000	0.19000
2	20	41188.03212	6530220.73442	70290429.82410	4439	3291	2580	4013	0	4029	2294.13087	0.47336	0.53241	15	3	16	1	1.00000	0.28205	0.19000	0.19000
2	20	41188.03212	6530220.73442	70290429.82410	4441	3319	2602	4013	0	4029	1318.79333	0.38678	0.47200	11	2	13	1	1.00000	0.15000	0.11000	0.10000
2	20	41188.03212	6530220.73442	70290429.82410	4457	3295	2583	4013	0	4029	368.12791	0.26584	0.31400	7	1	8	1	0.19000	0.17000	0.11000	0.10000
2	20	41188.03212	6530220.73442	70290429.82410	4458	3296	2584	4013	0	4029	894.98711	0.28298	0.31600	8	2	8	1	0.19000	0.17000	0.11000	0.11000
2	20	41188.03212	6530220.73442	70290429.82410	4464	3308	2592	4013	0	4029	632.52419	0.26473	0.31800	7	1	9	1	0.19000	0.19000	0.12000	0.09000
2	20	41188.03212	6530220.73442	70290429.82410	4465	3306	2591	4013	0	4029	662.19250	0.27586	0.31600	7	2	8	1	0.19000	0.17000	0.11000	0.11000
2	20	41188.03212	6530220.73442	70290429.82410	4468	3330	2612	4015	0	4032	659.39138	0.13767	0.14200	3	1	3	0	0.17000	0.14000	0.11000	0.10000
2	20	41188.03212	6530220.73442	70290429.82410	4469	3283	2575	4013	0	4029	1174.57263	0.29754	0.34067	8	2	10	1	0.19000	0.19000	0.19000	0.13333
2	20	41188.03212	6530220.73442	70290429.82410	4473	3285	2577	4013	0	4029	2515.88101	0.41345	0.50489	12	2	15	1	1.00000	0.19000	0.19000	0.14444
2	20	41188.03212	6530220.73442	70290429.82410	4484	3299	2586	4013	0	4029	1611.65094	0.44715	0.50303	14	3	15	1	1.00000	0.20513	0.19000	0.12000
2	20	41188.03212	6530220.73442	70290429.82410	4485	3298	2586	4013	0	4029	919.03219	0.45933	0.52171	14	3	15	1	1.00000	0.31034	0.17000	0.12821
2	20	41188.03212	6530220.73442	70290429.82410	4486	3297	2585	4013	0	4029	521.16296	0.27053	0.32800	7	1	9	1	0.19000	0.19000	0.14000	0.12000
2	20	41188.03212	6530220.73442	70290429.82410	4487	3301	2587	4013	0	4029	1630.75413	0.32833	0.34231	9	2	10	1	0.20513	0.19000	0.19000	0.12644
2	20	41188.03212	6530220.73442	70290429.82410	4488	3302	2588	4013	0	4029	1563.65205	0.59849	0.71667	17	3	19	1	1.00000	1.00000	0.33333	0.25000
2	20	41188.03212	6530220.73442	70290429.82410	4489	3300	2587	4013	0	4029	411.51028	0.29109	0.32848	8	2	9	1	0.19000	0.17241	0.17000	0.11000
2	20	41188.03212	6530220.73442	70290429.82410	4507	3328	2611	0	4014	4031	3221.19970	0.59433	0.72005	17	3	19	1	1.00000	1.00000	0.41026	0.19000
2	20	41188.03212	6530220.73442	70290429.82410	4508	3329	2611	0	4014	4031	880.53921	0.27463	0.30600	7	2	8	1	0.17000	0.14000	0.11000	0.11000
2	20	41188.03212	6530220.73442	70290429.82410	4529	3318	2601	4013	0	4029	1289.82150	0.57441	0.66733	17	3	18	1	1.00000	0.66667	0.50000	0.17000
2	20	41188.03212	6530220.73442	70290429.82410	4530	3313	2596	4013	0	4029	1490.35149	0.37700	0.48000	11	2	14	1	1.00000	0.19000	0.11000	0.10000
2	20	41188.03212	6530220.73442	70290429.82410	4531	3320	2603	4013	0	4029	684.77173	0.25327	0.30000	6	1	7	1	0.15000	0.14000	0.11000	0.10000
2	20	41188.03212	6530220.73442	70290429.82410	4532	3314	2597	4013	0	4029	867.38753	0.40578	0.50000	12	2	15	1	1.00000	0.19000	0.19000	0.12000
2	20	41188.03212	6530220.73442	70290429.82410	4533	3317	2600	4013	0	4029	3096.40577	0.39955	0.42356	12	2	13	1	0.34444	0.33333	0.25000	0.19000
2	20	41188.03212	6530220.73442	70290429.82410	4534	3321	2604	4013	0	4029	1112.14648	0.25629	0.30000	7	1	7	1	0.15000	0.14000	0.11000	0.10000
2	20	41188.03212	6530220.73442	70290429.82410	4535	3315	2598	4013	0	4029	676.39640	0.25654	0.30400	7	1	7	1	0.15000	0.14000	0.12000	0.11000
2	20	41188.03212	6530220.73442	70290429.82410	4536	3316	2599	4013	0	4029	524.50623	0.27078	0.32200	7	1	9	1	0.19000	0.19000	0.12000	0.11000
2	20	41188.03212	6530220.73442	70290429.82410	4537	3305	2590	4013	0	4029	1241.55079	0.29152	0.31400	8	2	8	1	0.16000	0.14000	0.14000	0.13000
2	20	41188.03212	6530220.73442	70290429.82410	4539	3304	2590	4013	0	4029	246.92666	0.24757	0.30000	6	1	7	1	0.15000	0.14000	0.11000	0.10000

SUB_AREA_I	FID_PAT_SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_ShoBas	ShoBas_ID	SZUnit_ID	P3SPU1	P3SPU2	New_SAU	Beach_ft	SumAll	AvgTop5	vig_SumAll	ter_SumAll	vig_AvgTop	Large_1	Large_2	Large_3	Large_4	Large_5
2	20	41188.03212	6530220.73442	70290429.82410	4540	3303	2589	4013	0	4029	892.35410	0.60010	0.71667	17	3	19	1	1.00000	1.00000	0.33333	0.25000
2	20	41188.03212	6530220.73442	70290429.82410	4541	3307	2592	4013	0	4029	1056.19187	0.27254	0.31600	7	2	8	1	0.19000	0.17000	0.11000	0.11000
2	20	41188.03212	6530220.73442	70290429.82410	4542	3309	2593	4013	0	4029	651.31162	0.26415	0.31600	7	1	8	1	0.19000	0.19000	0.12000	0.08000
2	20	41188.03212	6530220.73442	70290429.82410	4543	3310	2594	4013	0	4029	2264.36252	0.43599	0.52711	13	2	16	1	1.00000	0.25556	0.19000	0.19000
2	20	41188.03212	6530220.73442	70290429.82410	4544	3311	2595	4013	0	4029	206.05492	0.26378	0.31600	7	1	8	1	0.19000	0.19000	0.12000	0.08000
2	20	41188.03212	6530220.73442	70290429.82410	4545	3312	2595	4013	0	4029	1036.62633	0.24623	0.29164	6	1	7	1	0.12821	0.12000	0.11000	0.10000
2	20	41188.03212	6530220.73442	70290429.82410	4546	3324	2607	4013	0	4029	2006.05183	0.43770	0.52152	13	2	15	1	1.00000	0.22222	0.19540	0.19000
2	20	41188.03212	6530220.73442	70290429.82410	4547	3323	2606	4013	0	4029	563.62389	0.38567	0.47800	11	2	14	1	1.00000	0.19000	0.12000	0.08000
2	20	41188.03212	6530220.73442	70290429.82410	4548	3322	2605	4013	0	4029	1128.51806	0.52371	0.66200	16	3	18	1	1.00000	1.00000	0.19000	0.12000
2	20	41188.03212	6530220.73442	70290429.82410	4549	3325	2608	4013	4014	4030	2859.90523	0.44050	0.52644	14	2	16	1	1.00000	0.32222	0.19000	0.12000
2	20	41188.03212	6530220.73442	70290429.82410	4550	3326	2609	0	4014	4031	1151.79183	0.29048	0.32667	8	2	9	1	0.19000	0.19000	0.13333	0.12000
3	23	45417.96084	7629429.81628	82122170.58330	4402	3277	2570	4013	0	4029	2824.81385	0.51314	0.55037	16	3	17	1	1.00000	0.35897	0.20290	0.19000
3	23	45417.96084	7629429.81628	82122170.58330	4403	3280	2573	4013	0	4029	1939.27966	0.46518	0.53950	14	3	16	1	1.00000	0.25641	0.23000	0.21111
3	23	45417.96084	7629429.81628	82122170.58330	4404	3275	2568	4013	0	4029	1953.88006	0.07724	0.09299	2	1	2	0	0.11494	0.05000	0.05000	0.03000
3	23	45417.96084	7629429.81628	82122170.58330	4413	3276	2569	4013	0	4029	3927.14265	0.09431	0.10499	3	1	2	0	0.11494	0.11000	0.11000	0.07000
3	23	45417.96084	7629429.81628	82122170.58330	4461	3278	2571	4013	0	4029	947.66607	0.13060	0.14000	3	1	3	0	0.15000	0.14000	0.11000	0.11000
3	23	45417.96084	7629429.81628	82122170.58330	4469	3283	2575	4013	0	4029	1174.57263	0.29754	0.34067	8	2	10	1	0.19000	0.19000	0.19000	0.13333
3	23	45417.96084	7629429.81628	82122170.58330	4520	3279	2572	4013	0	4029	2728.52551	0.42885	0.53800	13	2	16	1	1.00000	0.30000	0.20000	0.19000
3	23	45417.96084	7629429.81628	82122170.58330	4521	3282	2574	4013	0	4029	2258.20035	0.17878	0.17911	5	1	5	0	0.23000	0.15000	0.14000	0.12000
3	23	45417.96084	7629429.81628	82122170.58330	4522	3281	2573	4013	0	4029	320.01504	0.39487	0.50600	12	2	15	1	1.00000	0.20000	0.19000	0.14000
3	23	45417.96084	7629429.81628	82122170.58330	4840	3259	2552	4007	4008	4024	2612.44342	0.17328	0.23000	4	1	6	1	0.05000	0.05000	0.03000	0.02000
3	23	45417.96084	7629429.81628	82122170.58330	4841	3260	2553	4007	4008	4024	2720.65508	0.25101	0.32766	6	1	9	1	0.39130	0.14700	0.05000	0.05000
3	23	45417.96084	7629429.81628	82122170.58330	5410	3250	2543	4007	0	4025	724.34537	0.32281	0.37200	9	2	11	1	0.38000	0.23000	0.14000	0.11000
3	23	45417.96084	7629429.81628	82122170.58330	5413	3249	2542	4007	0	4025	681.80312	0.33199	0.39600	10	2	12	1	0.50000	0.23000	0.14000	0.11000
3	23	45417.96084	7629429.81628	82122170.58330	5460	3261	2554	4007	4008	4024	559.36041	0.20170	0.27336	5	1	7	1	0.26000	0.04348	0.03333	0.03000
3	23	45417.96084	7629429.81628	82122170.58330	5461	3257	2550	4007	0	4025	848.86021	0.27810	0.32319	7	2	9	1	0.19000	0.19000	0.12000	0.11594
3	23	45417.96084	7629429.81628	82122170.58330	5462	3258	2551	4007	4008	4024	2363.74594	0.19205	0.25200	5	1	6	1	0.13000	0.05000	0.05000	0.03000
3	23	45417.96084	7629429.81628	82122170.58330	5467	3262	2555	4007	4008	4013	10519.76985	0.17472	0.23000	5	1	6	1	0.05000	0.05000	0.03000	0.02000
3	23	45417.96084	7629429.81628	82122170.58330	5485	3253	2546	4007	0	4025	1273.25242	0.32372	0.34445	9	2	10	1	0.19000	0.19000	0.18841	0.15385
3	23	45417.96084	7629429.81628	82122170.58330	5492	3254	2547	4007	0	4025	1111.07517	0.29117	0.32444	8	2	9	1	0.19000	0.19000	0.12222	0.12000
3	23	45417.96084	7629429.81628	82122170.58330	5493	3256	2549	4007	0	4025	517.34955	0.27195	0.31600	7	2	8	1	0.19000	0.19000	0.12000	0.08000

SUB_AREA_I	FID_PAT_SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_ShoBas	ShoBas_ID	SZUnit_ID	P3SPU1	P3SPU2	New_SAU	Beach_ft	SumAll	AvgTop5	vig_SumAll	ter_SumAll	vig_AvgTop	Large_1	Large_2	Large_3	Large_4	Large_5
3	23	45417.96084	7629429.81628	82122170.58330	5494	3255	2548	4007	0	4025	1232.98321	0.30516	0.33077	9	2	9	1	0.19000	0.19000	0.15385	0.12000
3	23	45417.96084	7629429.81628	82122170.58330	5495	3263	2556	4009	0	4026	4538.67449	0.08844	0.10850	2	1	3	0	0.19250	0.05000	0.05000	0.03000
3	23	45417.96084	7629429.81628	82122170.58330	5496	3264	2557	4009	0	4026	367.88975	0.08668	0.09600	2	1	2	0	0.11000	0.11000	0.07000	0.07000
3	23	45417.96084	7629429.81628	82122170.58330	5563	3251	2544	4007	0	4025	2550.67518	0.33313	0.39089	10	2	12	1	0.43000	0.19000	0.19000	0.14444
3	23	45417.96084	7629429.81628	82122170.58330	5564	3248	2542	4007	0	4025	1478.15631	0.65254	0.77600	18	3	20	1	1.00000	1.00000	0.50000	0.38000
3	23	45417.96084	7629429.81628	82122170.58330	5565	3252	2545	4007	0	4025	5571.73043	0.53187	0.56697	16	3	17	1	0.71795	0.40580	0.40000	0.31111
3	23	45417.96084	7629429.81628	82122170.58330	5566	3265	2558	4009	4010	4027	1781.30855	0.08170	0.09609	2	1	2	0	0.13043	0.05000	0.05000	0.03000
3	23	45417.96084	7629429.81628	82122170.58330	5568	3266	2559	0	4010	4028	6465.99180	0.13154	0.16275	3	1	4	0	0.22000	0.05000	0.05000	0.03000
4	16	30317.88240	18946819.61350	203941053.23400	4395	3513	2775	9007	0	9081	1484.46954	0.69732	0.73333	19	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	4398	3519	2780	9007	0	9081	2584.57789	0.07294	0.10103	2	1	2	0	0.09000	0.03000	0.02381	0.01000
4	16	30317.88240	18946819.61350	203941053.23400	4404	3275	2568	4013	0	4029	1953.88006	0.07724	0.09299	2	1	2	0	0.11494	0.05000	0.05000	0.03000
4	16	30317.88240	18946819.61350	203941053.23400	4411	3273	2566	4013	0	9081	1371.22576	0.06065	0.07400	1	1	1	0	0.05000	0.05000	0.03000	0.02000
4	16	30317.88240	18946819.61350	203941053.23400	4412	3524	2785	4013	0	9081	1360.71250	0.06065	0.07400	1	1	1	0	0.05000	0.05000	0.03000	0.02000
4	16	30317.88240	18946819.61350	203941053.23400	4440	3511	2773	9007	0	9081	3078.35827	0.67000	0.73333	19	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	4456	3515	2777	9007	0	9081	4390.68716	0.67000	0.73333	19	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	4482	3520	2781	9007	0	9081	604.27374	0.02022	0.02800	1	1	1	0	0.02000	0.01000	0.01000	0.01000
4	16	30317.88240	18946819.61350	203941053.23400	4483	3514	2776	9007	0	9081	1296.19585	0.02022	0.02800	1	1	1	0	0.02000	0.01000	0.01000	0.01000
4	16	30317.88240	18946819.61350	203941053.23400	4505	3522	2783	0	4149	9081	5112.05002	0.78619	0.80721	20	3	20	1	1.00000	1.00000	0.70270	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	4519	3274	2567	4013	0	9085	2130.16419	0.08498	0.10188	2	1	2	0	0.15942	0.05000	0.05000	0.03000
4	16	30317.88240	18946819.61350	203941053.23400	4523	3523	2784	4013	0	9081	2643.13495	0.10445	0.14067	3	1	3	0	0.25000	0.09000	0.02000	0.01000
4	16	30317.88240	18946819.61350	203941053.23400	4524	3521	2782	9007	0	9081	1150.85170	0.67000	0.73333	19	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	4538	3512	2774	9007	0	9081	6096.22651	0.76771	0.86667	20	3	20	1	1.00000	1.00000	1.00000	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	4589	3516	2778	9007	0	9081	2669.87280	0.10994	0.14827	3	1	4	0	0.30000	0.05000	0.03000	0.01000
4	16	30317.88240	18946819.61350	203941053.23400	4590	3518	2779	9007	0	9081	952.05193	0.14695	0.19154	4	1	5	0	0.13514	0.12821	0.05435	0.05000
4	16	30317.88240	18946819.61350	203941053.23400	4591	3517	2779	9007	0	9081	771.63760	0.08868	0.11083	2	1	3	0	0.10811	0.10256	0.05000	0.04348

SUB_AREA_I	FID_PAT_SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_ShoBas	ShoBas_ID	SZUnit_ID	P3SPU1	P3SPU2	New_SAU	Beach_ft	SumAll	AvgTop5	vig_SumAll	ter_SumAll	vig_AvgTop	Large_1	Large_2	Large_3	Large_4	Large_5
4	16	30317.88240	18946819.61350	203941053.23400	4593	3528	2789	9007	0	9081	1233.00321	0.67000	0.73333	19	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	4594	3526	2787	0	4149	9081	2568.49311	0.67000	0.73333	19	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	4595	3271	2564	9007	0	9081	1670.48110	0.07157	0.08513	2	1	2	0	0.07566	0.05000	0.05000	0.03000
4	16	30317.88240	18946819.61350	203941053.23400	4596	3272	2565	0	4149	9082	2275.92025	0.06472	0.07564	2	1	2	0	0.05000	0.05000	0.03000	0.02822
4	16	30317.88240	18946819.61350	203941053.23400	4597	3525	2786	4148	4149	9081	7476.94710	0.79467	0.83333	20	3	20	1	1.00000	1.00000	0.66667	0.50000
4	16	30317.88240	18946819.61350	203941053.23400	4598	3270	2563	9007	0	9081	6078.99133	0.67000	0.73333	18	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	4599	3527	2788	9007	0	9081	1735.23309	0.67000	0.73333	19	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	5405	3507	2769	9007	0	9081	1216.99010	0.67000	0.73333	19	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	5406	3268	2561	0	4010	9083	2659.88147	0.06094	0.07400	2	1	1	0	0.05000	0.05000	0.03000	0.02000
4	16	30317.88240	18946819.61350	203941053.23400	5417	3499	2761	9007	0	9081	1694.65913	0.02022	0.02800	1	1	1	0	0.02000	0.01000	0.01000	0.01000
4	16	30317.88240	18946819.61350	203941053.23400	5418	3500	2762	9007	0	9081	1910.08576	0.67000	0.73333	18	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	5419	3504	2766	9007	0	9081	1105.43537	0.67000	0.73333	19	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	5420	3505	2767	9007	0	9081	1775.58031	0.67000	0.73333	19	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	5422	3495	2757	4150	0	9081	616.04105	0.71043	0.73333	19	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	5425	3506	2768	9007	0	9081	4780.03447	0.67000	0.73333	19	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	5433	3269	2562	4150	0	9084	3815.56441	0.06132	0.07400	2	1	1	0	0.05000	0.05000	0.03000	0.02000
4	16	30317.88240	18946819.61350	203941053.23400	5448	3503	2765	9007	0	9081	960.60965	0.67000	0.73333	19	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	5453	3508	2770	9007	0	9081	2180.75877	0.67000	0.73333	19	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	5454	3509	2771	9007	0	9081	654.22555	0.71814	0.80000	19	3	20	1	1.00000	1.00000	0.66667	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	5468	3494	2756	4150	0	9084	2791.41422	0.06065	0.07400	1	1	1	0	0.05000	0.05000	0.03000	0.02000
4	16	30317.88240	18946819.61350	203941053.23400	5469	3497	2759	9007	0	9081	3607.47399	0.67000	0.73333	18	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	5471	3510	2772	9007	0	9081	7306.76939	0.81440	0.86667	20	3	20	1	1.00000	1.00000	1.00000	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	5473	3502	2764	9007	0	9081	1198.77054	0.67000	0.73333	18	3	19	1	1.00000	1.00000	0.33333	0.33333

SUB_AREA_I	FID_PAT_SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_ShoBas	ShoBas_ID	SZUnit_ID	P3SPU1	P3SPU2	New_SAU	Beach_ft	SumAll	AvgTop5	vig_SumAll	ter_SumAll	vig_AvgTop	Large_1	Large_2	Large_3	Large_4	Large_5
4	16	30317.88240	18946819.61350	203941053.23400	5486	3501	2763	9007	0	9081	2336.48279	0.67000	0.73333	18	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	5567	3267	2560	0	4010	9083	1518.07286	0.06065	0.07400	1	1	1	0	0.05000	0.05000	0.03000	0.02000
4	16	30317.88240	18946819.61350	203941053.23400	5568	3266	2559	0	4010	4028	6465.99180	0.13154	0.16275	3	1	4	0	0.22000	0.05000	0.05000	0.03000
4	16	30317.88240	18946819.61350	203941053.23400	5569	3496	2758	4150	0	9081	915.68940	0.67000	0.73333	18	3	19	1	1.00000	1.00000	0.33333	0.33333
4	16	30317.88240	18946819.61350	203941053.23400	5570	3498	2760	9007	0	9081	1046.17937	0.02022	0.02800	1	1	1	0	0.02000	0.01000	0.01000	0.01000
5	1	53040.47212	10177077.11240	109544708.16100	4842	3238	2533	0	4004	4021	4522.64533	0.37767	0.48895	11	2	14	1	1.00000	0.33333	0.06140	0.05000
5	1	53040.47212	10177077.11240	109544708.16100	4843	3239	2534	0	4004	4021	4497.04522	0.20248	0.27645	5	1	7	1	0.31884	0.03341	0.02000	0.01000
5	1	53040.47212	10177077.11240	109544708.16100	5407	3535	2795	4005	0	4322	1147.04359	0.10988	0.15219	3	1	4	0	0.17000	0.08000	0.08000	0.05000
5	1	53040.47212	10177077.11240	109544708.16100	5409	3233	2528	0	4002	4017	2459.57660	0.42390	0.50556	13	2	15	1	1.00000	0.27778	0.14000	0.11000
5	1	53040.47212	10177077.11240	109544708.16100	5414	3232	2527	0	4002	4017	797.97044	0.41046	0.47162	12	2	13	1	1.00000	0.14000	0.11000	0.10811
5	1	53040.47212	10177077.11240	109544708.16100	5415	3241	2536	0	4004	4021	293.23672	0.18853	0.24200	5	1	6	1	0.08000	0.05000	0.05000	0.03000
5	1	53040.47212	10177077.11240	109544708.16100	5416	3240	2535	0	4004	4021	4843.25003	0.24048	0.33108	6	1	10	1	0.61538	0.02000	0.01000	0.01000
5	1	53040.47212	10177077.11240	109544708.16100	5423	3226	2522	8055	0	8092	8890.60081	0.60482	0.75331	17	3	20	1	1.00000	0.98889	0.63768	0.14000
5	1	53040.47212	10177077.11240	109544708.16100	5424	3227	2523	8055	4002	4016	1519.61816	0.45066	0.51236	14	3	15	1	1.00000	0.20513	0.19000	0.16667
5	1	53040.47212	10177077.11240	109544708.16100	5438	3236	2531	4003	0	4019	1363.36924	0.44423	0.50974	14	2	15	1	1.00000	0.18919	0.18000	0.17949
5	1	53040.47212	10177077.11240	109544708.16100	5440	3536	2796	4005	0	4322	100.78890	0.01877	0.02400	1	1	1	0	0.03000	0.02000	0.01000	0.01000
5	1	53040.47212	10177077.11240	109544708.16100	5441	3243	2538	4005	4006	4022	2291.96137	0.31139	0.34568	9	2	10	1	0.21839	0.20000	0.16000	0.15000
5	1	53040.47212	10177077.11240	109544708.16100	5442	3529	2790	0	4004	4021	1314.40884	0.12996	0.15400	3	1	4	0	0.19000	0.19000	0.12000	0.08000
5	1	53040.47212	10177077.11240	109544708.16100	5445	3235	2530	4003	4002	4018	715.56433	0.61036	0.73000	18	3	19	1	1.00000	1.00000	0.50000	0.15000
5	1	53040.47212	10177077.11240	109544708.16100	5446	3234	2529	0	4002	4017	1689.18782	0.57397	0.67903	17	3	18	1	1.00000	1.00000	0.20513	0.19000
5	1	53040.47212	10177077.11240	109544708.16100	5447	3530	2791	4005	4004	4010	1113.80488	0.16977	0.18714	4	1	5	0	0.18000	0.16000	0.16000	0.15000
5	1	53040.47212	10177077.11240	109544708.16100	5455	3531	2792	4005	4004	4010	747.01455	0.58900	0.64733	17	3	18	1	1.00000	0.57000	0.33333	0.33333
5	1	53040.47212	10177077.11240	109544708.16100	5470	3237	2532	4003	0	4019	1235.08784	0.33260	0.44667	10	2	13	1	1.00000	0.13333	0.05000	0.05000
5	1	53040.47212	10177077.11240	109544708.16100	5474	3212	2509	8055	0	8092	1463.80104	0.15394	0.15600	4	1	4	0	0.19000	0.12000	0.11000	0.11000
5	1	53040.47212	10177077.11240	109544708.16100	5475	3214	2511	8055	0	8092	1352.27715	0.29831	0.32511	8	2	9	1	0.18000	0.16000	0.15556	0.13000
5	1	53040.47212	10177077.11240	109544708.16100	5476	3213	2510	8055	0	8092	856.74671	0.30267	0.32000	8	2	9	1	0.18000	0.16000	0.13000	0.13000
5	1	53040.47212	10177077.11240	109544708.16100	5478	3532	2793	4005	4004	4323	723.13023	0.16461	0.22600	4	1	6	1	0.09000	0.02000	0.01000	0.01000
5	1	53040.47212	10177077.11240	109544708.16100	5482	3230	2526	0	4002	4017	117.07912	0.39725	0.49800	12	2	15	1	1.00000	0.22000	0.14000	0.13000
5	1	53040.47212	10177077.11240	109544708.16100	5483	3229	2525	0	4002	4017	799.60323	0.50037	0.57133	15	3	17	1	1.00000	0.33333	0.33333	0.19000

SUB_AREA_I	FID_PAT_SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_ShoBas	ShoBas_ID	SZUnit_ID	P3SPU1	P3SPU2	New_SAU	Beach_ft	SumAll	AvgTop5	vig_SumAll	ter_SumAll	vig_AvgTop	Large_1	Large_2	Large_3	Large_4	Large_5
5	1	53040.47212	10177077.11240	109544708.16100	5484	3228	2524	0	4002	4017	2749.42251	0.51189	0.59333	16	3	17	1	1.00000	0.33333	0.33333	0.30000
5	1	53040.47212	10177077.11240	109544708.16100	5507	3211	2508	8055	0	8092	189.75752	0.28544	0.33800	8	2	10	1	0.24000	0.18000	0.14000	0.13000
5	1	53040.47212	10177077.11240	109544708.16100	5508	3210	2508	8055	0	8092	274.06889	0.28833	0.35200	8	2	11	1	0.28000	0.23000	0.14000	0.11000
5	1	53040.47212	10177077.11240	109544708.16100	5512	3231	2526	0	4002	4017	3985.42447	0.44056	0.54489	14	2	16	1	1.00000	0.44444	0.14000	0.14000
5	1	53040.47212	10177077.11240	109544708.16100	5513	3242	2537	0	4004	4021	3045.32053	0.18232	0.23800	5	1	6	1	0.06000	0.05000	0.05000	0.03000
5	1	53040.47212	10177077.11240	109544708.16100	5514	3538	2796	4005	0	4322	679.87211	0.20289	0.24901	5	1	6	0	0.13000	0.10000	0.08000	0.05000
5	1	53040.47212	10177077.11240	109544708.16100	5515	3537	2796	4005	0	4322	692.06744	0.08901	0.09129	2	1	2	0	0.09000	0.09000	0.08000	0.07000
5	1	53040.47212	10177077.11240	109544708.16100	5542	3209	2508	8055	0	8092	4108.29895	0.39115	0.47036	11	2	13	1	0.53846	0.44000	0.23333	0.14000
5	1	53040.47212	10177077.11240	109544708.16100	5546	3216	2513	8055	0	8092	796.26318	0.45797	0.50800	14	3	15	1	1.00000	0.20000	0.18000	0.16000
5	1	53040.47212	10177077.11240	109544708.16100	5547	3215	2512	8055	0	8092	1342.03139	0.43644	0.52695	13	2	16	1	1.00000	0.32000	0.21000	0.10475
5	1	53040.47212	10177077.11240	109544708.16100	5548	3217	2514	8055	0	8092	1542.66782	0.43814	0.53503	13	2	16	1	1.00000	0.28000	0.20513	0.19000
5	1	53040.47212	10177077.11240	109544708.16100	5549	3220	2517	8055	0	8092	673.80877	0.24761	0.27760	6	1	7	1	0.12000	0.11000	0.08108	0.07692
5	1	53040.47212	10177077.11240	109544708.16100	5550	3222	2519	8055	0	8092	893.47659	0.25911	0.30000	7	1	7	1	0.15000	0.14000	0.11000	0.10000
5	1	53040.47212	10177077.11240	109544708.16100	5551	3224	2520	8055	0	8092	646.67937	0.25510	0.30000	6	1	7	1	0.15000	0.14000	0.11000	0.10000
5	1	53040.47212	10177077.11240	109544708.16100	5552	3223	2519	8055	0	8092	745.58656	0.37367	0.47800	11	2	14	1	1.00000	0.19000	0.11000	0.09000
5	1	53040.47212	10177077.11240	109544708.16100	5553	3221	2518	8055	0	8092	1268.76546	0.30174	0.32920	8	2	9	1	0.19000	0.16216	0.15385	0.14000
5	1	53040.47212	10177077.11240	109544708.16100	5554	3219	2516	8055	0	8092	1550.74893	0.14658	0.14600	4	1	3	0	0.15000	0.14000	0.11000	0.10000
5	1	53040.47212	10177077.11240	109544708.16100	5555	3218	2515	8055	0	8092	1845.82102	0.22360	0.19215	6	1	5	0	0.19000	0.19000	0.19000	0.16000
5	1	53040.47212	10177077.11240	109544708.16100	5556	3225	2521	8055	0	8092	3501.61301	0.51597	0.59444	16	3	17	1	1.00000	0.38889	0.33333	0.25000
5	1	53040.47212	10177077.11240	109544708.16100	5557	3533	2794	4005	4004	4323	523.61912	0.12425	0.16810	3	1	4	0	0.06000	0.05000	0.03000	0.01000
5	1	53040.47212	10177077.11240	109544708.16100	5558	3245	2539	0	4006	4023	1285.18783	0.27984	0.31239	8	2	8	1	0.20000	0.16000	0.11000	0.09195
5	1	53040.47212	10177077.11240	109544708.16100	5559	3244	2539	0	4006	4023	350.37020	0.21665	0.30007	6	1	7	1	0.24138	0.13000	0.10000	0.02899
5	1	53040.47212	10177077.11240	109544708.16100	5560	3247	2541	0	4006	4023	1346.16457	0.43850	0.49473	13	2	14	1	1.00000	0.18919	0.14444	0.14000
5	1	53040.47212	10177077.11240	109544708.16100	5561	3246	2540	0	4006	4023	2575.41946	0.45338	0.52764	14	3	16	1	1.00000	0.28889	0.18841	0.16092
5	1	53040.47212	10177077.11240	109544708.16100	5562	3534	2795	4005	0	4322	537.04345	0.02744	0.03600	1	1	1	0	0.05000	0.02000	0.01000	0.01000

SUB_AREA_I	FID_PAT_SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_ShoBas	ShoBas_ID	SZUnit_ID	P3SPU1	P3SPU2	New_SAU	Beach_ft	SumAll	AvgTop5	vig_SumAll	ter_SumAll	vig_AvgTop	Large_1	Large_2	Large_3	Large_4	Large_5
5	1	53040.47212	10177077.11240	109544708.16100	5564	3248	2542	4007	0	4025	1478.15631	0.65254	0.77600	18	3	20	1	1.00000	1.00000	0.50000	0.38000
6	22	100624.22010	36546762.71580	393384506.35100	5408	3203	2502	8055	0	8092	1416.56135	0.33808	0.44029	10	2	13	1	1.00000	0.10145	0.05000	0.05000
6	22	100624.22010	36546762.71580	393384506.35100	5411	3188	2490	8055	0	8092	1054.43225	0.64461	0.73333	18	3	19	1	1.00000	1.00000	0.33333	0.33333
6	22	100624.22010	36546762.71580	393384506.35100	5412	5801	4682	8055	0	8092	1160.94534	0.13194	0.23000	2	1	3	1	0.05000	0.05000	0.03000	0.02000
6	22	100624.22010	36546762.71580	393384506.35100	5421	5800	4681	8055	0	9153	8583.16746	0.11642	0.21000	2	1	3	1	0.02000	0.01000	0.01000	0.01000
6	22	100624.22010	36546762.71580	393384506.35100	5426	5812	4693	8055	0	8092	706.70346	0.37056	0.54600	11	2	13	1	1.00000	0.25000	0.25000	0.23000
6	22	100624.22010	36546762.71580	393384506.35100	5428	3179	2482	8055	0	8092	1169.77013	0.38692	0.64400	12	2	15	1	1.00000	1.00000	0.11000	0.11000
6	22	100624.22010	36546762.71580	393384506.35100	5429	3178	2481	8055	0	8092	2158.19700	0.45755	0.69524	16	3	18	1	1.00000	1.00000	0.25000	0.22619
6	22	100624.22010	36546762.71580	393384506.35100	5430	5809	4690	8055	0	8092	1443.81283	0.26568	0.47000	6	1	9	1	1.00000	0.23000	0.09000	0.03000
6	22	100624.22010	36546762.71580	393384506.35100	5431	5813	4694	8055	0	8092	296.54939	0.36326	0.58352	11	2	14	1	1.00000	0.54762	0.23000	0.14000
6	22	100624.22010	36546762.71580	393384506.35100	5432	5810	4691	8055	0	8092	582.76204	0.19637	0.31600	4	1	5	1	0.23000	0.14000	0.11000	0.10000
6	22	100624.22010	36546762.71580	393384506.35100	5434	5789	4670	8055	0	9153	326.12067	0.14192	0.25400	2	1	4	1	0.23000	0.02000	0.01000	0.01000
6	22	100624.22010	36546762.71580	393384506.35100	5435	5790	4671	8055	0	9153	478.74784	0.11863	0.21200	2	1	3	1	0.02000	0.02000	0.01000	0.01000
6	22	100624.22010	36546762.71580	393384506.35100	5436	5815	4696	8055	0	8092	2391.25772	0.32271	0.52391	9	2	12	1	1.00000	0.25000	0.23000	0.13953
6	22	100624.22010	36546762.71580	393384506.35100	5437	5814	4695	8055	0	8092	496.47416	0.35869	0.57800	11	2	14	1	1.00000	0.50000	0.23000	0.16000
6	22	100624.22010	36546762.71580	393384506.35100	5439	5774	4655	8055	0	9153	3536.67401	0.16226	0.27095	3	1	4	1	0.15476	0.10000	0.05000	0.05000
6	22	100624.22010	36546762.71580	393384506.35100	5443	5802	4683	8055	0	8092	2474.87211	0.13194	0.23000	2	1	3	1	0.05000	0.05000	0.03000	0.02000
6	22	100624.22010	36546762.71580	393384506.35100	5444	5803	4684	8055	0	8092	703.98713	0.13194	0.23000	2	1	3	1	0.05000	0.05000	0.03000	0.02000
6	22	100624.22010	36546762.71580	393384506.35100	5449	5820	4701	8055	0	8092	1361.85038	0.20383	0.32100	4	1	5	1	0.21000	0.18000	0.12500	0.09000
6	22	100624.22010	36546762.71580	393384506.35100	5450	5806	4687	8055	0	8092	2436.44317	0.33307	0.52391	10	2	12	1	1.00000	0.25000	0.23000	0.13953
6	22	100624.22010	36546762.71580	393384506.35100	5451	5819	4700	8055	0	8092	1440.82242	0.44362	0.70743	15	3	18	1	1.00000	1.00000	0.35714	0.18000
6	22	100624.22010	36546762.71580	393384506.35100	5452	5807	4688	8055	0	8092	631.01932	0.27718	0.48800	6	1	10	1	1.00000	0.23000	0.11000	0.10000
6	22	100624.22010	36546762.71580	393384506.35100	5456	3176	2479	8055	0	8092	2710.06859	0.39815	0.65856	13	2	16	1	1.00000	1.00000	0.16279	0.13000
6	22	100624.22010	36546762.71580	393384506.35100	5457	3180	2483	8055	0	8092	2284.96405	0.40072	0.64758	13	2	15	1	1.00000	1.00000	0.12791	0.11000
6	22	100624.22010	36546762.71580	393384506.35100	5458	3175	2478	8055	0	8092	1225.20795	0.38725	0.64400	12	2	15	1	1.00000	1.00000	0.11000	0.11000
6	22	100624.22010	36546762.71580	393384506.35100	5459	3174	2477	8055	0	8092	7610.54978	0.44665	0.72647	15	3	18	1	1.00000	1.00000	0.44186	0.19048
6	22	100624.22010	36546762.71580	393384506.35100	5463	5818	4699	8055	0	8092	1093.98185	0.42940	0.67600	14	3	17	1	1.00000	1.00000	0.19000	0.19000

SUB_AREA_I	FID_PAT_SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_ShoBas	ShoBas_ID	SZUnit_ID	P3SPU1	P3SPU2	New_SAU	Beach_ft	SumAll	AvgTop5	vig_SumAll	ter_SumAll	vig_AvgTop	Large_1	Large_2	Large_3	Large_4	Large_5
6	22	100624.22010	36546762.71580	393384506.35100	5464	5808	4689	8055	0	8092	823.23091	0.26982	0.47330	6	1	9	1	1.00000	0.23000	0.09000	0.04651
6	22	100624.22010	36546762.71580	393384506.35100	5465	5792	4673	8055	0	9153	1211.98586	0.11642	0.21000	2	1	3	1	0.02000	0.01000	0.01000	0.01000
6	22	100624.22010	36546762.71580	393384506.35100	5466	5794	4675	8055	0	9153	561.58050	0.11642	0.21000	2	1	3	1	0.02000	0.01000	0.01000	0.01000
6	22	100624.22010	36546762.71580	393384506.35100	5472	3204	2503	8055	0	8092	1284.20268	0.15162	0.21000	4	1	5	1	0.02000	0.01000	0.01000	0.01000
6	22	100624.22010	36546762.71580	393384506.35100	5477	5799	4680	8055	0	9153	1136.91260	0.11642	0.21000	2	1	3	1	0.02000	0.01000	0.01000	0.01000
6	22	100624.22010	36546762.71580	393384506.35100	5479	3181	2483	8055	0	8092	1410.20994	0.55705	0.69547	17	3	19	1	1.00000	1.00000	0.28736	0.19000
6	22	100624.22010	36546762.71580	393384506.35100	5480	3182	2484	8055	0	8092	948.00556	0.70690	0.89400	19	3	20	1	1.00000	1.00000	1.00000	0.47000
6	22	100624.22010	36546762.71580	393384506.35100	5481	3183	2485	8055	0	8092	3666.50937	0.74448	0.86667	19	3	20	1	1.00000	1.00000	1.00000	0.33333
6	22	100624.22010	36546762.71580	393384506.35100	5487	5771	4652	8055	0	9153	175.86029	0.13048	0.23537	2	1	3	1	0.09000	0.08000	0.00685	0.00000
6	22	100624.22010	36546762.71580	393384506.35100	5488	5775	4656	8055	0	9153	597.95861	0.14273	0.24075	3	1	3	1	0.07373	0.05000	0.05000	0.03000
6	22	100624.22010	36546762.71580	393384506.35100	5489	5773	4654	8055	0	9153	814.09632	0.17822	0.30400	3	1	4	1	0.39000	0.05000	0.05000	0.03000
6	22	100624.22010	36546762.71580	393384506.35100	5490	5772	4653	8055	0	9153	1449.52375	0.15139	0.25949	3	1	4	1	0.15000	0.05952	0.04795	0.04000
6	22	100624.22010	36546762.71580	393384506.35100	5497	5795	4676	8055	0	9153	2995.87530	0.11642	0.21000	2	1	3	1	0.02000	0.01000	0.01000	0.01000
6	22	100624.22010	36546762.71580	393384506.35100	5498	5797	4678	8055	0	9153	1470.44372	0.17629	0.30600	3	1	4	1	0.40000	0.05000	0.05000	0.03000
6	22	100624.22010	36546762.71580	393384506.35100	5499	5796	4677	8055	0	9153	3223.07325	0.11642	0.21000	2	1	3	1	0.02000	0.01000	0.01000	0.01000
6	22	100624.22010	36546762.71580	393384506.35100	5500	5791	4672	8055	0	9153	2015.58339	0.11642	0.21000	2	1	3	1	0.02000	0.01000	0.01000	0.01000
6	22	100624.22010	36546762.71580	393384506.35100	5501	5776	4657	8055	0	9153	6934.76190	0.17961	0.32400	3	1	5	1	0.53000	0.04000	0.03000	0.02000
6	22	100624.22010	36546762.71580	393384506.35100	5502	5793	4674	8055	0	9153	376.28732	0.11642	0.21000	2	1	3	1	0.02000	0.01000	0.01000	0.01000
6	22	100624.22010	36546762.71580	393384506.35100	5503	3207	2506	8055	0	8092	1313.12805	0.31655	0.42600	9	2	13	1	1.00000	0.05000	0.05000	0.03000
6	22	100624.22010	36546762.71580	393384506.35100	5504	3206	2505	8055	0	8092	1908.36622	0.15739	0.21600	4	1	5	1	0.04000	0.02000	0.01000	0.01000
6	22	100624.22010	36546762.71580	393384506.35100	5505	3208	2507	8055	0	8092	1308.82103	0.30181	0.32800	8	2	9	1	0.19000	0.18000	0.14000	0.13000
6	22	100624.22010	36546762.71580	393384506.35100	5506	3189	2491	8055	0	8092	6486.12979	0.42587	0.52000	13	2	15	1	1.00000	0.25000	0.19000	0.16000
6	22	100624.22010	36546762.71580	393384506.35100	5507	3211	2508	8055	0	8092	189.75752	0.28544	0.33800	8	2	10	1	0.24000	0.18000	0.14000	0.13000
6	22	100624.22010	36546762.71580	393384506.35100	5509	3190	2492	8055	0	8092	474.77588	0.44956	0.54467	14	3	16	1	1.00000	0.33333	0.25000	0.14000
6	22	100624.22010	36546762.71580	393384506.35100	5510	3191	2493	8055	0	8092	1806.11605	0.51249	0.65400	16	3	18	1	1.00000	1.00000	0.15000	0.12000

SUB_AREA_I	FID_PAT _SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_Sh oBas	ShoBas _ID	SZUnit _ID	P3SPU 1	P3SP U2	New_S AU	Beach_ft	SumAll	AvgTop5	vig_Su mAll	ter_S umAll	vig_A vgTop	Large_1	Large_2	Large_3	Large_4	Large_5
6	22	100624.22010	36546762.71580	393384506.35100	5511	3205	2504	8055	0	8092	2673.68608	0.17431	0.20667	4	1	5	0	0.25000	0.22000	0.18000	0.05000
6	22	100624.22010	36546762.71580	393384506.35100	5516	5804	4685	8055	0	8092	781.17709	0.13194	0.23000	2	1	3	1	0.05000	0.05000	0.03000	0.02000
6	22	100624.22010	36546762.71580	393384506.35100	5517	5805	4686	8055	0	8092	651.42355	0.25604	0.41386	6	1	8	1	0.46429	0.25000	0.23000	0.12500
6	22	100624.22010	36546762.71580	393384506.35100	5518	5798	4679	8055	0	9153	2742.60567	0.13194	0.23000	2	1	3	1	0.05000	0.05000	0.03000	0.02000
6	22	100624.22010	36546762.71580	393384506.35100	5522	3172	2475	8055	0	8092	615.01516	0.18947	0.31600	4	1	5	1	0.18000	0.14000	0.13000	0.13000
6	22	100624.22010	36546762.71580	393384506.35100	5523	5817	4698	8055	0	8092	2658.24826	0.28588	0.47823	7	1	10	1	1.00000	0.15116	0.15000	0.09000
6	22	100624.22010	36546762.71580	393384506.35100	5524	5822	4703	8055	0	8092	740.08753	0.27496	0.47200	6	1	9	1	1.00000	0.21000	0.09000	0.06000
6	22	100624.22010	36546762.71580	393384506.35100	5525	3173	2476	8055	0	8092	1298.07781	0.19382	0.30800	4	1	5	1	0.19000	0.14000	0.11000	0.10000
6	22	100624.22010	36546762.71580	393384506.35100	5526	5816	4697	8055	0	8092	421.75846	0.34961	0.54800	11	2	13	1	1.00000	0.30000	0.25000	0.19000
6	22	100624.22010	36546762.71580	393384506.35100	5527	5821	4702	8055	0	8092	782.19384	0.19103	0.30860	4	1	5	1	0.21000	0.18000	0.09000	0.06299
6	22	100624.22010	36546762.71580	393384506.35100	5528	3177	2480	8055	0	8092	1341.35524	0.29643	0.47600	8	2	9	1	1.00000	0.14000	0.13000	0.11000
6	22	100624.22010	36546762.71580	393384506.35100	5529	5811	4692	8055	0	8092	2110.54729	0.27528	0.46158	6	1	9	1	1.00000	0.12791	0.09000	0.09000
6	22	100624.22010	36546762.71580	393384506.35100	5530	3184	2486	8055	0	8092	1204.94624	1.00000	1.00000	20	3	20	1	1.00000	1.00000	1.00000	1.00000
6	22	100624.22010	36546762.71580	393384506.35100	5531	3186	2488	8055	0	8092	923.51102	0.41997	0.51800	12	2	15	1	1.00000	0.25000	0.20000	0.14000
6	22	100624.22010	36546762.71580	393384506.35100	5532	3187	2489	8055	0	8092	1007.45923	0.38490	0.49000	11	2	14	1	1.00000	0.20000	0.14000	0.11000
6	22	100624.22010	36546762.71580	393384506.35100	5533	3185	2487	8055	0	8092	5277.19892	0.61299	0.70778	18	3	19	1	1.00000	1.00000	0.28889	0.25000
6	22	100624.22010	36546762.71580	393384506.35100	5534	3201	2501	8055	0	8092	752.52795	0.39260	0.48000	11	2	14	1	1.00000	0.14000	0.13000	0.13000
6	22	100624.22010	36546762.71580	393384506.35100	5535	3200	2501	8055	0	8092	746.49623	0.36859	0.46600	11	2	13	1	1.00000	0.11000	0.11000	0.11000
6	22	100624.22010	36546762.71580	393384506.35100	5536	3202	2501	8055	0	8092	19.73399	0.12418	0.14800	3	1	3	0	0.16000	0.14000	0.13000	0.13000
6	22	100624.22010	36546762.71580	393384506.35100	5537	3199	2500	8055	0	8092	504.26122	0.64979	0.82800	18	3	20	1	1.00000	1.00000	1.00000	0.14000
6	22	100624.22010	36546762.71580	393384506.35100	5538	3198	2499	8055	0	8092	234.28993	0.50493	0.65400	15	3	18	1	1.00000	1.00000	0.14000	0.13000
6	22	100624.22010	36546762.71580	393384506.35100	5539	3197	2499	8055	0	8092	498.58501	0.37025	0.47000	11	2	13	1	1.00000	0.14000	0.11000	0.10000
6	22	100624.22010	36546762.71580	393384506.35100	5540	3192	2494	8055	0	8092	3531.09065	0.42973	0.51217	13	2	15	1	1.00000	0.26087	0.16000	0.14000
6	22	100624.22010	36546762.71580	393384506.35100	5541	3196	2498	8055	0	8092	2286.63726	0.49140	0.55467	15	3	17	1	1.00000	0.33333	0.25000	0.19000

SUB_AREA_I	FID_PAT_SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_ShoBas	ShoBas_ID	SZUnit_ID	P3SPU1	P3SPU2	New_SAU	Beach_ft	SumAll	AvgTop5	vig_SumAll	ter_SumAll	vig_AvgTop	Large_1	Large_2	Large_3	Large_4	Large_5
6	22	100624.22010	36546762.71580	393384506.35100	5543	3195	2497	8055	0	8092	1105.65001	0.47771	0.55467	15	3	17	1	1.00000	0.33333	0.25000	0.19000
6	22	100624.22010	36546762.71580	393384506.35100	5544	3193	2495	8055	0	8092	1405.42268	0.50168	0.65000	15	3	18	1	1.00000	1.00000	0.13000	0.12000
6	22	100624.22010	36546762.71580	393384506.35100	5545	3194	2496	8055	0	8092	2668.87781	0.50356	0.65200	15	3	18	1	1.00000	1.00000	0.14000	0.12000
6	22	100624.22010	36546762.71580	393384506.35100	5572	5779	4660	8055	0	9153	4377.97096	0.43925	0.68150	15	3	17	1	0.94000	0.86000	0.30612	0.30137
6	22	100624.22010	36546762.71580	393384506.35100	5573	5782	4663	8055	0	9153	2472.56608	0.14244	0.25295	3	1	4	1	0.12601	0.09875	0.03000	0.01000
6	22	100624.22010	36546762.71580	393384506.35100	5574	5778	4659	8055	0	9153	2508.87570	0.39071	0.59649	12	2	14	1	0.78000	0.72000	0.34247	0.14000
6	22	100624.22010	36546762.71580	393384506.35100	5575	5783	4664	8055	0	9153	3587.21756	0.15271	0.26347	3	1	4	1	0.18736	0.05000	0.05000	0.03000
6	22	100624.22010	36546762.71580	393384506.35100	5576	5777	4658	8055	0	9153	5955.26973	0.47252	0.76038	16	3	19	1	0.92000	0.92000	0.82192	0.14000
6	22	100624.22010	36546762.71580	393384506.35100	5577	5784	4665	8055	0	9153	2961.86782	0.15412	0.26397	3	1	4	1	0.10274	0.09999	0.07712	0.04000
6	22	100624.22010	36546762.71580	393384506.35100	5578	5780	4661	8055	0	9153	3306.02849	0.32701	0.55665	9	2	13	1	0.95000	0.62000	0.16327	0.05000
6	22	100624.22010	36546762.71580	393384506.35100	5579	5781	4662	8055	0	9153	3332.19674	0.19110	0.32274	4	1	5	1	0.38372	0.13000	0.05000	0.05000
6	22	100624.22010	36546762.71580	393384506.35100	5723	5786	4667	0	6056	9156	455.79456	0.28719	0.48273	7	1	10	1	1.00000	0.18367	0.18000	0.05000
6	22	100624.22010	36546762.71580	393384506.35100	5724	5785	4666	0	6056	9156	519.70370	0.35869	0.61849	11	2	15	1	1.00000	0.92000	0.12245	0.05000
6	22	100624.22010	36546762.71580	393384506.35100	5725	5787	4668	8055	0	9153	2079.78425	0.46856	0.80206	16	3	19	1	1.00000	0.98980	0.97000	0.05049
6	22	100624.22010	36546762.71580	393384506.35100	5726	5788	4669	8055	0	9153	2075.27578	0.44553	0.77567	15	3	19	1	1.00000	0.91837	0.91000	0.05000
6	22	100624.22010	36546762.71580	393384506.35100	5976	5728	4614	6054	0	9151	741.20100	0.29201	0.45000	7	2	8	1	0.63000	0.24000	0.19000	0.19000
6	22	100624.22010	36546762.71580	393384506.35100	5977	5731	4617	6054	0	9151	1353.92631	0.27570	0.42600	6	1	8	1	0.53000	0.23000	0.23000	0.14000
6	22	100624.22010	36546762.71580	393384506.35100	5995	5729	4615	6054	0	9151	2251.42018	0.32272	0.49000	9	2	10	1	0.79000	0.28000	0.19000	0.19000
6	22	100624.22010	36546762.71580	393384506.35100	5997	5735	4621	0	6056	9156	894.44317	0.28140	0.42000	7	1	8	1	0.60000	0.19000	0.19000	0.12000
6	22	100624.22010	36546762.71580	393384506.35100	6001	5762	4645	0	6056	9156	502.56184	0.25460	0.36927	6	1	7	0	0.37000	0.31633	0.19000	0.17000
6	22	100624.22010	36546762.71580	393384506.35100	6047	5730	4616	6054	0	9151	1301.52089	0.31545	0.51200	9	2	11	1	0.76000	0.43000	0.23000	0.14000
6	22	100624.22010	36546762.71580	393384506.35100	6048	5734	4620	0	6056	9156	1178.57154	0.33579	0.47581	10	2	9	1	0.47000	0.36905	0.35000	0.19000

SUB_AREA_I	FID_PAT _SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_Sh oBas	ShoBas _ID	SZUnit _ID	P3SPU 1	P3SP U2	New_S AU	Beach_ft	SumAll	AvgTop5	vig_Su mAll	ter_S umAll	vig_A vgTop	Large_1	Large_2	Large_3	Large_4	Large_5
6	22	100624.22010	36546762.71580	393384506.35100	6049	5760	4644	0	6056	9156	1989.68156	0.28750	0.43326	7	1	8	1	0.72000	0.19000	0.14000	0.11628
6	22	100624.22010	36546762.71580	393384506.35100	6050	5733	4619	0	6056	9156	784.22613	0.34224	0.53000	10	2	12	1	0.64000	0.63000	0.19000	0.19000
6	22	100624.22010	36546762.71580	393384506.35100	6052	5759	4643	0	6056	9156	1733.12057	0.27848	0.42753	7	1	8	1	0.56000	0.19767	0.19000	0.19000
6	22	100624.22010	36546762.71580	393384506.35100	6053	5732	4618	6054	6056	9155	6846.16590	0.37660	0.58307	12	2	14	1	0.66000	0.63000	0.39535	0.23000
7	10	68437.22685	87552820.74840	942406949.62700	5427	5845	4726	9006	0	9152	4255.69088	0.16866	0.20000	3	1	2	0	0.25000	0.25000	0.12500	0.12500
7	10	68437.22685	87552820.74840	942406949.62700	5487	5771	4652	8055	0	9153	175.86029	0.13048	0.23537	2	1	3	1	0.09000	0.08000	0.00685	0.00000
7	10	68437.22685	87552820.74840	942406949.62700	5491	5770	4652	9006	0	9152	1820.06775	0.12325	0.22233	2	1	3	1	0.06164	0.05000	0.00000	0.00000
7	10	68437.22685	87552820.74840	942406949.62700	5519	5868	4749	9006	0	9152	16479.89762	0.32544	0.35000	9	2	6	0	0.50000	0.25000	0.25000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5520	5847	4728	9006	0	9152	1327.38373	0.19815	0.23800	4	1	3	0	0.25000	0.25000	0.23000	0.21000
7	10	68437.22685	87552820.74840	942406949.62700	5521	5846	4727	9006	0	9152	900.06389	0.02360	0.04257	1	1	1	0	0.01285	0.00000	0.00000	0.00000
7	10	68437.22685	87552820.74840	942406949.62700	5571	5848	4729	9006	0	9152	12442.55031	1.00000	1.00000	20	3	20	1	1.00000	1.00000	1.00000	1.00000
7	10	68437.22685	87552820.74840	942406949.62700	5580	5844	4725	9006	0	9152	1131.30326	0.23788	0.35000	5	1	6	1	0.25000	0.25000	0.12500	0.12500
7	10	68437.22685	87552820.74840	942406949.62700	5581	5843	4724	9006	0	9152	4275.45285	0.37197	0.45600	11	2	9	0	0.50000	0.50000	0.25000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5605	5849	4730	9006	0	9152	11213.94729	0.63949	0.68500	20	3	17	0	0.75000	0.75000	0.62500	0.55000
7	10	68437.22685	87552820.74840	942406949.62700	5606	5873	4754	9006	0	9152	10160.49623	0.49250	0.45900	17	3	9	0	0.50000	0.50000	0.42000	0.37500
7	10	68437.22685	87552820.74840	942406949.62700	5607	5855	4736	9006	0	9152	1478.45388	0.25764	0.33000	6	1	5	0	0.42000	0.25000	0.25000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5608	5856	4737	9006	0	9152	2033.20513	0.24757	0.30800	6	1	5	0	0.25000	0.25000	0.25000	0.18000
7	10	68437.22685	87552820.74840	942406949.62700	5609	5854	4735	9006	0	9152	1756.69084	0.22768	0.27800	5	1	4	0	0.28000	0.25000	0.25000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5610	5857	4738	9006	0	9152	3024.70386	0.22571	0.28000	5	1	4	0	0.29000	0.25000	0.25000	0.25000

SUB_AREA_I	FID_PAT_SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_ShoBas	ShoBas_ID	SZUnit_ID	P3SPU1	P3SPU2	New_SAU	Beach_ft	SumAll	AvgTop5	vig_SumAll	ter_SumAll	vig_AvgTop	Large_1	Large_2	Large_3	Large_4	Large_5
7	10	68437.22685	87552820.74840	942406949.62700	5611	5853	4734	9006	0	9152	1660.00439	0.20300	0.23400	4	1	3	0	0.25000	0.25000	0.25000	0.17000
7	10	68437.22685	87552820.74840	942406949.62700	5612	5851	4732	9006	0	9152	7435.09838	0.65879	0.78800	20	3	19	0	0.79000	0.75000	0.75000	0.75000
7	10	68437.22685	87552820.74840	942406949.62700	5613	5850	4731	9006	0	9152	2767.74775	0.73562	0.89800	20	3	20	1	1.00000	1.00000	0.99000	0.50000
7	10	68437.22685	87552820.74840	942406949.62700	5713	5861	4742	9006	0	9152	11419.97541	0.43014	0.52317	14	3	12	1	0.66279	0.41000	0.29306	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5714	5866	4747	9006	0	9152	1907.03842	0.37875	0.55000	12	2	13	1	1.00000	0.25000	0.25000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5715	5870	4751	9006	0	9152	4439.23757	0.17996	0.32462	3	1	5	1	0.49000	0.11311	0.02000	0.00000
7	10	68437.22685	87552820.74840	942406949.62700	5716	5869	4750	9006	0	9152	1645.77476	0.14426	0.26023	3	1	4	1	0.24000	0.04113	0.02000	0.00000
7	10	68437.22685	87552820.74840	942406949.62700	5717	5837	4718	9006	0	9152	5460.93303	0.47583	0.59063	16	3	14	1	0.93000	0.45918	0.31395	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5718	5863	4744	9006	0	9152	4435.44084	0.46903	0.65000	16	3	15	1	1.00000	0.50000	0.50000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5719	5867	4748	9006	0	9152	2144.62883	0.37932	0.55000	12	2	13	1	1.00000	0.25000	0.25000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5720	5874	4755	9006	0	9152	1047.12248	0.34846	0.50000	10	2	11	1	0.75000	0.25000	0.25000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5721	5875	4756	9006	0	9152	3462.52335	0.33730	0.44200	10	2	8	0	0.48000	0.25000	0.25000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5722	5852	4733	9006	0	9152	12233.38214	0.76778	0.82000	20	3	19	0	0.89000	0.75000	0.75000	0.75000
7	10	68437.22685	87552820.74840	942406949.62700	5727	5840	4721	9006	0	9152	2426.60201	0.29893	0.35000	8	2	6	0	0.50000	0.25000	0.25000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5728	5841	4722	9006	0	9152	919.16124	0.19628	0.25100	4	1	3	0	0.25000	0.25000	0.25000	0.12500
7	10	68437.22685	87552820.74840	942406949.62700	5729	5858	4739	9006	0	9152	2756.42033	0.23829	0.26600	5	1	4	0	0.28000	0.25000	0.25000	0.25000

SUB_AREA_I	FID_PAT_SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_ShoBas	ShoBas_ID	SZUnit_ID	P3SPU1	P3SPU2	New_SAU	Beach_ft	SumAll	AvgTop5	vig_SumAll	ter_SumAll	vig_AvgTop	Large_1	Large_2	Large_3	Large_4	Large_5
7	10	68437.22685	87552820.74840	942406949.62700	5730	5768	4650	9006	0	9152	6221.95146	0.31242	0.52281	8	2	12	1	0.57000	0.46000	0.42466	0.15938
7	10	68437.22685	87552820.74840	942406949.62700	5731	5769	4651	9006	0	9152	6901.79238	0.40803	0.46000	13	2	9	1	0.52000	0.28000	0.25000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5732	5838	4719	9006	0	9152	939.24446	0.19518	0.24900	4	1	3	0	0.25000	0.25000	0.25000	0.12500
7	10	68437.22685	87552820.74840	942406949.62700	5733	5839	4720	9006	0	9152	1818.16304	0.20107	0.25500	4	1	4	0	0.25000	0.25000	0.25000	0.12500
7	10	68437.22685	87552820.74840	942406949.62700	5734	5842	4723	9006	0	9152	2215.36041	0.26449	0.35200	6	1	6	0	0.29000	0.25000	0.25000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5735	5871	4752	9006	0	9152	3337.59190	0.35139	0.40800	11	2	8	0	0.50000	0.50000	0.25000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5736	5872	4753	9006	0	9152	3755.80269	0.29659	0.37000	8	2	7	0	0.25000	0.25000	0.25000	0.23000
7	10	68437.22685	87552820.74840	942406949.62700	5737	5767	4650	9006	0	9152	2717.37754	0.32569	0.55897	9	2	13	1	1.00000	0.45000	0.19178	0.15306
7	10	68437.22685	87552820.74840	942406949.62700	5974	5862	4743	9006	0	9152	4356.99787	0.22733	0.26400	5	1	4	0	0.25000	0.25000	0.25000	0.22000
7	10	68437.22685	87552820.74840	942406949.62700	5975	5864	4745	9006	0	9152	3575.11937	0.17117	0.25100	3	1	3	0	0.25000	0.25000	0.13000	0.12500
7	10	68437.22685	87552820.74840	942406949.62700	5988	5833	4714	9006	0	9152	1597.21159	0.23612	0.27800	5	1	4	0	0.29000	0.25000	0.25000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	5989	5859	4740	9006	0	9152	2293.51992	0.19030	0.22100	4	1	3	0	0.25000	0.25000	0.23000	0.12500
7	10	68437.22685	87552820.74840	942406949.62700	5990	5860	4741	9006	0	9152	1401.06519	0.16445	0.20000	3	1	2	0	0.25000	0.25000	0.12500	0.12500
7	10	68437.22685	87552820.74840	942406949.62700	5991	5836	4717	9006	0	9152	6297.32714	0.23106	0.41279	5	1	8	0	0.77000	0.21233	0.16195	0.07969
7	10	68437.22685	87552820.74840	942406949.62700	5992	5765	4648	9006	0	9152	2057.28127	0.20903	0.29102	4	1	4	0	0.31000	0.25510	0.18000	0.16000
7	10	68437.22685	87552820.74840	942406949.62700	5993	5761	4645	9006	0	9152	422.50210	0.09535	0.17200	2	1	2	0	0.06000	0.06000	0.00000	0.00000
7	10	68437.22685	87552820.74840	942406949.62700	5994	5764	4647	9006	0	9152	2918.21086	0.14895	0.23541	3	1	3	0	0.26000	0.17442	0.15000	0.13265

SUB_AREA_I	FID_PAT_SU	Shape_Leng	Shape_Area	NS_SUB_SQR	FID_ShoBas	ShoBas_ID	SZUnit_ID	P3SPU1	P3SPU2	New_SAU	Beach_ft	SumAll	AvgTop5	vig_SumAll	ter_SumAll	vig_AvgTop	Large_1	Large_2	Large_3	Large_4	Large_5
7	10	68437.22685	87552820.74840	942406949.62700	5996	5766	4649	9006	0	9152	2921.67581	0.27173	0.31800	6	1	5	0	0.35000	0.25000	0.25000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	6000	5763	4646	9006	0	9152	1246.84773	0.04774	0.07395	1	1	1	0	0.06977	0.06000	0.06000	0.06000
7	10	68437.22685	87552820.74840	942406949.62700	6001	5762	4645	0	6056	9156	502.56184	0.25460	0.36927	6	1	7	0	0.37000	0.31633	0.19000	0.17000
7	10	68437.22685	87552820.74840	942406949.62700	6045	5834	4715	9006	0	9152	1261.13325	0.19099	0.24700	4	1	3	0	0.25000	0.25000	0.25000	0.12500
7	10	68437.22685	87552820.74840	942406949.62700	6046	5835	4716	9006	0	9152	14660.07616	0.24603	0.30058	6	1	4	0	0.37500	0.25000	0.25000	0.25000
7	10	68437.22685	87552820.74840	942406949.62700	6051	5865	4746	9006	0	9152	10297.46035	0.32674	0.37796	9	2	7	0	0.50000	0.37500	0.26478	0.25000

SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
1	Clam_Hard	Geoduck	Coho Salmon	Coast Resident Cutthroat	Crab_Dun	3517.23153
1	Clam_Hard	Geoduck	Natl_Wetlands	Crab_Dun	Smelt	580.70116
1	Geoduck	Coast Resident Cutthroat	Coho Salmon	Chum Salmon	ZOS_UNIT	1453.65510
1	SandLance	Crab_Dun	Geoduck	Smelt	Clam_Hard	716.45455
1	Geoduck	SandLance	Smelt	Crab_Dun	Clam_Hard	783.23919
1	Geoduck	ZOS_UNIT	Crab_Dun	Smelt	Clam_Hard	1563.66396
1	Crab_Dun	Geoduck	Smelt	Clam_Hard	SandLance	1147.07611
1	Geoduck	Crab_Dun	Smelt	ZOS_UNIT	Clam_Hard	3106.32926
1	Geoduck	Crab_Dun	Smelt	Natl_Wetlands	Clam_Hard	125.13066
1	Crab_Dun	Geoduck	Smelt	Clam_Hard	SandLance	140.19030
1	Clam_Hard	Geoduck	Crab_Dun	Smelt	MedDens2000_2009	3513.17611
1	Geoduck	Smelt	Crab_Dun	Clam_Hard	SandLance	1201.50362
1	Geoduck	Coast Resident Cutthroat	Coho Salmon	Chum Salmon	Smelt	3421.40934
1	Geoduck	Natl_Wetlands	Crab_Dun	Smelt	Clam_Hard	281.73287
1	Clam_Hard	Geoduck	Coho Salmon	Chum Salmon	Coast Resident Cutthroat	349.99006
1	Clam_Hard	Geoduck	Crab_Dun	Smelt	Natl_Wetlands	1720.69870
1	Geoduck	Crab_Dun	Smelt	Natl_Wetlands	MedDens2000_2009	475.51310
1	SandLance	Smelt	Crab_Dun	Geoduck	Clam_Hard	426.68022
1	Smelt	Crab_Dun	Geoduck	Natl_Wetlands	Clam_Hard	361.61749
1	SandLance	Smelt	Crab_Dun	Natl_Wetlands	Geoduck	311.80943
1	Smelt	Crab_Dun	Geoduck	Clam_Hard	Natl_Wetlands	126.79463
1	Geoduck	Smelt	BE_Nest	ZOS_UNIT	Natl_Wetlands	2289.59081
1	Geoduck	Natl_Wetlands	Crab_Dun	SandLance	Clam_Hard	607.93118

SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
1	Geoduck	Coho Salmon	ZOS_UNIT	Chum Salmon	Coast Resident Cutthroat	2439.89471
1	Geoduck	Natl_Wetlands	ZOS_UNIT	Crab_Dun	Smelt	3436.02738
1	Clam_Hard	Geoduck	ZOS_UNIT	Crab_Dun	Smelt	4345.00817
1	Geoduck	Smelt	Crab_Dun	Clam_Hard	Natl_Wetlands	1212.32116
1	Clam_Hard	Coho Salmon	Chum Salmon	Coast Resident Cutthroat	Crab_Dun	509.09484
1	Geoduck	Crab_Dun	Smelt	ZOS_UNIT	Clam_Hard	2680.80225
1	Geoduck	Coho Salmon	Chum Salmon	Coast Resident Cutthroat	Natl_Wetlands	1396.33733
1	Smelt	Crab_Dun	Geoduck	Clam_Hard	SandLance	659.39138
1	Crab_Dun	Smelt	Geoduck	Clam_Hard	Natl_Wetlands	4751.59159
1	Geoduck	Smelt	Coast Resident Cutthroat	Coho Salmon	Crab_Dun	597.89944
1	Geoduck	ZOS_UNIT	Crab_Dun	Smelt	Natl_Wetlands	2587.11970
1	Smelt	Coast Resident Cutthroat	Coho Salmon	Crab_Dun	Geoduck	1173.82174
1	Natl_Wetlands	Geoduck	Crab_Dun	SandLance	Clam_Hard	637.12262
1	Natl_Wetlands	Geoduck	Crab_Dun	SandLance	Clam_Hard	733.55933
1	Natl_Wetlands	Geoduck	Crab_Dun	SandLance	Clam_Hard	362.76197
1	Geoduck	Natl_Wetlands	Coho Salmon	Crab_Dun	Smelt	1608.42948
1	Geoduck	Crab_Dun	Smelt	Clam_Hard	SandLance	676.05933
1	Clam_Hard	Geoduck	Coho Salmon	Coast Resident Cutthroat	Smelt	962.65535
1	Clam_Hard	Geoduck	Crab_Dun	Smelt	Natl_Wetlands	198.44685
1	Geoduck	Smelt	Crab_Dun	Clam_Hard	SandLance	3153.54279
1	Geoduck	Smelt	ZOS_UNIT	Crab_Dun	Clam_Hard	3886.87833
1	Crab_Dun	Geoduck	Smelt	ZOS_UNIT	Clam_Hard	2404.82361

SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
1	Geoduck	Smelt	Coast Resident Cutthroat	Crab_Dun	Clam_Hard	658.30168
1	Geoduck	Smelt	Natl_Wetlands	Crab_Dun	Clam_Hard	1502.80262
1	Geoduck	Smelt	Coho Salmon	Natl_Wetlands	Crab_Dun	1365.75567
1	Clam_Hard	Geoduck	Smelt	Natl_Wetlands	SandLance	2904.14808
1	Geoduck	Smelt	Crab_Dun	ZOS_UNIT	Clam_Hard	3030.88888
1	BE_Nest	Crab_Dun	Geoduck	Smelt	Clam_Hard	468.09456
1	Geoduck	Coast Resident Cutthroat	ZOS_UNIT	Coho Salmon	Crab_Dun	3883.61648
1	Geoduck	Smelt	Crab_Dun	Clam_Hard	ZOS_UNIT	1907.17548
1	SandLance	Smelt	SBR_UNIT	Crab_Dun	Geoduck	2129.44912
1	Geoduck	Crab_Dun	Natl_Wetlands	MedDens2000_2009	0	455.81594
1	Smelt	Coho Salmon	Natl_Wetlands	Crab_Dun	Geoduck	248.86175
1	Geoduck	Smelt	Coho Salmon	MedDens2000_2009	Natl_Wetlands	829.95146
1	Geoduck	SandLance	Smelt	Crab_Dun	Clam_Hard	946.43135
1	Clam_Hard	Crab_Dun	Clam_Subt	Crab_RedRk	Urchin	2222.96053
1	Clam_Hard	Crab_Dun	Clam_Subt	Crab_RedRk	Urchin	2343.85942
1	SandLance	Smelt	Crab_Dun	Geoduck	Natl_Wetlands	793.56131
1	SandLance	Smelt	Geoduck	Crab_Dun	Clam_Hard	1035.84364
1	Geoduck	Coast Resident Cutthroat	Coho Salmon	Crab_Dun	Smelt	1065.70025
2	Clam_Hard	Geoduck	Crab_Dun	Smelt	Natl_Wetlands	1421.46572
2	Clam_Hard	Geoduck	Crab_Dun	Smelt	SBR_UNIT	845.50388
2	Geoduck	Smelt	Crab_Dun	Clam_Hard	SandLance	661.86082
2	Clam_Hard	Geoduck	Smelt	Crab_Dun	SandLance	198.69490
2	Clam_Hard	Geoduck	SBR_UNIT	Crab_Dun	Smelt	2437.33093
2	Clam_Hard	Geoduck	Crab_Dun	SBR_UNIT	Natl_Wetlands	1334.16300
2	Clam_Hard	Geoduck	Smelt	Crab_Dun	SandLance	278.17581
2	Clam_Hard	Geoduck	Crab_Dun	Smelt	SandLance	795.94163
2	Geoduck	Smelt	Crab_Dun	Clam_Hard	SBR_UNIT	848.49000

SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
2	Clam_Hard	Geoduck	SBR_UNIT	Crab_Dun	Smelt	2388.53922
2	Clam_Hard	Geoduck	SBR_UNIT	Crab_Dun	Smelt	2294.13087
2	Geoduck	Smelt	Crab_Dun	Clam_Hard	SandLance	1318.79333
2	Geoduck	Smelt	Crab_Dun	Clam_Hard	SandLance	368.12791
2	Geoduck	Smelt	Crab_Dun	Clam_Hard	Natl_Wetlands	894.98711
2	Geoduck	Crab_Dun	Smelt	Clam_Hard	Natl_Wetlands	632.52419
2	Geoduck	Smelt	Crab_Dun	Clam_Hard	Natl_Wetlands	662.19250
2	Smelt	Crab_Dun	Geoduck	Clam_Hard	SandLance	659.39138
2	Clam_Hard	Crab_Dun	Geoduck	Smelt	ZOS_UNIT	1174.57263
2	Clam_Hard	Geoduck	Crab_Dun	Smelt	ZOS_UNIT	2515.88101
2	Geoduck	Smelt	SBR_UNIT	Crab_Dun	Clam_Hard	1611.65094
2	Geoduck	Smelt	BE_Nest	Crab_Dun	SBR_UNIT	919.03219
2	Geoduck	Crab_Dun	Smelt	Natl_Wetlands	Clam_Hard	521.16296
2	Geoduck	SBR_UNIT	Crab_Dun	Smelt	BE_Nest	1630.75413
2	Geoduck	SandLance	Smelt	Coho Salmon	Coast Resident Cutthroat	1563.65205
2	Geoduck	Smelt	BE_Nest	Crab_Dun	Clam_Hard	411.51028
2	Geoduck	SandLance	Smelt	SBR_UNIT	Crab_Dun	3221.19970
2	Smelt	Crab_Dun	Geoduck	Clam_Hard	Natl_Wetlands	880.53921
2	Geoduck	Smelt	Coho Salmon	Coast Resident Cutthroat	Natl_Wetlands	1289.82150
2	Geoduck	SandLance	Crab_Dun	Smelt	Natl_Wetlands	1490.35149
2	Geoduck	Crab_Dun	Smelt	Clam_Hard	SandLance	684.77173
2	Geoduck	SandLance	Crab_Dun	Smelt	Clam_Hard	867.38753
2	Geoduck	ZOS_UNIT	Coho Salmon	Coast Resident Cutthroat	Crab_Dun	3096.40577
2	Geoduck	Crab_Dun	Smelt	Clam_Hard	SandLance	1112.14648
2	Geoduck	Crab_Dun	Smelt	Natl_Wetlands	Clam_Hard	676.39640
2	Geoduck	Crab_Dun	Smelt	Clam_Hard	Natl_Wetlands	524.50623
2	Geoduck	Crab_Dun	SandLance	Natl_Wetlands	Clam_Hard	1241.55079
2	Geoduck	Crab_Dun	Smelt	Clam_Hard	SandLance	246.92666

SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
2	Geoduck	SandLance	Smelt	Coho Salmon	Coast Resident Cutthroat	892.35410
2	Geoduck	Smelt	Crab_Dun	Clam_Hard	Natl_Wetlands	1056.19187
2	Geoduck	Crab_Dun	Smelt	Clam_Hard	SandLance	651.31162
2	Geoduck	SandLance	ZOS_UNIT	Crab_Dun	Smelt	2264.36252
2	Geoduck	Crab_Dun	Smelt	Clam_Hard	SandLance	206.05492
2	Geoduck	SBR_UNIT	Crab_Dun	Smelt	Natl_Wetlands	1036.62633
2	Geoduck	Smelt	ZOS_UNIT	BE_Nest	Crab_Dun	2006.05183
2	Geoduck	Smelt	Crab_Dun	Clam_Hard	SandLance	563.62389
2	Geoduck	SandLance	Smelt	Crab_Dun	Clam_Hard	1128.51806
2	Geoduck	Smelt	ZOS_UNIT	Crab_Dun	Clam_Hard	2859.90523
2	Geoduck	Crab_Dun	Smelt	ZOS_UNIT	Clam_Hard	1151.79183
3	ShrimpPan	CHB_UNIT	SBR_UNIT	NER_UNIT	Crab_Dun	2824.81385
3	SandLance	Smelt	SBR_UNIT	Geoduck	ZOS_UNIT	1939.27966
3	Crab_Dun	BE_Nest	Clam_Hard	Smelt	SandLance	1953.88006
3	Crab_Dun	BE_Nest	Geoduck	Smelt	Clam_Hard	3927.14265
3	Crab_Dun	Natl_Wetlands	Geoduck	SandLance	Smelt	947.66607
3	Clam_Hard	Crab_Dun	Geoduck	Smelt	ZOS_UNIT	1174.57263
3	SandLance	Smelt	ZOS_UNIT	Natl_Wetlands	Crab_Dun	2728.52551
3	ZOS_UNIT	Geoduck	Crab_Dun	Smelt	Natl_Wetlands	2258.20035
3	SandLance	Smelt	Natl_Wetlands	Crab_Dun	Geoduck	320.01504
3	Crab_Dun	Clam_Hard	Smelt	SandLance	Clam_Subt	2612.44342
3	Crab_Dun	NER_UNIT	MedDens2000_2009	Clam_Hard	Smelt	2720.65508
3	Crab_Dun	Natl_Wetlands	Geoduck	Smelt	Clam_Hard	724.34537
3	Crab_Dun	Natl_Wetlands	Geoduck	Smelt	Clam_Hard	681.80312
3	Crab_Dun	Natl_Wetlands	NER_UNIT	ZOS_UNIT	Smelt	559.36041
3	Crab_Dun	Geoduck	Smelt	Clam_Hard	NER_UNIT	848.86021
3	Crab_Dun	Natl_Wetlands	Clam_Hard	Smelt	SandLance	2363.74594
3	Crab_Dun	Clam_Hard	Smelt	SandLance	Clam_Subt	10519.76985
3	Crab_Dun	Geoduck	Smelt	NER_UNIT	SBR_UNIT	1273.25242
3	Crab_Dun	Geoduck	Smelt	ZOS_UNIT	Clam_Hard	1111.07517
3	Crab_Dun	Geoduck	Smelt	Clam_Hard	SandLance	517.34955

SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
3	Crab_Dun	Geoduck	Smelt	SBR_UNIT	Clam_Hard	1232.98321
3	Crab_Dun	MedDens2000_2009	Clam_Hard	Smelt	SandLance	4538.67449
3	Crab_Dun	Geoduck	Smelt	Clam_Hard	SandLance	367.88975
3	Crab_Dun	Natl_Wetlands	Geoduck	Smelt	ZOS_UNIT	2550.67518
3	Crab_Dun	Geoduck	Smelt	HaulOuts	Natl_Wetlands	1478.15631
3	Crab_Dun	SBR_UNIT	NER_UNIT	Natl_Wetlands	ZOS_UNIT	5571.73043
3	Crab_Dun	NER_UNIT	Clam_Hard	Smelt	SandLance	1781.30855
3	NER_UNIT	Crab_Dun	Clam_Hard	Smelt	SandLance	6465.99180
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	1484.46954
4	GRA_UNIT	Clam_Hard	Natl_Wetlands	GBH_600ft	Crab_Dun	2584.57789
4	Crab_Dun	BE_Nest	Clam_Hard	Smelt	SandLance	1953.88006
4	Crab_Dun	Clam_Hard	Smelt	SandLance	Clam_Subt	1371.22576
4	Crab_Dun	Clam_Hard	Smelt	SandLance	Clam_Subt	1360.71250
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	3078.35827
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	4390.68716
4	Crab_Dun	Clam_Hard	Clam_Subt	Crab_RedRk	Urchin	604.27374
4	Crab_Dun	Clam_Hard	Clam_Subt	Crab_RedRk	Urchin	1296.19585
4	Bull Trout	Pink Salmon	Sockeye	GRA_UNIT	Chinook Salmon	5112.05002
4	Crab_Dun	NER_UNIT	Clam_Hard	Smelt	SandLance	2130.16419
4	Coho Salmon	Coast Resident Cutthroat	Crab_Dun	Clam_Hard	Clam_Subt	2643.13495
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	1150.85170
4	Bull Trout	Coho Salmon	Pink Salmon	Sockeye	Chinook Salmon	6096.22651
4	GRA_UNIT	Natl_Wetlands	Crab_Dun	Smelt	Oyster	2669.87280
4	Natl_Wetlands	GRA_UNIT	SED_UNIT	TRI_UNIT	Crab_Dun	952.05193
4	Natl_Wetlands	GRA_UNIT	SED_UNIT	Crab_Dun	TRI_UNIT	771.63760

SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	1233.00321
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	2568.49311
4	Crab_Dun	MedDens2000 _2009	Clam_Hard	Smelt	SandLance	1670.48110
4	Crab_Dun	Clam_Hard	Smelt	SandLance	MedDens200 0_2009	2275.92025
4	Bull Trout	Pink Salmon	Sockeye	Coho Salmon	Coast Resident Cutthroat	7476.94710
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	6078.99133
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	1735.23309
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	1216.99010
4	Crab_Dun	Clam_Hard	Smelt	SandLance	Clam_Subt	2659.88147
4	Crab_Dun	Clam_Hard	Clam_Subt	Crab_RedRk	Urchin	1694.65913
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	1910.08576
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	1105.43537
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	1775.58031
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	616.04105
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	4780.03447
4	Crab_Dun	Clam_Hard	Smelt	SandLance	Clam_Subt	3815.56441
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	960.60965
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	2180.75877
4	Bull Trout	Pink Salmon	Sockeye	Coho Salmon	Chinook Salmon	654.22555
4	Crab_Dun	Clam_Hard	Smelt	SandLance	Clam_Subt	2791.41422
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	3607.47399
4	Bull Trout	Pink Salmon	Sockeye	GRA_UNIT	Chinook Salmon	7306.76939
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	1198.77054

SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	2336.48279
4	Crab_Dun	Clam_Hard	Smelt	SandLance	Clam_Subt	1518.07286
4	NER_UNIT	Crab_Dun	Clam_Hard	Smelt	SandLance	6465.99180
4	Bull Trout	Pink Salmon	Sockeye	Chinook Salmon	Coho Salmon	915.68940
4	Crab_Dun	Clam_Hard	Clam_Subt	Crab_RedRk	Urchin	1046.17937
5	Crab_Dun	HaulOuts	NER_UNIT	MedDens2000_2009	Clam_Hard	4522.64533
5	Crab_Dun	NER_UNIT	MedDens2000_2009	Clam_Hard	Clam_Subt	4497.04522
5	GBH_600ft	Crab_Dun	Clam_Subt	Urchin	Natl_Wetlands	1147.04359
5	Crab_Dun	Geoduck	ZOS_UNIT	Smelt	Clam_Hard	2459.57660
5	Crab_Dun	Geoduck	Smelt	Clam_Hard	GRA_UNIT	797.97044
5	Crab_Dun	Natl_Wetlands	Clam_Hard	Smelt	SandLance	293.23672
5	Crab_Dun	SBR_UNIT	Clam_Hard	Clam_Subt	Crab_RedRk	4843.25003
5	Crab_Dun	Geoduck	ZOS_UNIT	NER_UNIT	Smelt	8890.60081
5	Crab_Dun	Geoduck	SBR_UNIT	Smelt	ZOS_UNIT	1519.61816
5	Crab_Dun	SandLance	GRA_UNIT	Geoduck	SBR_UNIT	1363.36924
5	Crab_Dun	Smelt	Natl_Wetlands	Oyster	ShrimpPan	100.78890
5	Crab_Dun	BE_Nest	Geoduck	Clam_Hard	Natl_Wetlands	2291.96137
5	Crab_Dun	Geoduck	Smelt	Clam_Hard	SandLance	1314.40884
5	Crab_Dun	Geoduck	SandLance	HaulOuts	Natl_Wetlands	715.56433
5	Crab_Dun	Geoduck	SandLance	SBR_UNIT	Smelt	1689.18782
5	GBH_600ft	Oyster	Crab_Dun	Smelt	Geoduck	1113.80488
5	Bull Trout	Sockeye	Natl_Wetlands	Chinook Salmon	Coho Salmon	747.01455
5	Crab_Dun	SandLance	ZOS_UNIT	Clam_Hard	Smelt	1235.08784
5	Coast Resident Cutthroat	Natl_Wetlands	Crab_Dun	Geoduck	Smelt	1463.80104
5	SandLance	Geoduck	Crab_Dun	ZOS_UNIT	Clam_Hard	1352.27715
5	SandLance	Geoduck	Crab_Dun	Clam_Hard	Smelt	856.74671
5	GBH_600ft	Crab_Dun	Clam_Hard	Clam_Subt	Crab_RedRk	723.13023
5	Crab_Dun	Geoduck	Natl_Wetlands	SandLance	Clam_Hard	117.07912
5	Crab_Dun	Geoduck	Chinook Salmon	Coho Salmon	Smelt	799.60323

SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
5	Crab_Dun	Geoduck	Chinook Salmon	Coho Salmon	ZOS_UNIT	2749.42251
5	Crab_Dun	Natl_Wetlands	Geoduck	SandLance	Clam_Hard	189.75752
5	Crab_Dun	Natl_Wetlands	Geoduck	Smelt	Clam_Hard	274.06889
5	Crab_Dun	Geoduck	ZOS_UNIT	Smelt	Natl_Wetlands	3985.42447
5	Crab_Dun	Natl_Wetlands	Clam_Hard	Smelt	SandLance	3045.32053
5	BE_Nest	Crab_Dun	Natl_Wetlands	Oyster	Geoduck	679.87211
5	BE_Nest	Clam_Hard	Natl_Wetlands	Crab_Dun	Clam_Subt	692.06744
5	Crab_Dun	SBR_UNIT	Natl_Wetlands	ZOS_UNIT	Geoduck	4108.29895
5	SandLance	Smelt	Natl_Wetlands	Geoduck	Crab_Dun	796.26318
5	SandLance	Smelt	Crab_Dun	Clam_Hard	MedDens2000_2009	1342.03139
5	SandLance	Smelt	Natl_Wetlands	SBR_UNIT	Crab_Dun	1542.66782
5	Smelt	Crab_Dun	Geoduck	GRA_UNIT	SBR_UNIT	673.80877
5	Geoduck	Crab_Dun	Smelt	Clam_Hard	SandLance	893.47659
5	Geoduck	Crab_Dun	Smelt	Clam_Hard	SandLance	646.67937
5	Geoduck	Smelt	Crab_Dun	SandLance	Natl_Wetlands	745.58656
5	Smelt	Crab_Dun	GRA_UNIT	SBR_UNIT	Geoduck	1268.76546
5	Geoduck	Crab_Dun	Smelt	Clam_Hard	SandLance	1550.74893
5	SBR_UNIT	Crab_Dun	Geoduck	Smelt	Natl_Wetlands	1845.82102
5	Crab_Dun	Geoduck	ZOS_UNIT	Coho Salmon	Coast Resident Cutthroat	3501.61301
5	GBH_600ft	Natl_Wetlands	Crab_Dun	Smelt	Oyster	523.61912
5	Crab_Dun	Geoduck	Clam_Hard	Smelt	BE_Nest	1285.18783
5	Crab_Dun	BE_Nest	Geoduck	Natl_Wetlands	NER_UNIT	350.37020
5	Crab_Dun	Smelt	GRA_UNIT	ZOS_UNIT	Geoduck	1346.16457
5	Crab_Dun	Smelt	ZOS_UNIT	NER_UNIT	BE_Nest	2575.41946
5	Crab_Dun	Natl_Wetlands	Clam_Hard	Clam_Subt	Crab_RedRk	537.04345

SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
5	Crab_Dun	Geoduck	Smelt	HaulOuts	Natl_Wetlands	1478.15631
6	Crab_Dun	Geoduck	NER_UNIT	Clam_Hard	Smelt	1416.56135
6	Crab_Dun	Geoduck	SandLance	Coho Salmon	Steelhead Trout	1054.43225
6	Crab_Dun	Clam_Hard	Smelt	SandLance	Clam_Subt	1160.94534
6	Crab_Dun	Clam_Hard	Clam_Subt	Urchin	Smelt	8583.16746
6	Clam_Hard	Crab_Dun	Coast Resident Cutthroat	Natl_Wetlands	Geoduck	706.70346
6	Crab_Dun	ShrimpPan	Geoduck	SandLance	Smelt	1169.77013
6	Crab_Dun	ShrimpPan	Geoduck	Coast Resident Cutthroat	BE_Nest	2158.19700
6	Crab_Dun	Smelt	Clam_Hard	SandLance	Clam_Subt	1443.81283
6	Clam_Hard	Crab_Dun	BE_Nest	Geoduck	Smelt	296.54939
6	Crab_Dun	Geoduck	Smelt	Clam_Hard	SandLance	582.76204
6	Crab_Dun	Natl_Wetlands	Clam_Hard	Clam_Subt	Urchin	326.12067
6	Crab_Dun	Clam_Hard	Natl_Wetlands	Clam_Subt	Urchin	478.74784
6	Clam_Hard	Crab_Dun	Coast Resident Cutthroat	Natl_Wetlands	ZOS_UNIT	2391.25772
6	Clam_Hard	Crab_Dun	BE_Nest	Geoduck	Natl_Wetlands	496.47416
6	Crab_Dun	BE_Nest	Natl_Wetlands	Clam_Hard	Smelt	3536.67401
6	Crab_Dun	Clam_Hard	Smelt	SandLance	Clam_Subt	2474.87211
6	Crab_Dun	Clam_Hard	Smelt	SandLance	Clam_Subt	703.98713
6	Crab_Dun	Clam_Hard	SandLance	Coho Salmon	Smelt	1361.85038
6	Crab_Dun	Smelt	Coast Resident Cutthroat	Clam_Hard	ZOS_UNIT	2436.44317
6	Clam_Hard	Crab_Dun	SandLance	BE_Nest	Natl_Wetlands	1440.82242
6	Crab_Dun	Smelt	Geoduck	Clam_Hard	SandLance	631.01932
6	Crab_Dun	ShrimpPan	Geoduck	ZOS_UNIT	Natl_Wetlands	2710.06859
6	Crab_Dun	ShrimpPan	Geoduck	ZOS_UNIT	SandLance	2284.96405
6	Crab_Dun	ShrimpPan	Geoduck	SandLance	Smelt	1225.20795
6	Crab_Dun	ShrimpPan	Geoduck	ZOS_UNIT	BE_Nest	7610.54978
6	Clam_Hard	Crab_Dun	SandLance	Geoduck	Smelt	1093.98185

SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
6	Crab_Dun	Smelt	Clam_Hard	SandLance	ZOS_UNIT	823.23091
6	Crab_Dun	Clam_Hard	Clam_Subt	Urchin	Smelt	1211.98586
6	Crab_Dun	Clam_Hard	Clam_Subt	Urchin	Smelt	561.58050
6	Crab_Dun	Clam_Hard	Clam_Subt	Crab_RedRk	Urchin	1284.20268
6	Crab_Dun	Clam_Hard	Clam_Subt	Urchin	Smelt	1136.91260
6	Crab_Dun	ShrimpPan	Geoduck	BE_Nest	Natl_Wetlands	1410.20994
6	Clam_Hard	Crab_Dun	ShrimpPan	Geoduck	Natl_Wetlands	948.00556
6	Clam_Hard	Crab_Dun	ShrimpPan	Geoduck	Coho Salmon	3666.50937
6	Crab_Dun	Clam_Hard	Natl_Wetlands	SAL_UNIT	0	175.86029
6	Crab_Dun	AtRisk2005_2009	Clam_Hard	Smelt	SandLance	597.95861
6	Crab_Dun	Natl_Wetlands	Clam_Hard	Smelt	SandLance	814.09632
6	Crab_Dun	Natl_Wetlands	BE_Nest	SAL_UNIT	SandLance	1449.52375
6	Crab_Dun	Clam_Hard	Clam_Subt	Urchin	Smelt	2995.87530
6	Crab_Dun	HaulOuts	Clam_Hard	Smelt	SandLance	1470.44372
6	Crab_Dun	Clam_Hard	Clam_Subt	Urchin	Smelt	3223.07325
6	Crab_Dun	Clam_Hard	Clam_Subt	Urchin	Smelt	2015.58339
6	Crab_Dun	Natl_Wetlands	SandLance	Smelt	Clam_Hard	6934.76190
6	Crab_Dun	Clam_Hard	Clam_Subt	Urchin	Smelt	376.28732
6	Crab_Dun	Geoduck	Clam_Hard	Smelt	SandLance	1313.12805
6	Crab_Dun	Natl_Wetlands	Clam_Hard	Clam_Subt	Crab_RedRk	1908.36622
6	Crab_Dun	Natl_Wetlands	Geoduck	SandLance	Clam_Hard	1308.82103
6	Crab_Dun	Geoduck	Coast Resident Cutthroat	Smelt	Natl_Wetlands	6486.12979
6	Crab_Dun	Natl_Wetlands	Geoduck	SandLance	Clam_Hard	189.75752
6	Crab_Dun	Geoduck	Coho Salmon	Coast Resident Cutthroat	Smelt	474.77588
6	Crab_Dun	Geoduck	Smelt	Natl_Wetlands	Clam_Hard	1806.11605

SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
6	Coho Salmon	Coast Resident Cutthroat	Crab_Dun	Natl_Wetlands	Clam_Hard	2673.68608
6	Crab_Dun	Clam_Hard	Smelt	SandLance	Clam_Subt	781.17709
6	Crab_Dun	BE_Nest	Coast Resident Cutthroat	Clam_Hard	Coho Salmon	651.42355
6	Crab_Dun	Clam_Hard	Smelt	SandLance	Clam_Subt	2742.60567
6	Crab_Dun	Geoduck	SandLance	Clam_Hard	Smelt	615.01516
6	Clam_Hard	Crab_Dun	ZOS_UNIT	Natl_Wetlands	SandLance	2658.24826
6	Crab_Dun	SandLance	Clam_Hard	Smelt	ShrimpPan	740.08753
6	Crab_Dun	Smelt	Geoduck	Clam_Hard	SandLance	1298.07781
6	Clam_Hard	Crab_Dun	Natl_Wetlands	Coast Resident Cutthroat	Geoduck	421.75846
6	Crab_Dun	Clam_Hard	SandLance	Smelt	MedDens2000_2009	782.19384
6	Crab_Dun	ShrimpPan	Geoduck	Natl_Wetlands	SandLance	1341.35524
6	Clam_Hard	Crab_Dun	ZOS_UNIT	SandLance	Smelt	2110.54729
6	Clam_Hard	Crab_Dun	ShrimpPan	Geoduck	SandLance	1204.94624
6	Crab_Dun	Geoduck	Coast Resident Cutthroat	Natl_Wetlands	Smelt	923.51102
6	Crab_Dun	Geoduck	Natl_Wetlands	Smelt	Clam_Hard	1007.45923
6	Crab_Dun	Geoduck	SandLance	ZOS_UNIT	Coast Resident Cutthroat	5277.19892
6	Crab_Dun	Geoduck	SandLance	Clam_Hard	Smelt	752.52795
6	Crab_Dun	Geoduck	SandLance	Smelt	Natl_Wetlands	746.49623
6	Geoduck	Crab_Dun	SandLance	Clam_Hard	Smelt	19.73399
6	Crab_Dun	Geoduck	Smelt	HaulOuts	SandLance	504.26122
6	Crab_Dun	Geoduck	Smelt	SandLance	Clam_Hard	234.28993
6	Crab_Dun	Geoduck	Smelt	Clam_Hard	SandLance	498.58501
6	Crab_Dun	Geoduck	NER_UNIT	Natl_Wetlands	Smelt	3531.09065
6	Crab_Dun	Geoduck	Coho Salmon	Coast Resident Cutthroat	Smelt	2286.63726

SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
6	Crab_Dun	Geoduck	Coho Salmon	Coast Resident Cutthroat	Smelt	1105.65001
6	Crab_Dun	Geoduck	Smelt	Natl_Wetlands	Clam_Hard	1405.42268
6	Crab_Dun	Geoduck	Smelt	Natl_Wetlands	Clam_Hard	2668.87781
6	Crab_Dun	Waterfowl	Natl_Wetlands	Shorebirds	GRA_UNIT	4377.97096
6	Crab_Dun	MedDens2000_2009	AtRisk2005_2009	Smelt	ShrimpPan	2472.56608
6	Crab_Dun	Natl_Wetlands	Waterfowl	GRA_UNIT	Geoduck	2508.87570
6	Crab_Dun	MedDens2000_2009	Clam_Hard	Smelt	SandLance	3587.21756
6	Crab_Dun	Waterfowl	Natl_Wetlands	GRA_UNIT	Geoduck	5955.26973
6	Crab_Dun	SAL_UNIT	MedDens2000_2009	TRI_UNIT	Waterfowl	2961.86782
6	Crab_Dun	Waterfowl	Natl_Wetlands	Shorebirds	Clam_Hard	3306.02849
6	Crab_Dun	ZOS_UNIT	Natl_Wetlands	Clam_Hard	Smelt	3332.19674
6	Crab_Dun	Waterfowl	Shorebirds	Natl_Wetlands	Clam_Hard	455.79456
6	Crab_Dun	Waterfowl	Natl_Wetlands	Shorebirds	Clam_Hard	519.70370
6	Crab_Dun	Waterfowl	Shorebirds	Natl_Wetlands	AtRisk2005_2009	2079.78425
6	Crab_Dun	Waterfowl	Shorebirds	Natl_Wetlands	Clam_Hard	2075.27578
6	Crab_Dun	Waterfowl	Natl_Wetlands	Geoduck	Smelt	741.20100
6	Crab_Dun	Waterfowl	Geoduck	Natl_Wetlands	Smelt	1353.92631
6	Crab_Dun	Waterfowl	Natl_Wetlands	Geoduck	Smelt	2251.42018
6	Crab_Dun	Waterfowl	Geoduck	Smelt	Clam_Hard	894.44317
6	Waterfowl	Natl_Wetlands	Shorebirds	Smelt	Crab_Dun	502.56184
6	Crab_Dun	Waterfowl	Natl_Wetlands	Geoduck	Smelt	1301.52089
6	Crab_Dun	Waterfowl	BE_Nest	Natl_Wetlands	Geoduck	1178.57154

SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
6	Crab_Dun	Waterfowl	Smelt	Geoduck	ZOS_UNIT	1989.68156
6	Crab_Dun	Waterfowl	Natl_Wetlands	Geoduck	Smelt	784.22613
6	Crab_Dun	Waterfowl	ZOS_UNIT	Geoduck	Smelt	1733.12057
6	Crab_Dun	Natl_Wetlands	Waterfowl	ZOS_UNIT	Geoduck	6846.16590
7	Bull Trout	Coast Resident Cutthroat	Sockeye	Chinook Salmon	Chum Salmon	4255.69088
7	Crab_Dun	Clam_Hard	Natl_Wetlands	SAL_UNIT	0	175.86029
7	Crab_Dun	SAL_UNIT	Clam_Hard	0	0	1820.06775
7	Bull Trout	Sockeye	Chinook Salmon	Chum Salmon	Coast Resident Cutthroat	16479.89762
7	Bull Trout	Coast Resident Cutthroat	Sockeye	Waterfowl	Natl_Wetlands	1327.38373
7	Natl_Wetlands	SED_UNIT	0	0	0	900.06389
7	Chinook Salmon	Chum Salmon	Coho Salmon	Pink Salmon	Steelhead Trout	12442.55031
7	Natl_Wetlands	Bull Trout	Sockeye	Chinook Salmon	Chum Salmon	1131.30326
7	Natl_Wetlands	Bull Trout	Sockeye	Chinook Salmon	Chum Salmon	4275.45285
7	Bull Trout	Coast Resident Cutthroat	Sockeye	Chinook Salmon	Natl_Wetlands	11213.94729
7	Bull Trout	Coast Resident Cutthroat	Sockeye	Natl_Wetlands	Chinook Salmon	10160.49623
7	Waterfowl	Natl_Wetlands	Bull Trout	Coast Resident Cutthroat	Sockeye	1478.45388
7	Waterfowl	Bull Trout	Coast Resident Cutthroat	Sockeye	Natl_Wetlands	2033.20513
7	Waterfowl	Natl_Wetlands	Bull Trout	Coast Resident Cutthroat	Sockeye	1756.69084
7	Natl_Wetlands	Waterfowl	Bull Trout	Coast Resident Cutthroat	Sockeye	3024.70386

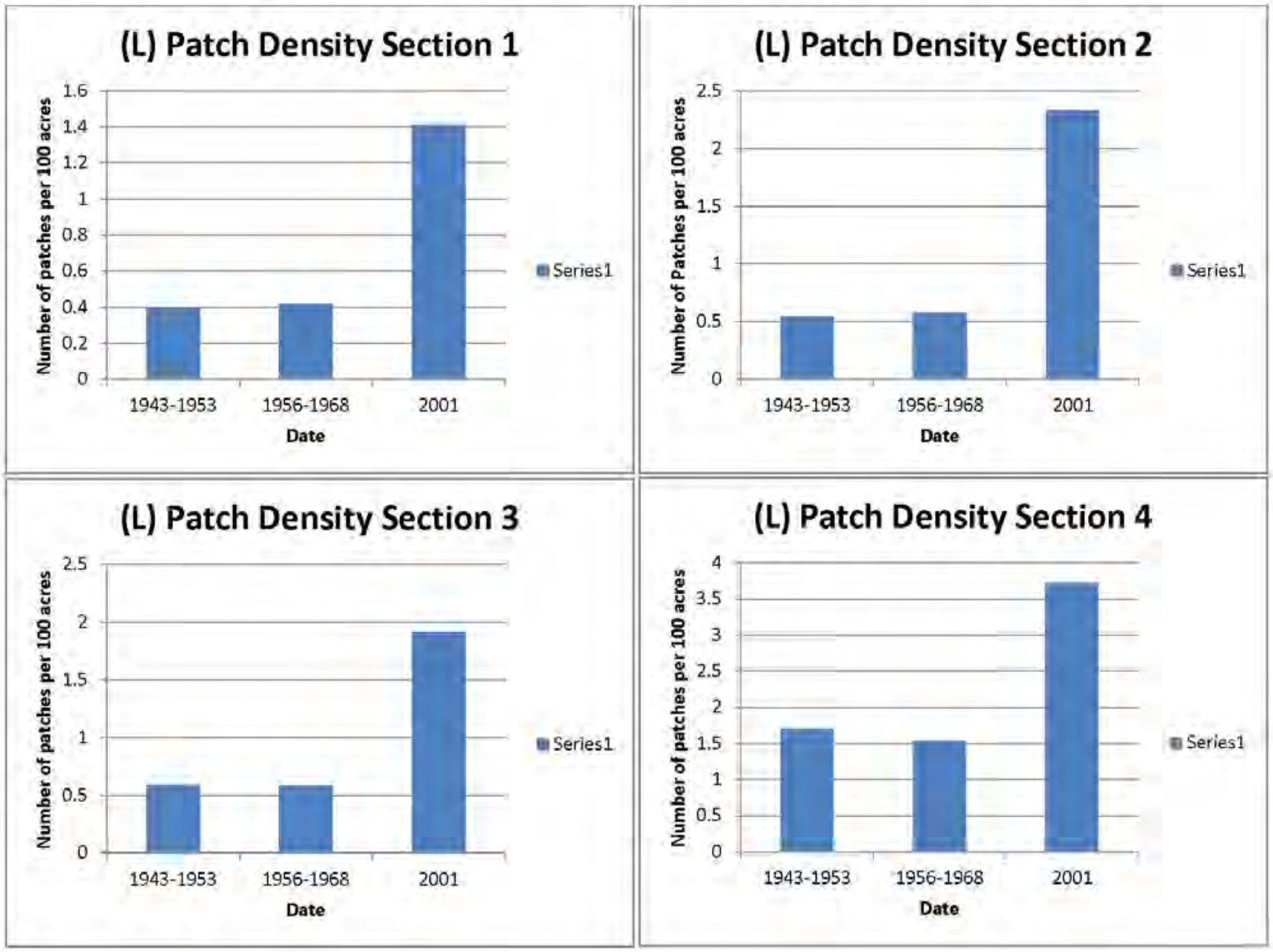
SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
7	Bull Trout	Coast Resident Cutthroat	Sockeye	Waterfowl	Natl_Wetlands	1660.00439
7	Waterfowl	Natl_Wetlands	Bull Trout	Coast Resident Cutthroat	Sockeye	7435.09838
7	Bull Trout	Coast Resident Cutthroat	Sockeye	Natl_Wetlands	Chinook Salmon	2767.74775
7	Waterfowl	ZOS_UNIT	Natl_Wetlands	SED_UNIT	Bull Trout	11419.97541
7	Waterfowl	Natl_Wetlands	Bull Trout	Coast Resident Cutthroat	Sockeye	1907.03842
7	Waterfowl	Natl_Wetlands	SED_UNIT	Crab_Dun	0	4439.23757
7	Waterfowl	Natl_Wetlands	SED_UNIT	Crab_Dun	0	1645.77476
7	Waterfowl	Natl_Wetlands	Shorebirds	ZOS_UNIT	Bull Trout	5460.93303
7	Waterfowl	Natl_Wetlands	Bull Trout	Coast Resident Cutthroat	Chinook Salmon	4435.44084
7	Waterfowl	Natl_Wetlands	Bull Trout	Coast Resident Cutthroat	Sockeye	2144.62883
7	Natl_Wetlands	Waterfowl	Bull Trout	Coast Resident Cutthroat	Sockeye	1047.12248
7	Natl_Wetlands	Waterfowl	Bull Trout	Coast Resident Cutthroat	Coho Salmon	3462.52335
7	Natl_Wetlands	Waterfowl	Bull Trout	Coast Resident Cutthroat	Sockeye	12233.38214
7	Bull Trout	Sockeye	Chinook Salmon	Chum Salmon	Coast Resident Cutthroat	2426.60201
7	Natl_Wetlands	Bull Trout	Coast Resident Cutthroat	Sockeye	Chinook Salmon	919.16124
7	Natl_Wetlands	Waterfowl	Bull Trout	Coast Resident Cutthroat	Sockeye	2756.42033

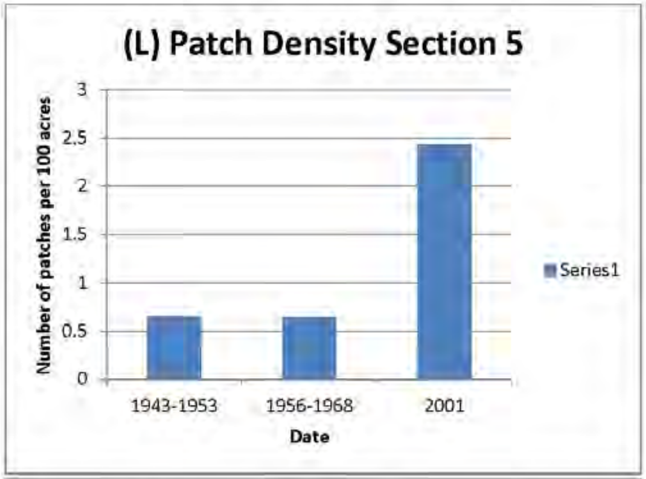
SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
7	Crab_Dun	Natl_Wetlands	Waterfowl	GRA_UNIT	SED_UNIT	6221.95146
7	Crab_Dun	Natl_Wetlands	Waterfowl	Bull Trout	Coast Resident Cutthroat	6901.79238
7	Natl_Wetlands	Bull Trout	Coast Resident Cutthroat	Sockeye	Chinook Salmon	939.24446
7	Natl_Wetlands	Bull Trout	Coast Resident Cutthroat	Sockeye	Chinook Salmon	1818.16304
7	Natl_Wetlands	Waterfowl	Bull Trout	Coast Resident Cutthroat	Sockeye	2215.36041
7	Natl_Wetlands	Bull Trout	Sockeye	Chinook Salmon	Chum Salmon	3337.59190
7	Natl_Wetlands	Bull Trout	Coast Resident Cutthroat	Sockeye	Waterfowl	3755.80269
7	Crab_Dun	Waterfowl	Natl_Wetlands	GRA_UNIT	Shorebirds	2717.37754
7	Natl_Wetlands	Bull Trout	Coast Resident Cutthroat	Sockeye	Waterfowl	4356.99787
7	Coast Resident Cutthroat	Bull Trout	Coho Salmon	Natl_Wetlands	Chinook Salmon	3575.11937
7	Waterfowl	Natl_Wetlands	Bull Trout	Coast Resident Cutthroat	Coho Salmon	1597.21159
7	Bull Trout	Coast Resident Cutthroat	Sockeye	Waterfowl	Chinook Salmon	2293.51992
7	Bull Trout	Coast Resident Cutthroat	Sockeye	Chinook Salmon	Chum Salmon	1401.06519
7	Waterfowl	Natl_Wetlands	SAL_UNIT	SED_UNIT	TRI_UNIT	6297.32714
7	Waterfowl	Natl_Wetlands	Shorebirds	Crab_Dun	Clam_Hard	2057.28127
7	Waterfowl	Crab_Dun	Smelt	0	0	422.50210
7	Waterfowl	Natl_Wetlands	ZOS_UNIT	Crab_Dun	Shorebirds	2918.21086

SUB_AREA_I	TaxaHab_1	TaxaHab_2	TaxaHab_3	TaxaHab_4	TaxaHab_5	Shape_Le_1
7	Waterfowl	Natl_Wetlands	Bull Trout	Coast Resident Cutthroat	Coho Salmon	2921.67581
7	Natl_Wetlands	ZOS_UNIT	Clam_Hard	Clam_Subt	Crab_Dun	1246.84773
7	Waterfowl	Natl_Wetlands	Shorebirds	Smelt	Crab_Dun	502.56184
7	Waterfowl	Bull Trout	Coast Resident Cutthroat	Natl_Wetlands	Chinook Salmon	1261.13325
7	SED_UNIT	Coho Salmon	Bull Trout	Chum Salmon	Coast Resident Cutthroat	14660.07616
7	Bull Trout	Coast Resident Cutthroat	Coho Salmon	SED_UNIT	Chinook Salmon	10297.46035

Appendix B

FRAGSTAT Graphs for all subsections


(L) Patch Density Section 1
Number of patches per 100 acres
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1943-1953
1956-1968
2001
Date
Series1
(L) Patch Density Section 2
Number of Patches per 100 acres
0
0.5
1
1.5
2
2.5
1943-1953
1956-1968
2001
Date
Series1
(L) Patch Density Section 3
Number of patches per 100 acres
0
0.5
1
1.5
2
2.5
1943-1953
1956-1968
2001
Date
Series1
(L) Patch Density Section 4
Number of patches per 100 acres
0
0.5
1
1.5
2
2.5
3
3.5
4
1943-1953
1956-1968
2001
Date
Series1


(L) Patch Density Section 5
Number of patches per 100 acres
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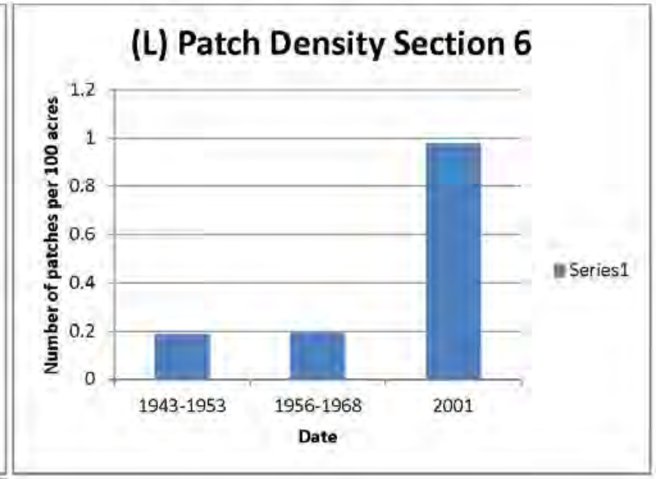
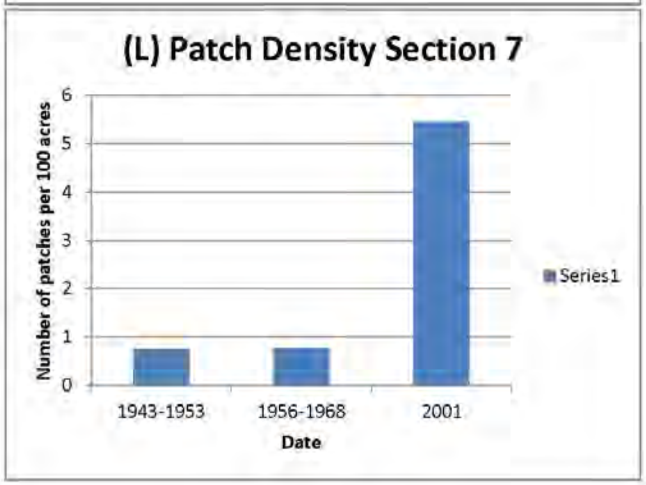
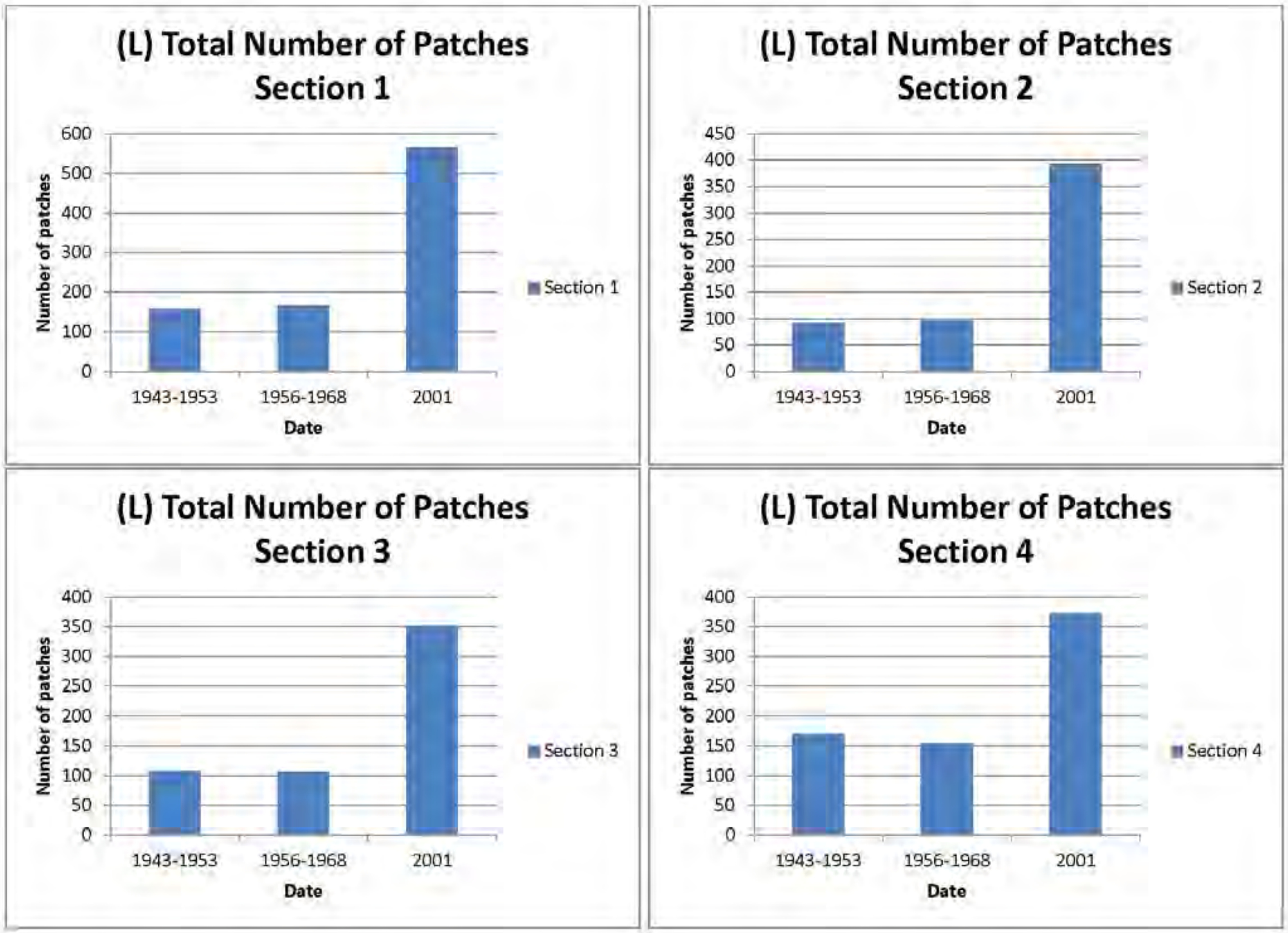
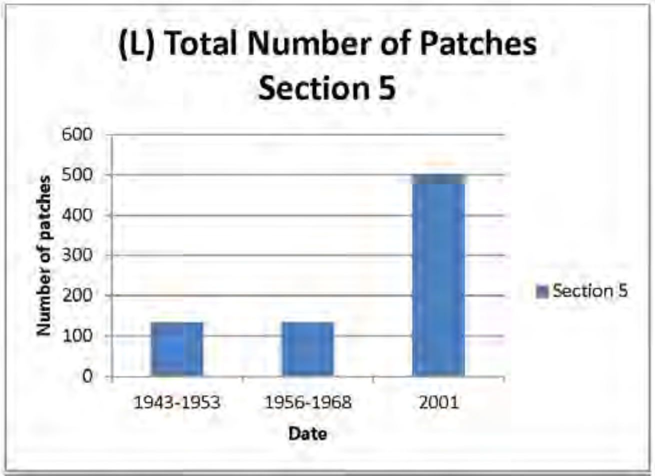
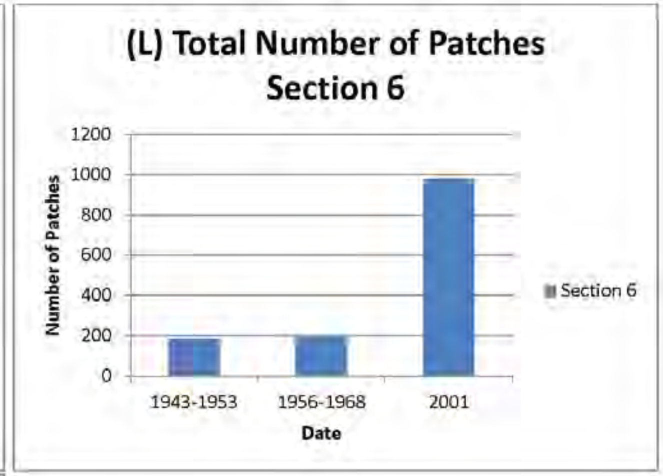
0.5
1
1.5
2
2.5
3
1943-1953
1956-1968
2001
Date
Series1


(L) Patch Density Section 6
Number of patches per 100 acres
0
0.2
0.4
0.6
0.8
1
1.2
1943-1953
1956-1968
2001
Date
Series1


(L) Patch Density Section 7
Number of patches per 100 acres
0
1
2
3
4
5
6
1943-1953
1956-1968
2001
Date
Series1


(L) Total Number of Patches
Section 1
600
500
400
300
200
100
0
Number of patches
1943-1953
1956-1968
2001
Date
Section 1
(L) Total Number of Patches
Section 2
450
400
350
300
250
200
150
100
50
0
Number of patches
1943-1953
1956-1968
2001
Date
Section 2
(L) Total Number of Patches
Section 3
400
350
300
250
200
150
100
50
0
Number of patches
1943-1953
1956-1968
2001
Date
Section 3
(L) Total Number of Patches
Section 4
400
350
300
250
200
150
100
50
0
Number of patches
1943-1953
1956-1968
2001
Date
Section 4


(L) Total Number of Patches
Section 5
600
500
400
300
200
100
0
Number of patches
1943-1953
1956-1968
2001
Date
Section 5


(L) Total Number of Patches
Section 6
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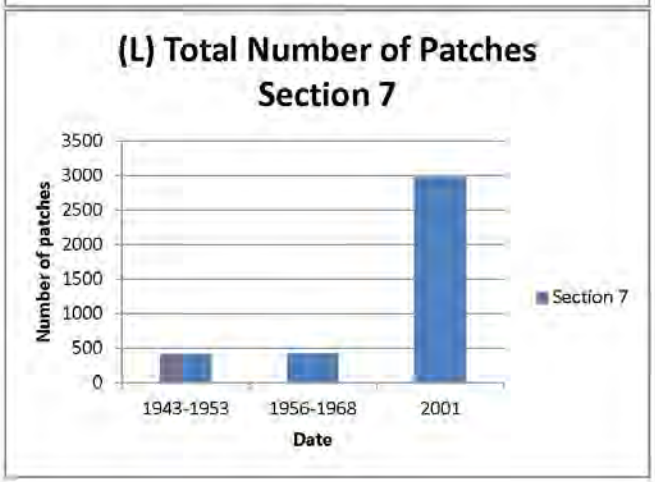
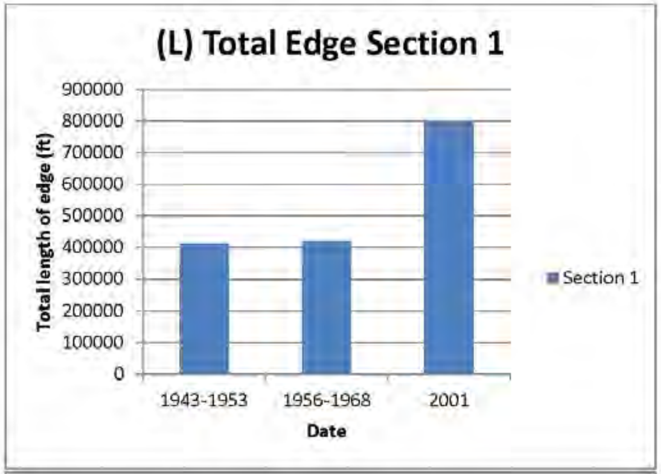
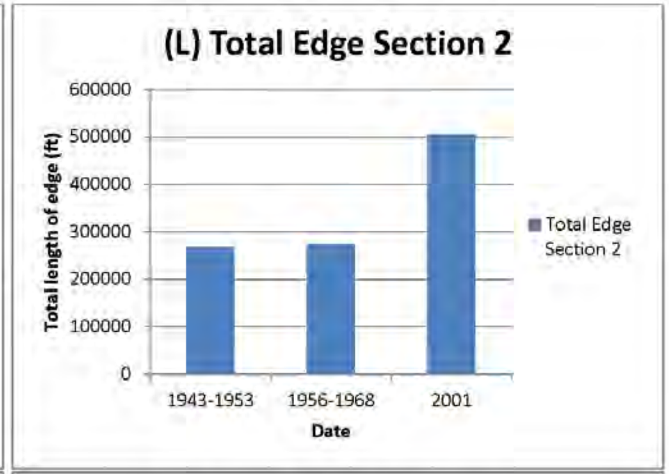
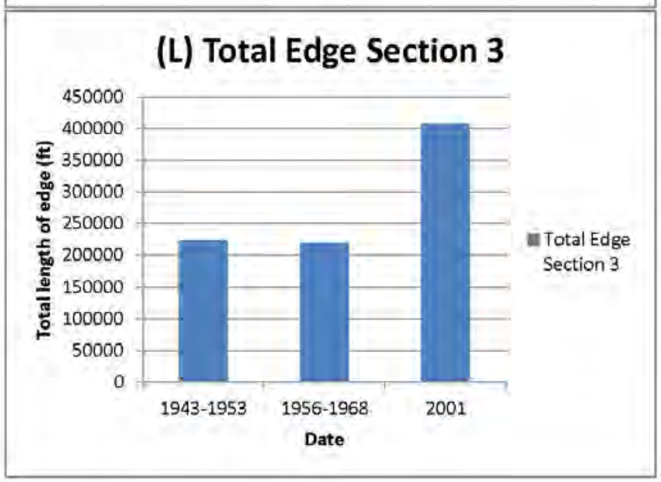
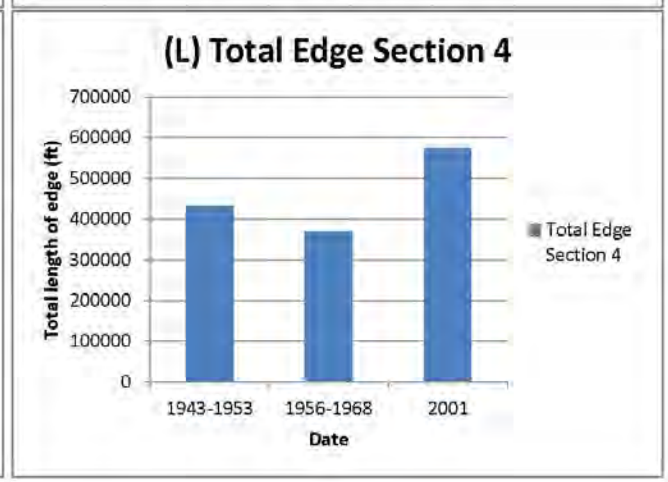
1000
800
600
400
200
0
Number of Patches
1943-1953
1956-1968
2001
Date
Section 6

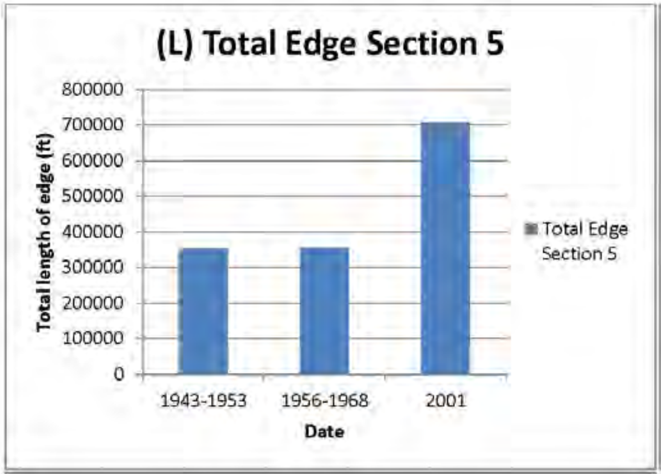

(L) Total Number of Patches
Section 7
3500
3000
2500
2000
1500
1000
500
0
Number of patches
1943-1953
1956-1968
2001
Date
Section 7

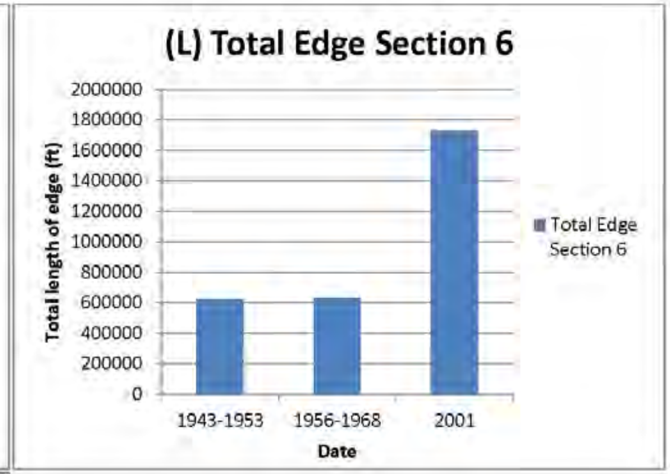

(L) Total Edge Section 1
Total length of edge (ft)
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
1943-1953
1956-1968
2001
Date
Section 1

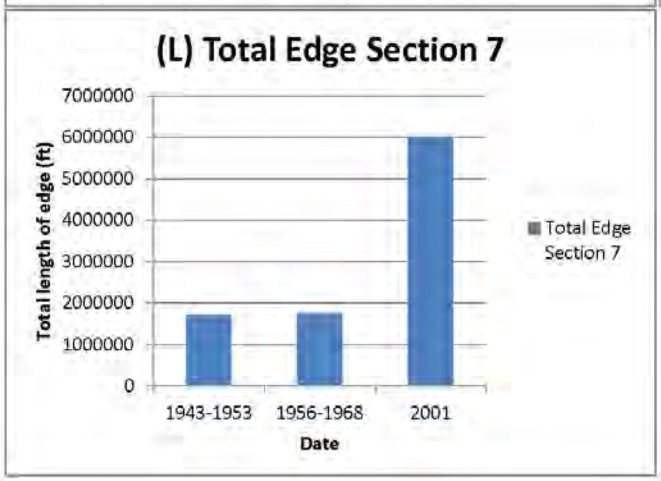

(L) Total Edge Section 2
Total length of edge (ft)
600000
500000
400000
300000
200000
100000
0
1943-1953
1956-1968
2001
Date
Total Edge Section 2

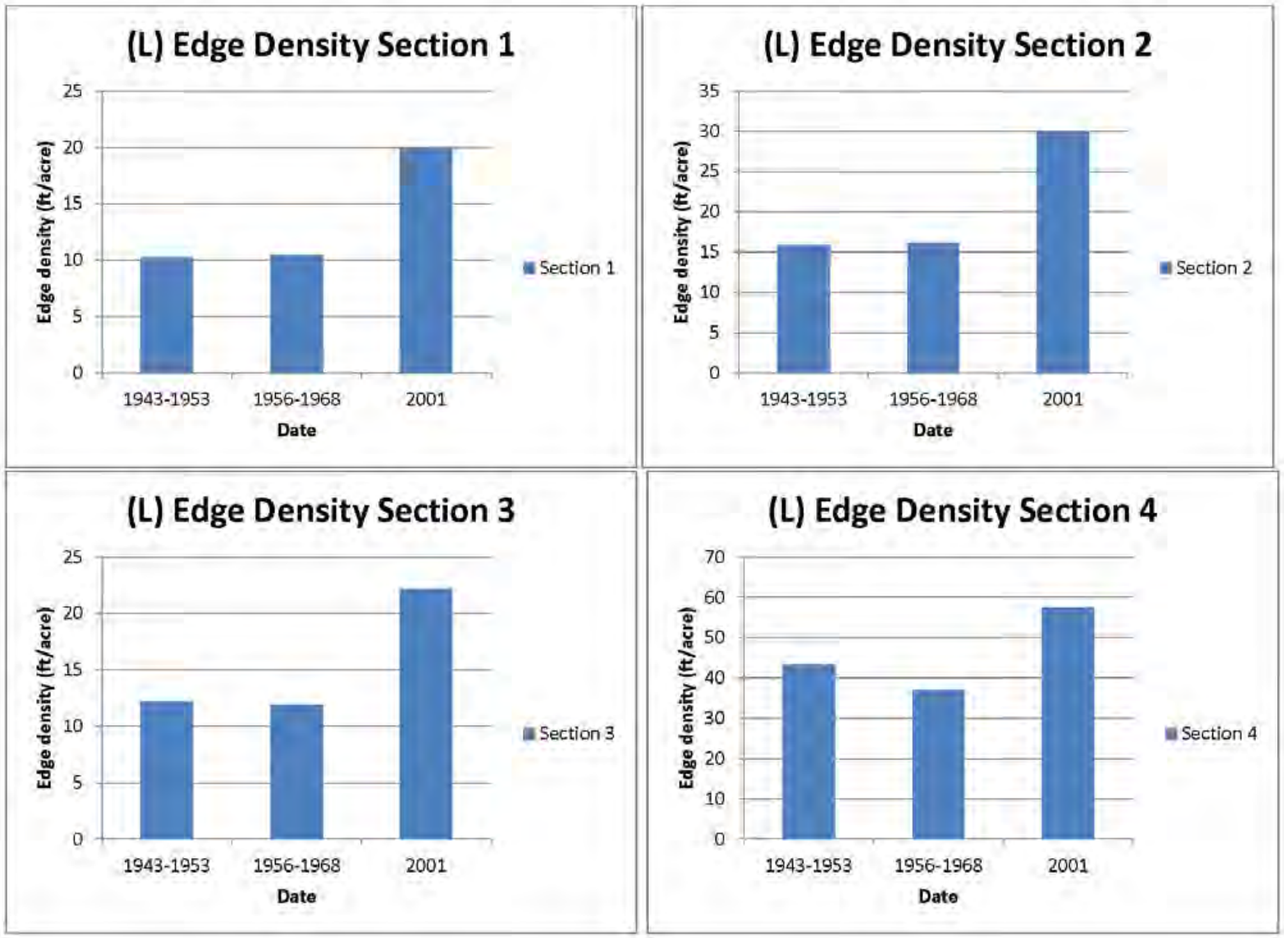

(L) Total Edge Section 3
Total length of edge (ft)
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
1943-1953
1956-1968
2001
Date
Total Edge Section 3

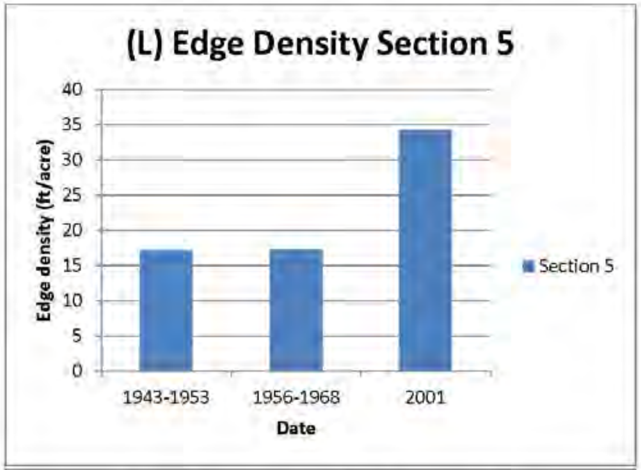

(L) Total Edge Section 4
Total length of edge (ft)
700000
600000
500000
400000
300000
200000
100000
0
1943-1953
1956-1968
2001
Date
Total Edge Section 4

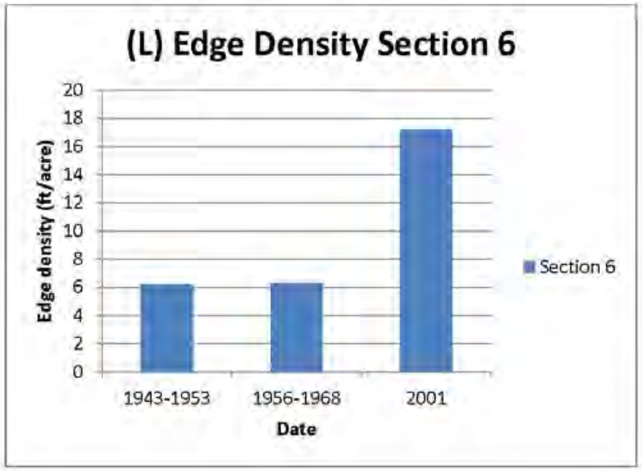

(L) Total Edge Section 5
800000
700000
600000
500000
400000
300000
200000
100000
0
Total length of edge (ft)
1943-1953
1956-1968
2001
Date
Total Edge Section 5

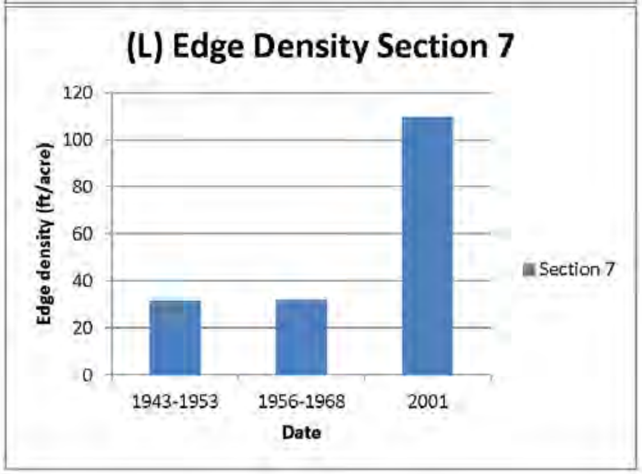

(L) Total Edge Section 6
2000000
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
Total length of edge (ft)
1943-1953
1956-1968
2001
Date
Total Edge Section 6

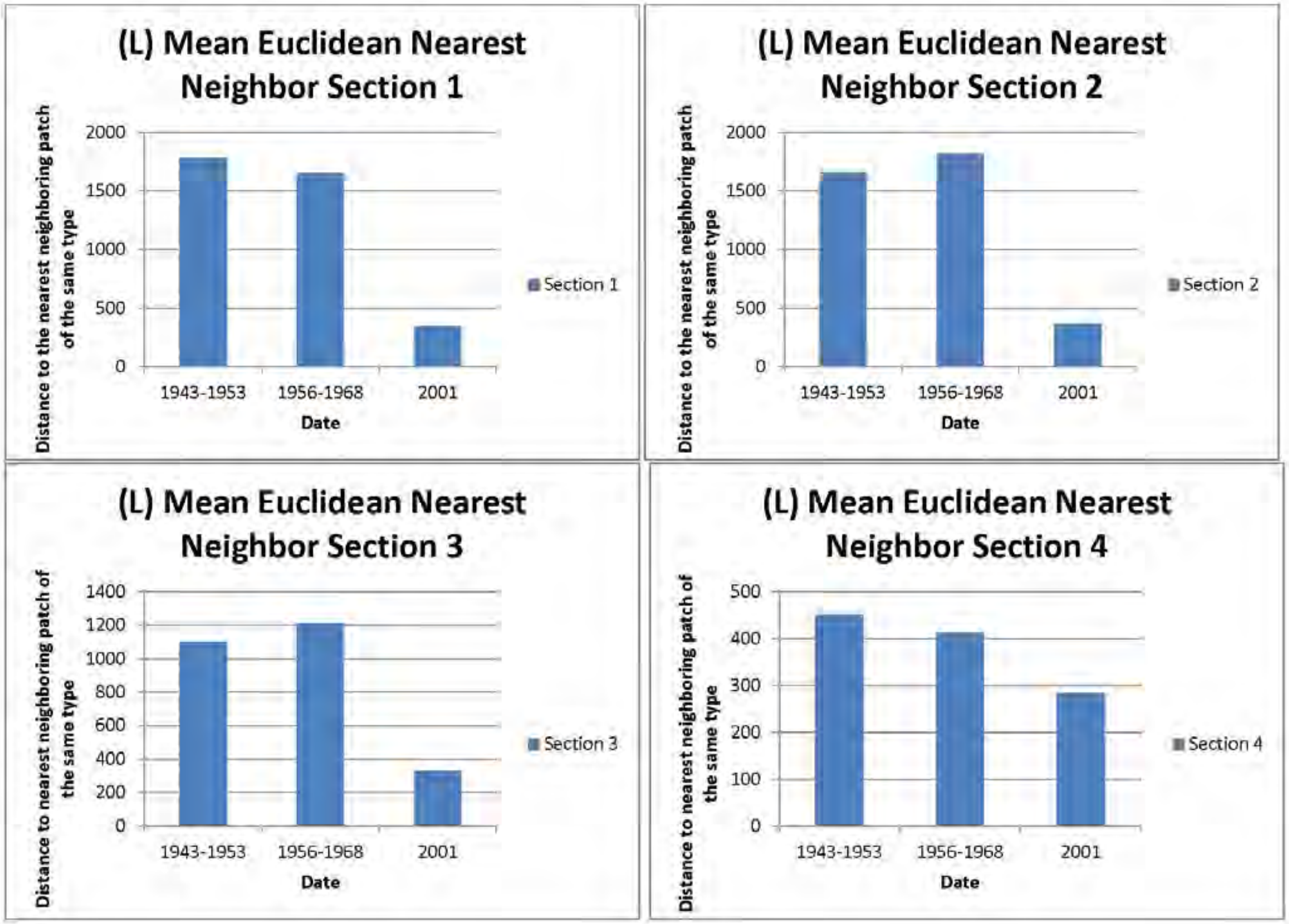

(L) Total Edge Section 7
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
Total length of edge (ft)
1943-1953
1956-1968
2001
Date
Total Edge Section 7

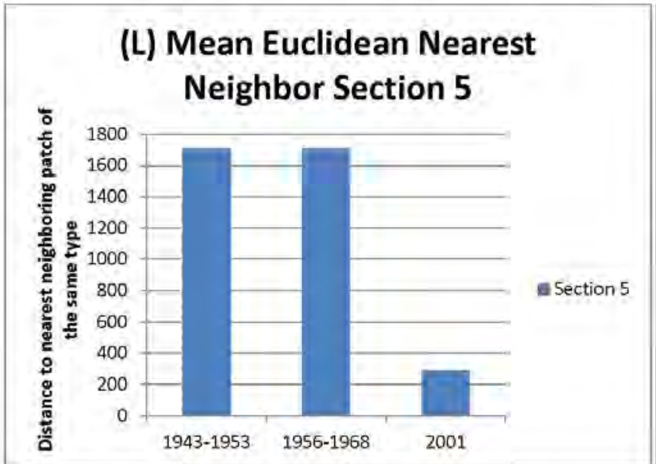

(L) Edge Density Section 1
Edge density (ft/acre)
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Section 1
(L) Edge Density Section 2
Edge density (ft/acre)
35
30
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Section 2
(L) Edge Density Section 3
Edge density (ft/acre)
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Section 3
(L) Edge Density Section 4
Edge density (ft/acre)
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Section 4

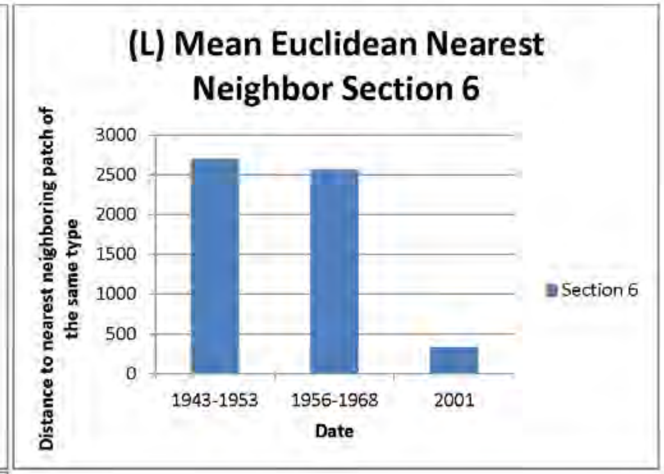

(L) Edge Density Section 5
Edge density (ft/acre)
40
35
30
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Section 5

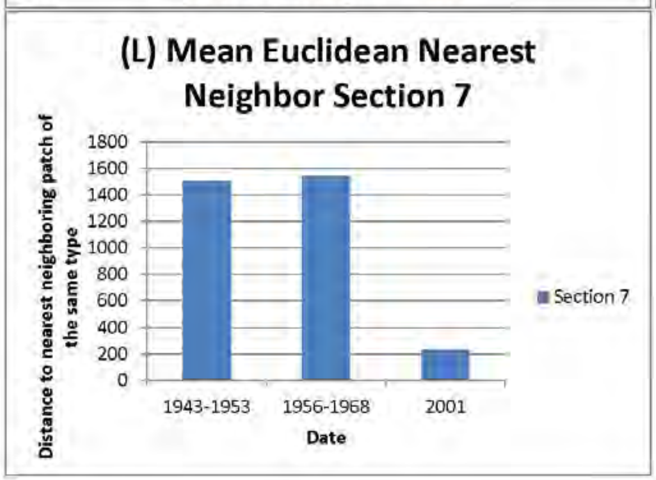

(L) Edge Density Section 6
Edge density (ft/acre)
20
18
16
14
12
10
8
6
4
2
0
1943-1953
1956-1968
2001
Date
Section 6

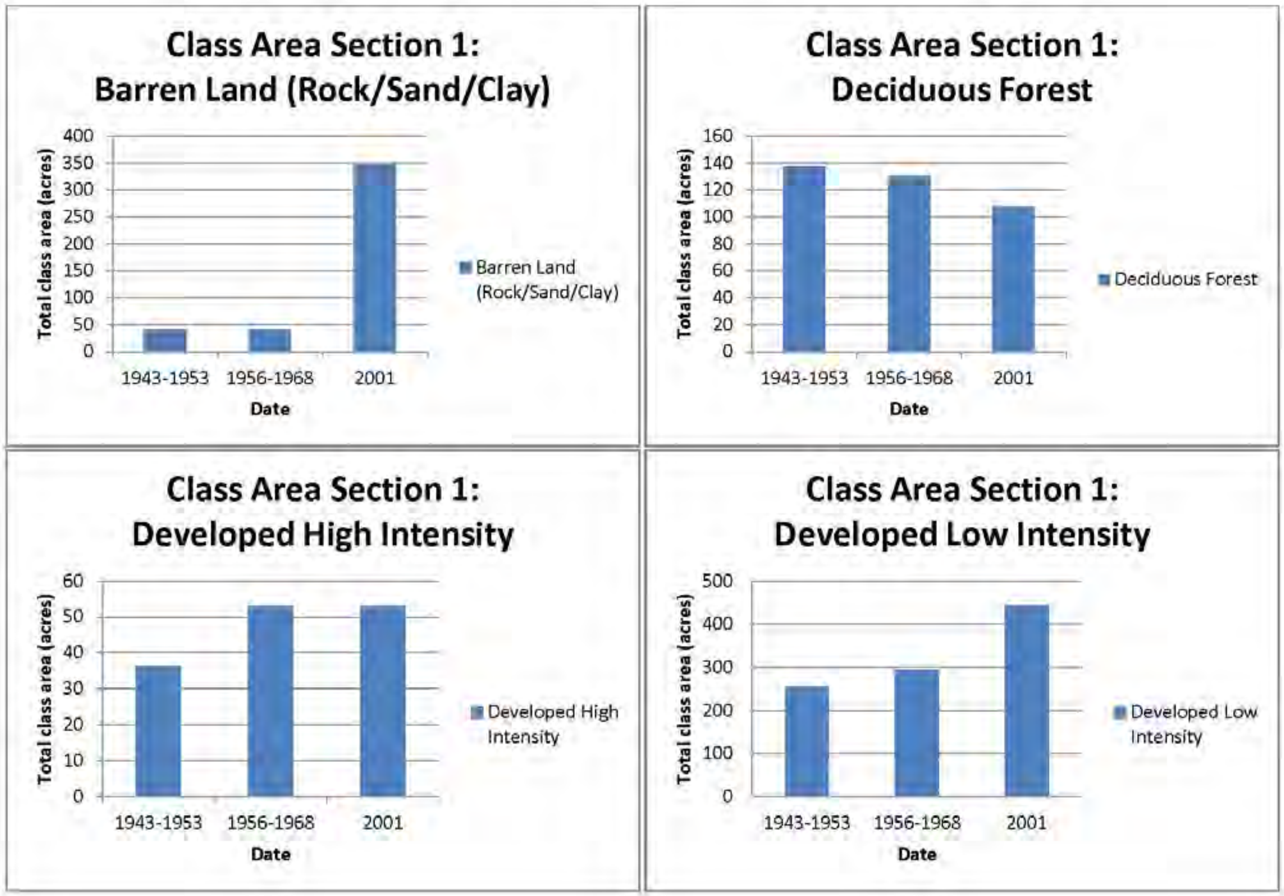

(L) Edge Density Section 7
Edge density (ft/acre)
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Section 7

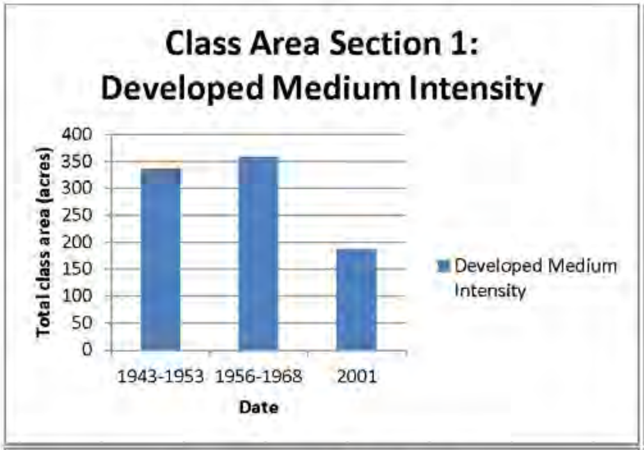

(L) Mean Euclidean Nearest Neighbor Section 1
Distance to the nearest neighboring patch of the same type
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Section 1
(L) Mean Euclidean Nearest Neighbor Section 2
Distance to the nearest neighboring patch of the same type
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Section 2
(L) Mean Euclidean Nearest Neighbor Section 3
Distance to nearest neighboring patch of the same type
1400
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Section 3
(L) Mean Euclidean Nearest Neighbor Section 4
Distance to nearest neighboring patch of the same type
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Section 4

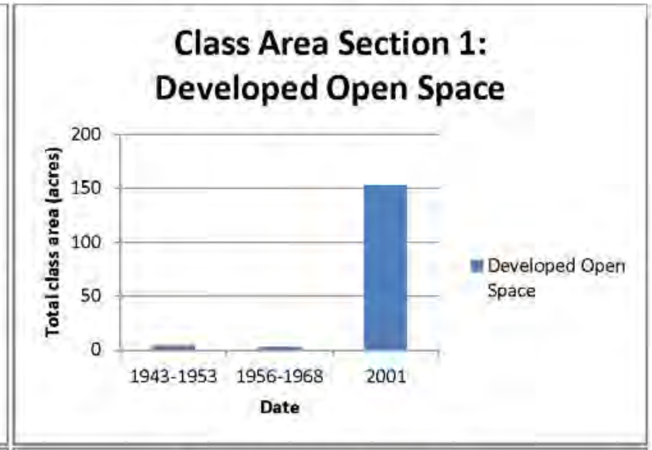

(L) Mean Euclidean Nearest Neighbor Section 5
Distance to nearest neighboring patch of the same type
1800
1600
1400
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Section 5

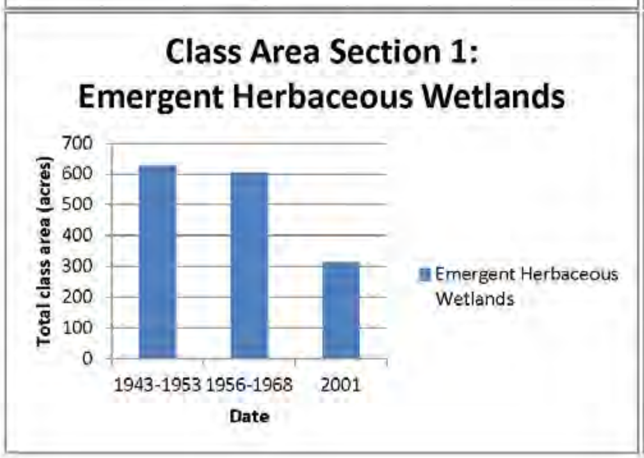

(L) Mean Euclidean Nearest Neighbor Section 6
Distance to nearest neighboring patch of the same type
3000
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Section 6

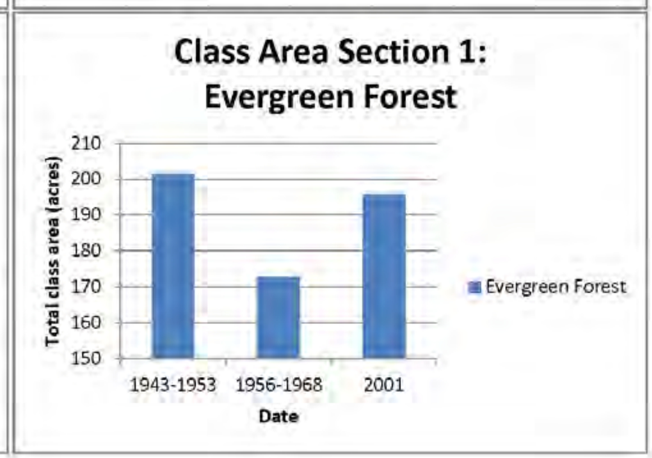

(L) Mean Euclidean Nearest Neighbor Section 7
Distance to nearest neighboring patch of the same type
1800
1600
1400
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Section 7


Class Area Section 1:
Barren Land (Rock/Sand/Clay)
Total class area (acres)
400
350
300
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)
Class Area Section 1:
Deciduous Forest
Total class area (acres)
160
140
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Deciduous Forest
Class Area Section 1:
Developed High Intensity
Total class area (acres)
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Developed High Intensity
Class Area Section 1:
Developed Low Intensity
Total class area (acres)
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

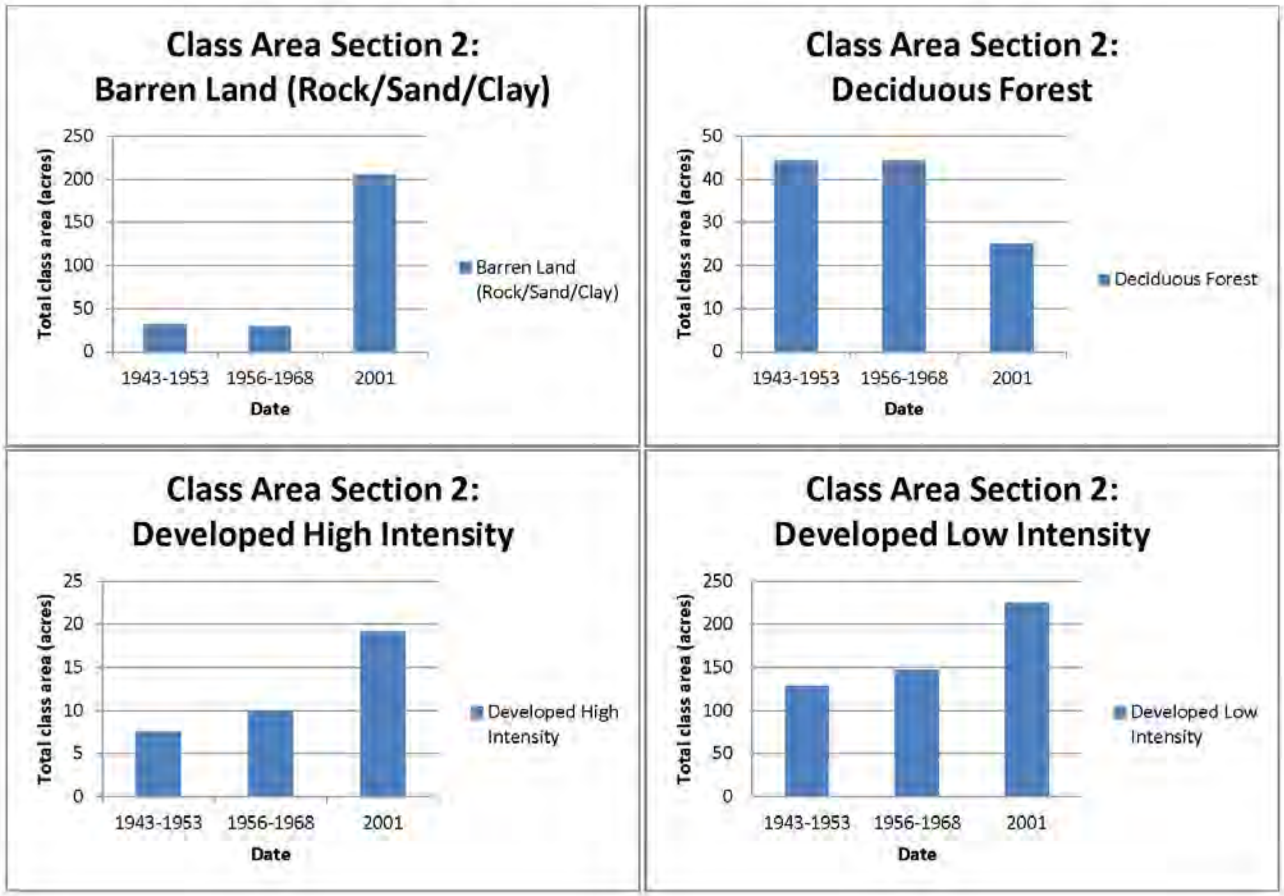

Class Area Section 1:
Developed Medium Intensity
Total class area (acres)
400
350
300
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

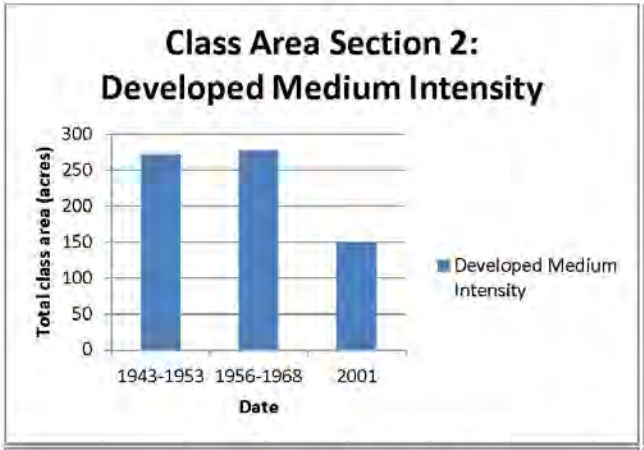

Class Area Section 1:
Developed Open Space
Total class area (acres)
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Developed Open Space

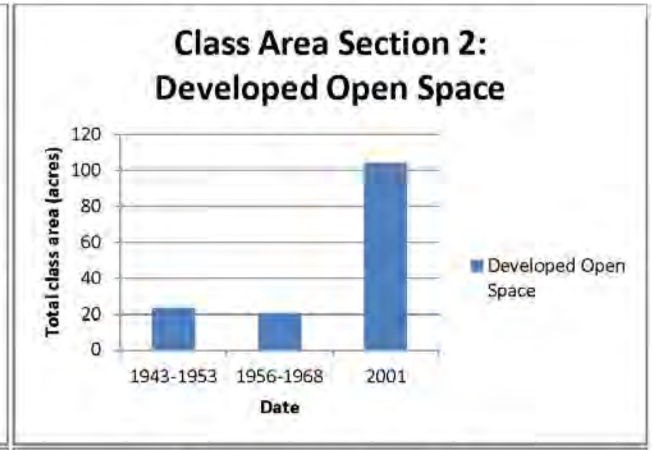

Class Area Section 1:
Emergent Herbaceous Wetlands
Total class area (acres)
700
600
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

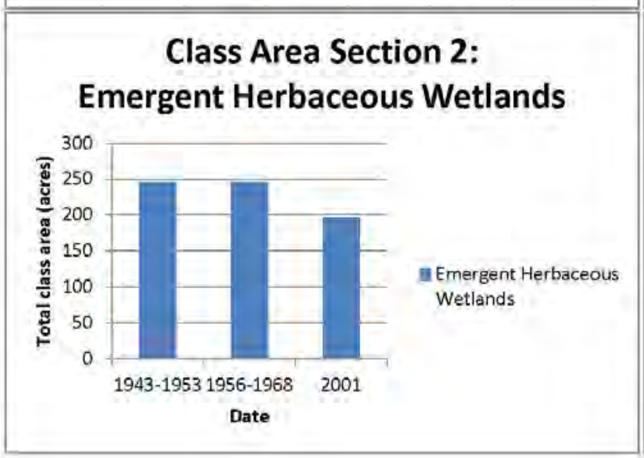

Class Area Section 1:
Evergreen Forest
Total class area (acres)
210
200
190
180
170
160
150
1943-1953
1956-1968
2001
Date
Evergreen Forest

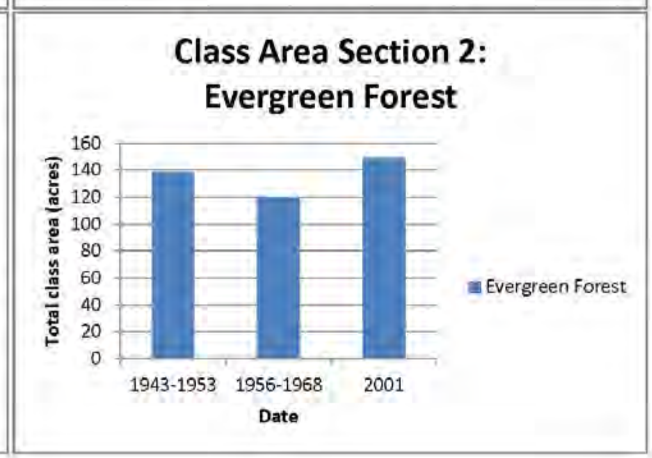

Class Area Section 1:
Mixed Forest
Total class area (acres)
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Mixed Forest
Class Area Section 1:
Open Water
Total class area (acres)
660
650
640
630
620
610
600
590
580
1943-1953
1956-1968
2001
Date
Open Water
Class Area Section 1:
Shrub/Scrub
Total class area (acres)
4.6
4.5
4.4
4.3
4.2
4.1
1943-1953
1956-1968
2001
Date
Shrub/Scrub
Class Area Section 1:
Woody Wetlands
Total class area (acres)
74
72
70
68
66
64
62
1943-1953
1956-1968
2001
Date
Woody Wetlands

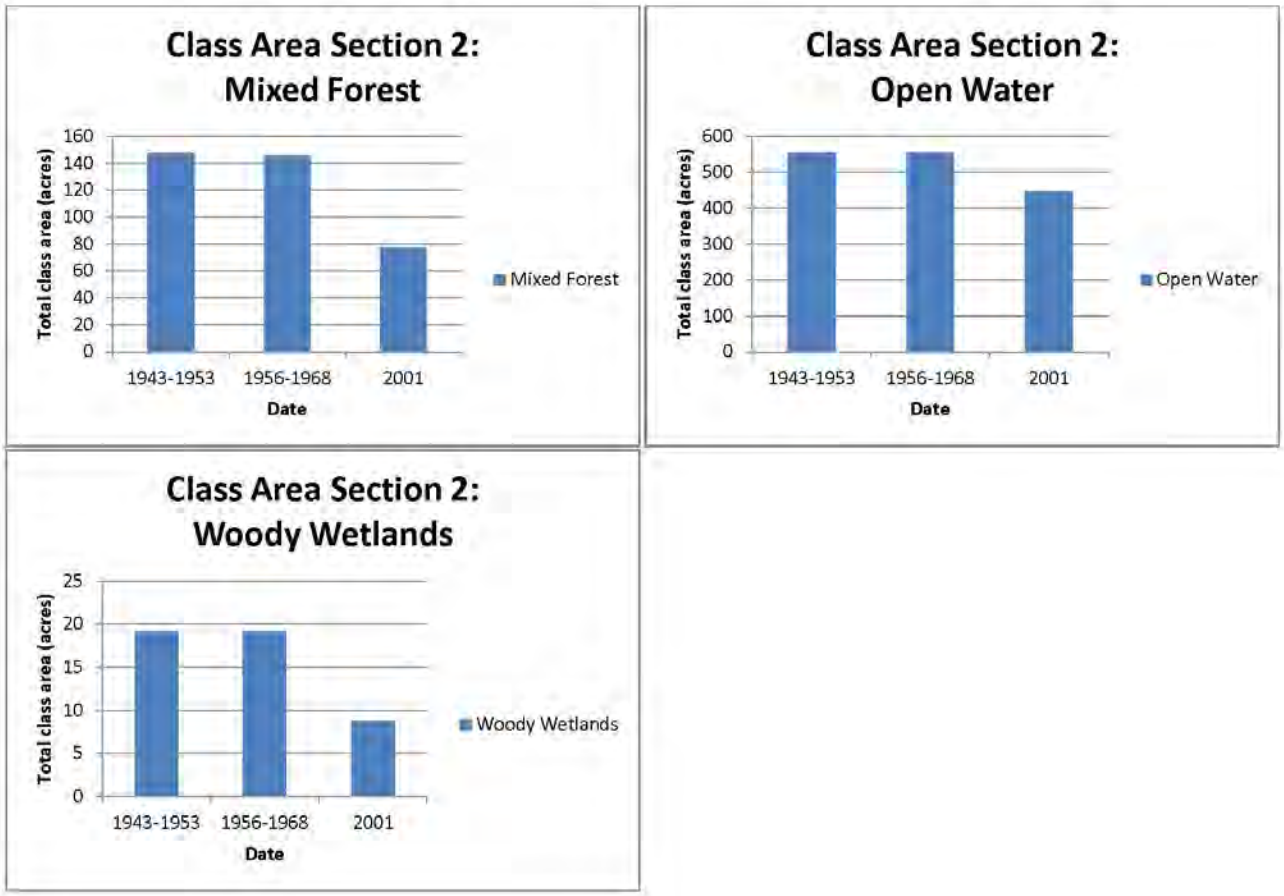

Class Area Section 2:
Barren Land (Rock/Sand/Clay)
Total class area (acres)
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)
Class Area Section 2:
Deciduous Forest
Total class area (acres)
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Deciduous Forest
Class Area Section 2:
Developed High Intensity
Total class area (acres)
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Developed High Intensity
Class Area Section 2:
Developed Low Intensity
Total class area (acres)
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

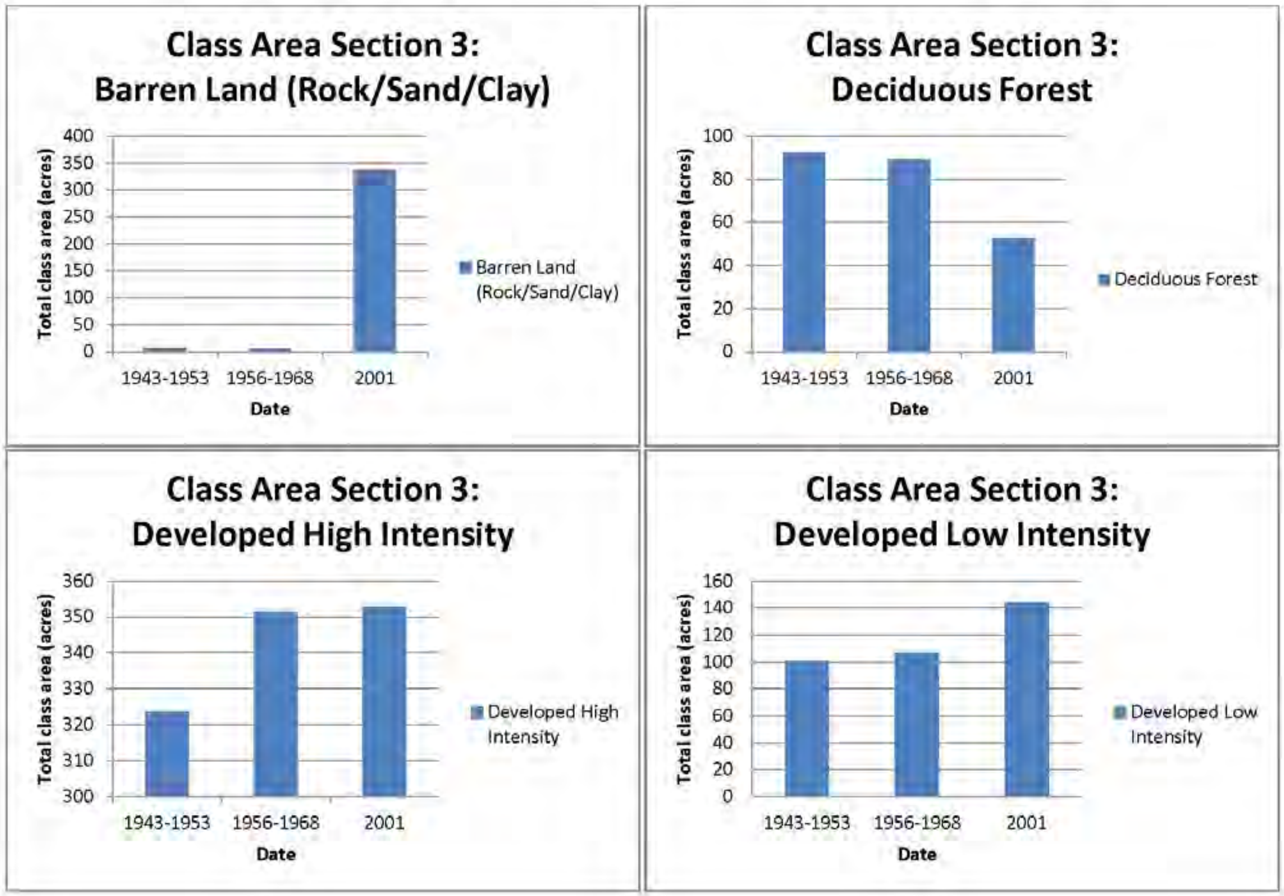

Class Area Section 2:
Developed Medium Intensity
Total class area (acres)
300
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

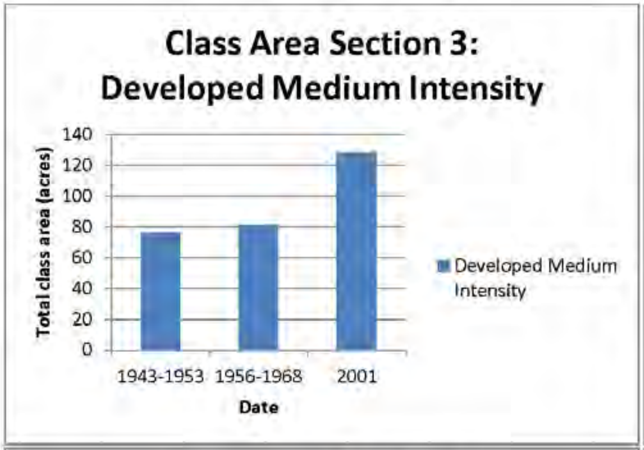

Class Area Section 2:
Developed Open Space
Total class area (acres)
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Developed Open Space

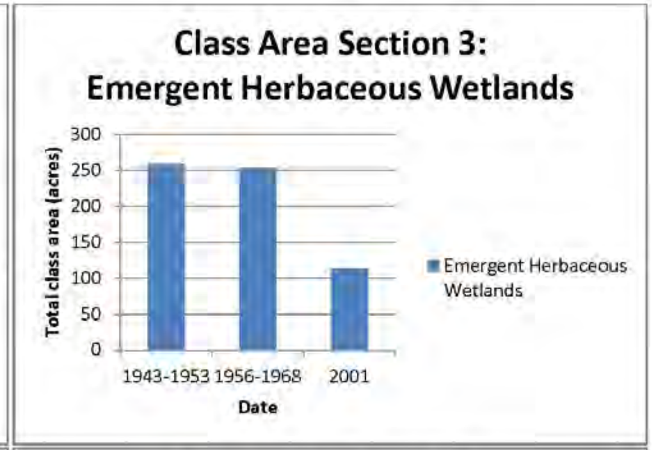

Class Area Section 2:
Emergent Herbaceous Wetlands
Total class area (acres)
300
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

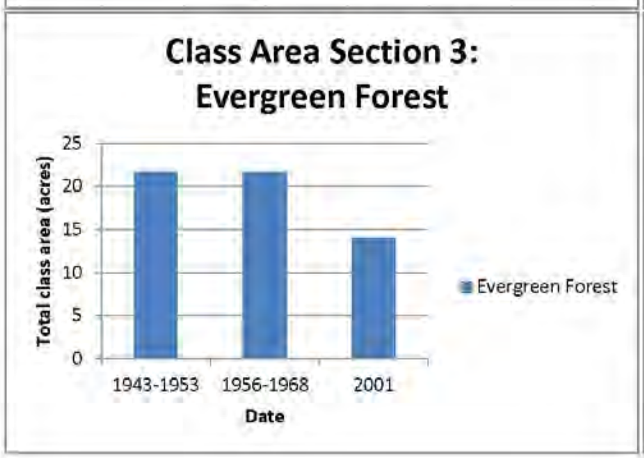

Class Area Section 2:
Evergreen Forest
Total class area (acres)
160
140
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

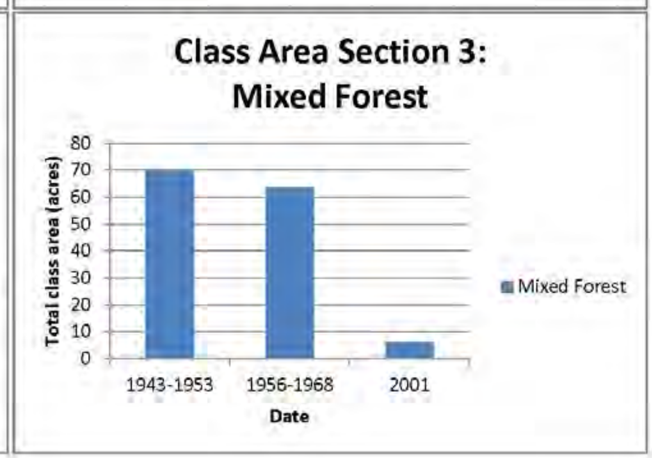

Class Area Section 2:
Mixed Forest
Total class area (acres)
160
140
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Mixed Forest
Class Area Section 2:
Open Water
Total class area (acres)
600
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Open Water
Class Area Section 2:
Woody Wetlands
Total class area (acres)
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

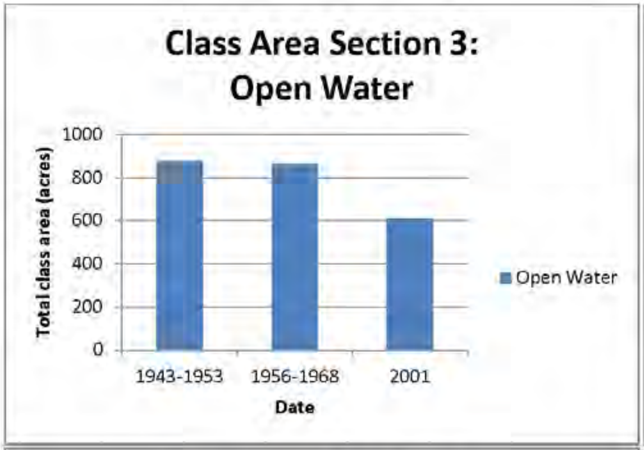

Class Area Section 3:
Barren Land (Rock/Sand/Clay)
Total class area (acres)
400
350
300
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)
Class Area Section 3:
Deciduous Forest
Total class area (acres)
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Deciduous Forest
Class Area Section 3:
Developed High Intensity
Total class area (acres)
360
350
340
330
320
310
300
1943-1953
1956-1968
2001
Date
Developed High Intensity
Class Area Section 3:
Developed Low Intensity
Total class area (acres)
160
140
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

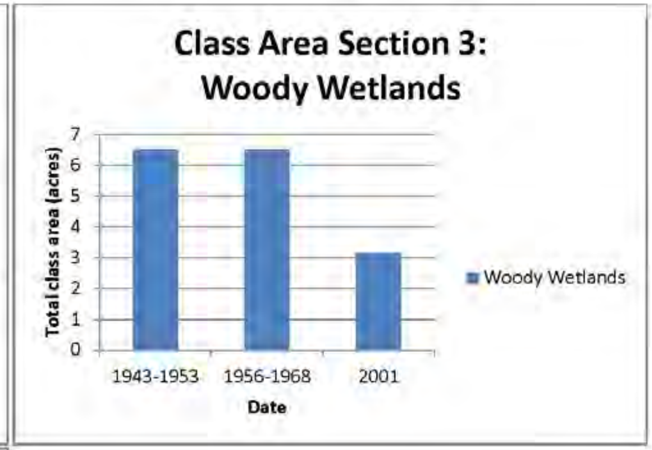

Class Area Section 3:
Developed Medium Intensity
Total class area (acres)
0
20
40
60
80
100
120
140
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

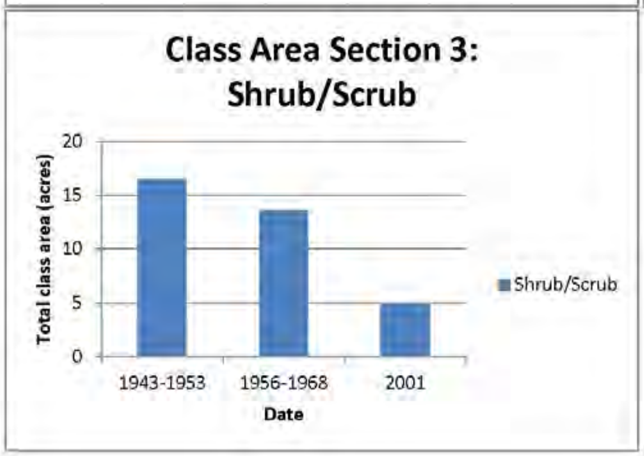

Class Area Section 3:
Emergent Herbaceous Wetlands
Total class area (acres)
0
50
100
150
200
250
300
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

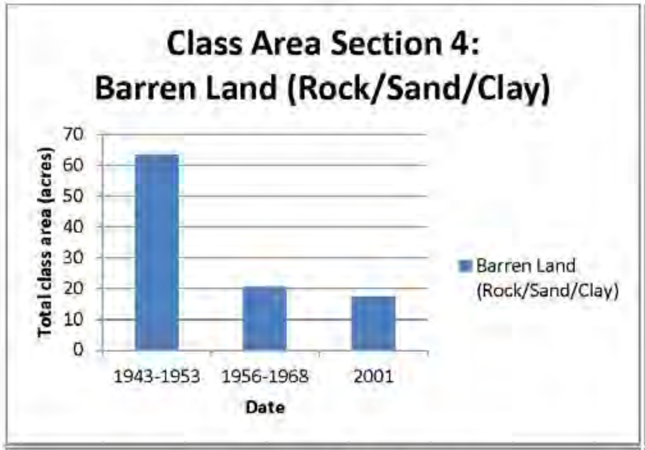

Class Area Section 3:
Evergreen Forest
Total class area (acres)
0
5
10
15
20
25
1943-1953
1956-1968
2001
Date
Evergreen Forest

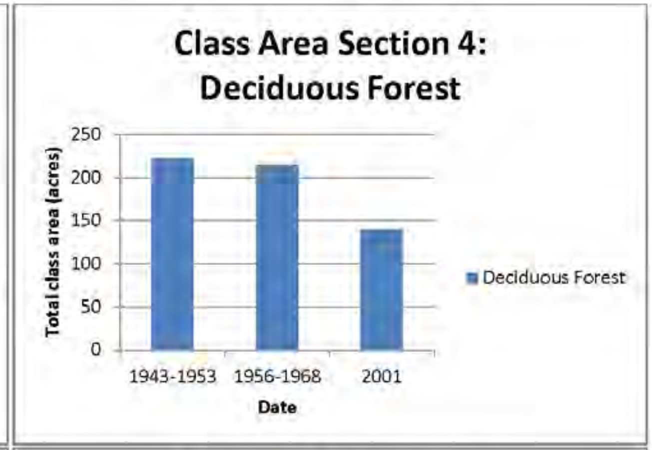

Class Area Section 3:
Mixed Forest
Total class area (acres)
0
10
20
30
40
50
60
70
80
1943-1953
1956-1968
2001
Date
Mixed Forest

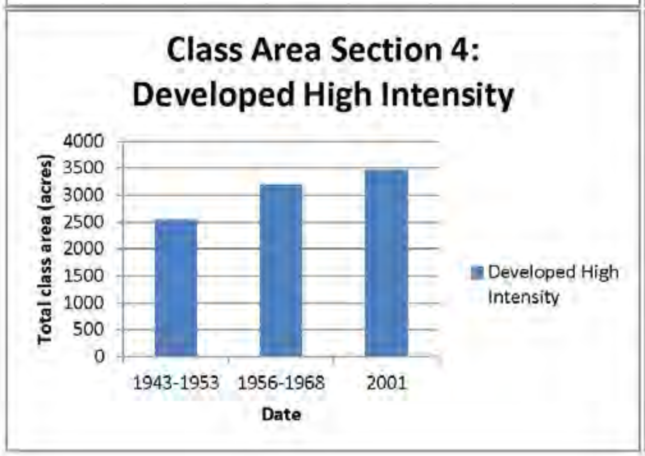

Class Area Section 3:
Open Water
Total class area (acres)
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Open Water

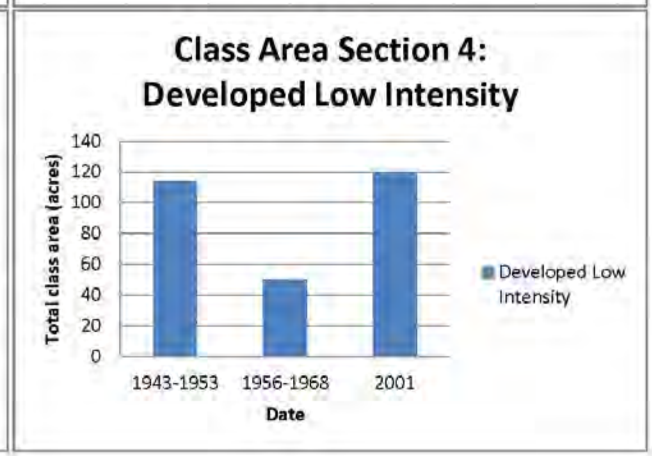

Class Area Section 3:
Woody Wetlands
Total class area (acres)
7
6
5
4
3
2
1
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

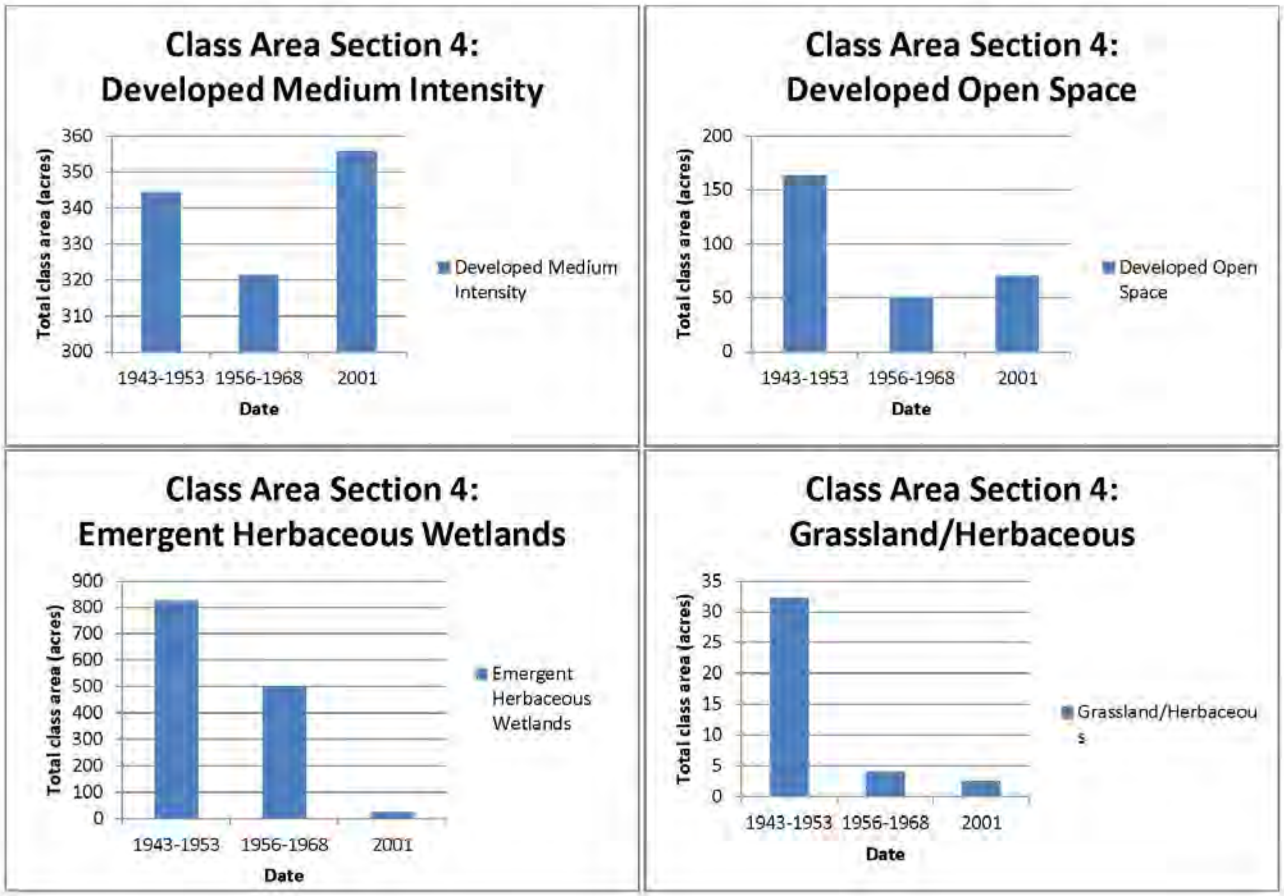

Class Area Section 3:
Shrub/Scrub
Total class area (acres)
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

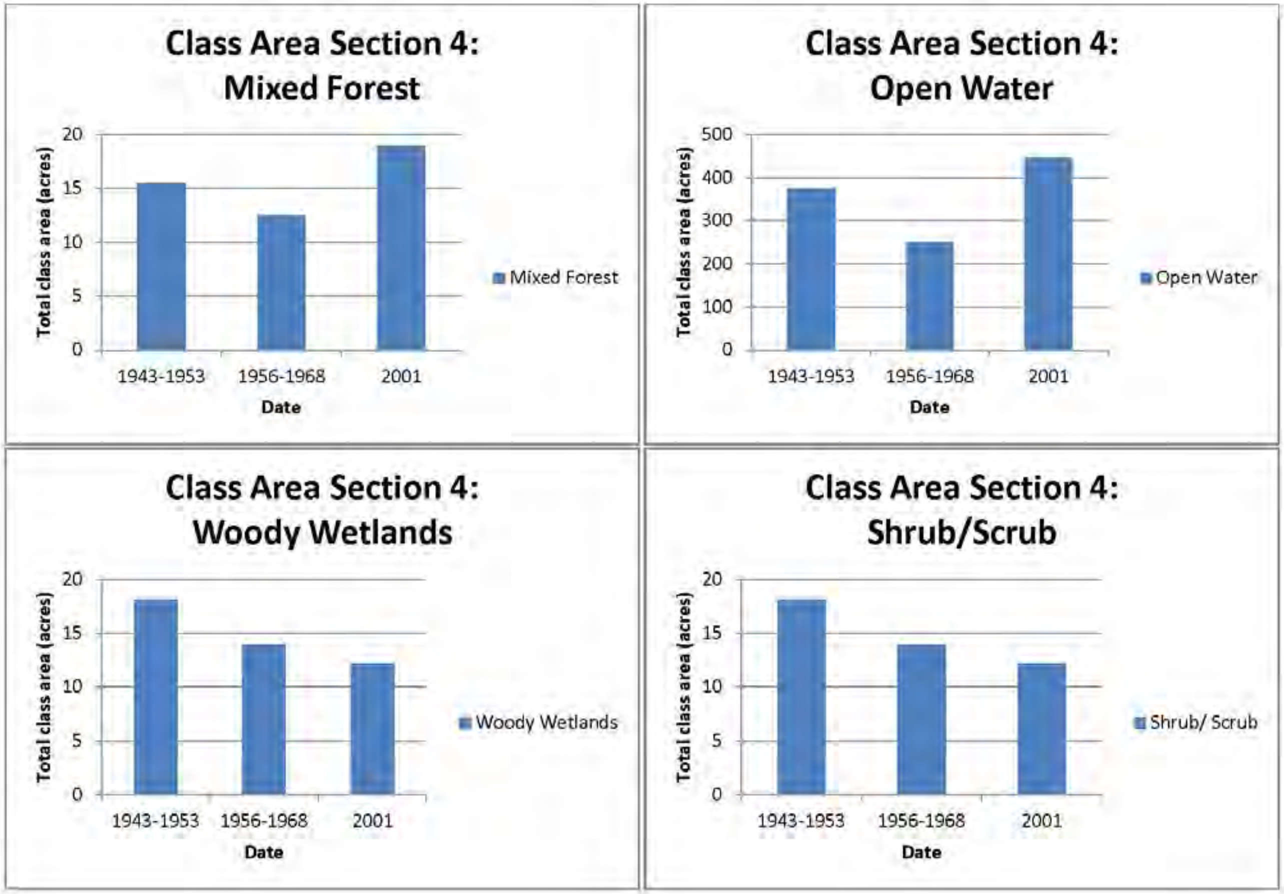

Class Area Section 4:
Barren Land (Rock/Sand/Clay)
Total class area (acres)
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

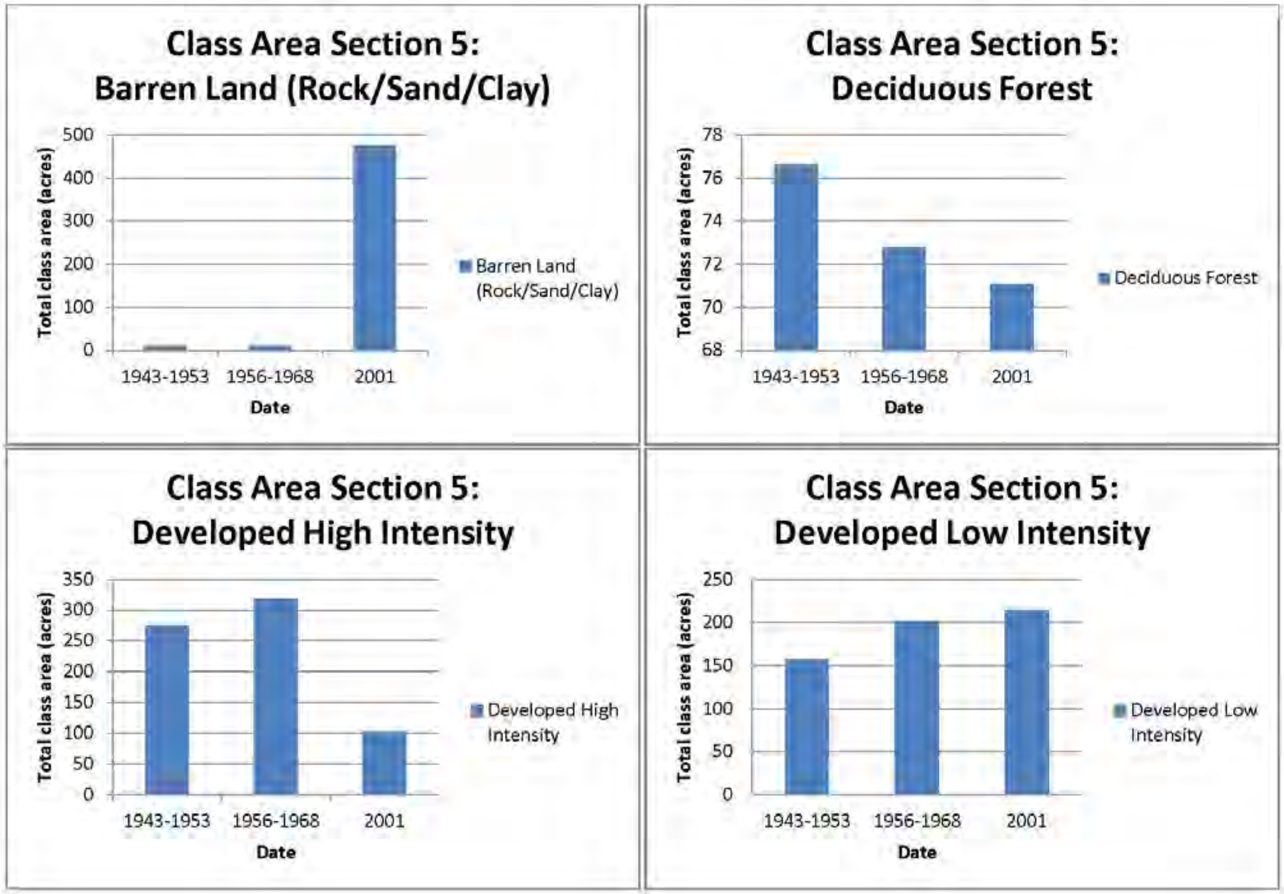

Class Area Section 4:
Deciduous Forest
Total class area (acres)
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

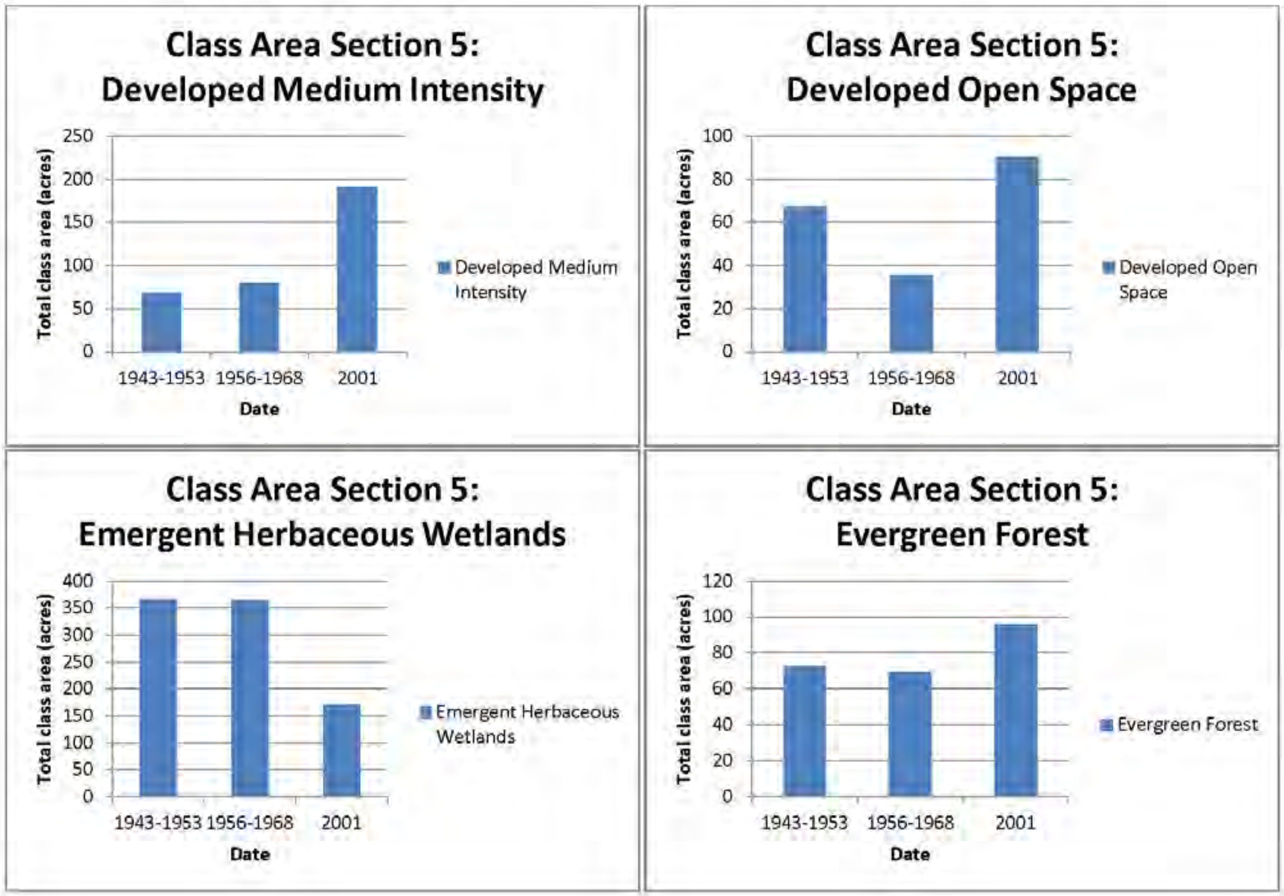

Class Area Section 4:
Developed High Intensity
Total class area (acres)
4000
3500
3000
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

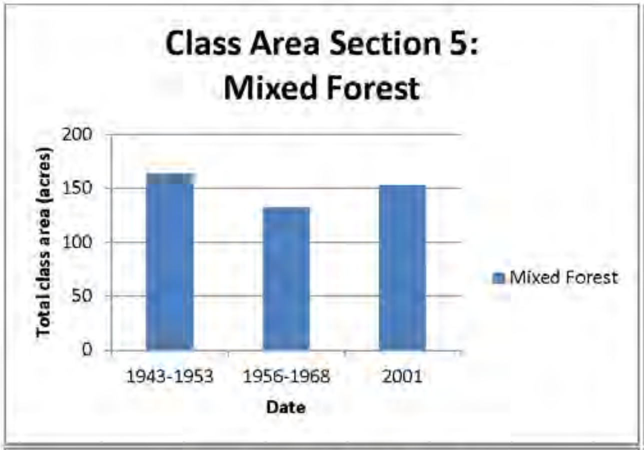

Class Area Section 4:
Developed Low Intensity
Total class area (acres)
140
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

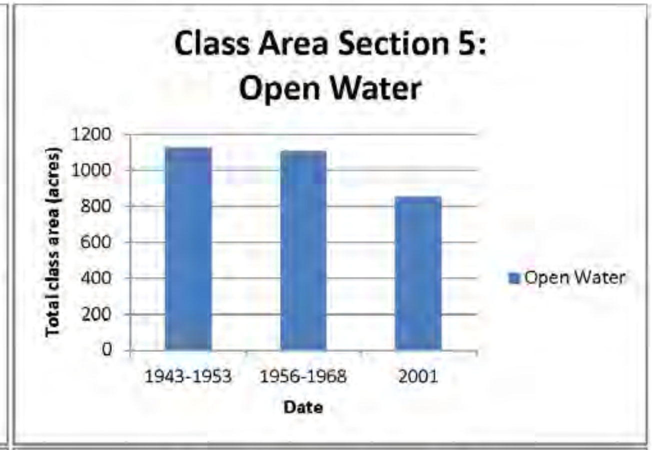

Class Area Section 4:
Developed Medium Intensity
Total class area (acres)
360
350
340
330
320
310
300
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Class Area Section 4:
Developed Open Space
Total class area (acres)
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Class Area Section 4:
Emergent Herbaceous Wetlands
Total class area (acres)
900
800
700
600
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Class Area Section 4:
Grassland/Herbaceous
Total class area (acres)
35
30
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Grassland/Herbaceous


Class Area Section 4:
Mixed Forest
Total class area (acres)
0
5
10
15
20
1943-1953
1956-1968
2001
Date
Mixed Forest
Class Area Section 4:
Open Water
Total class area (acres)
0
100
200
300
400
500
1943-1953
1956-1968
2001
Date
Open Water
Class Area Section 4:
Woody Wetlands
Total class area (acres)
0
5
10
15
20
1943-1953
1956-1968
2001
Date
Woody Wetlands
Class Area Section 4:
Shrub/Scrub
Total class area (acres)
0
5
10
15
20
1943-1953
1956-1968
2001
Date
Shrub/ Scrub

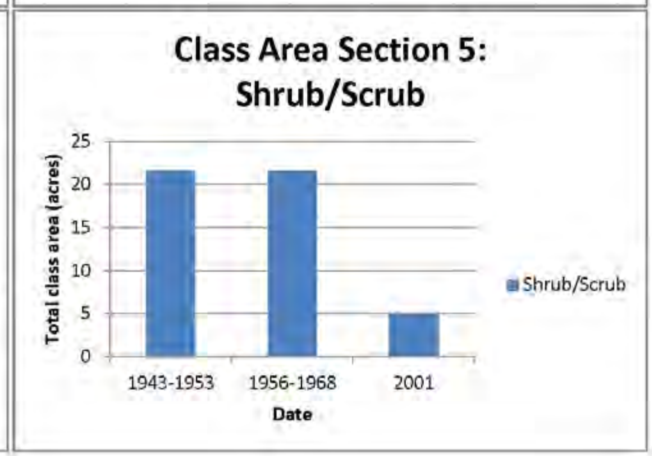

Class Area Section 5:
Barren Land (Rock/Sand/Clay)
Total class area (acres)
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)
Class Area Section 5:
Deciduous Forest
Total class area (acres)
78
76
74
72
70
68
1943-1953
1956-1968
2001
Date
Deciduous Forest
Class Area Section 5:
Developed High Intensity
Total class area (acres)
350
300
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Developed High Intensity
Class Area Section 5:
Developed Low Intensity
Total class area (acres)
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

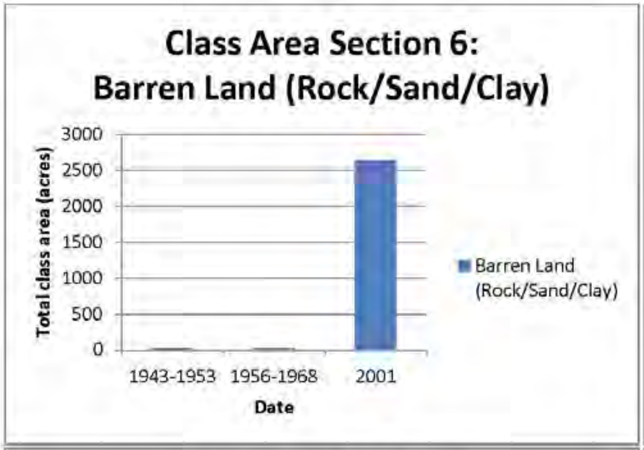

Class Area Section 5: Developed Medium Intensity
Total class area (acres)
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Class Area Section 5: Developed Open Space
Total class area (acres)
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Class Area Section 5: Emergent Herbaceous Wetlands
Total class area (acres)
400
350
300
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Class Area Section 5: Evergreen Forest
Total class area (acres)
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

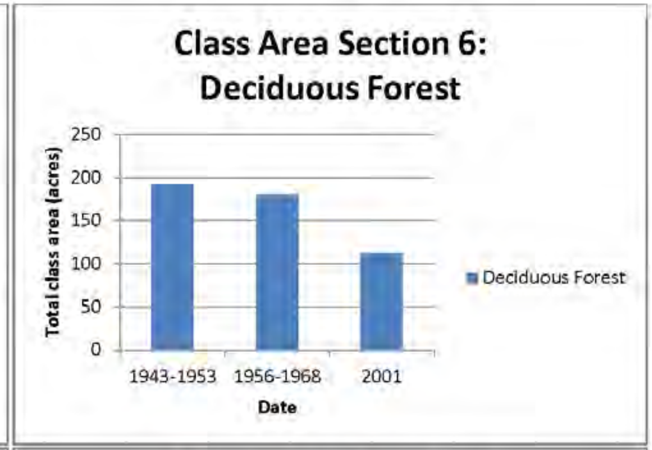

Class Area Section 5:
Mixed Forest
Total class area (acres)
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Mixed Forest


Class Area Section 5:
Open Water
Total class area (acres)
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Open Water

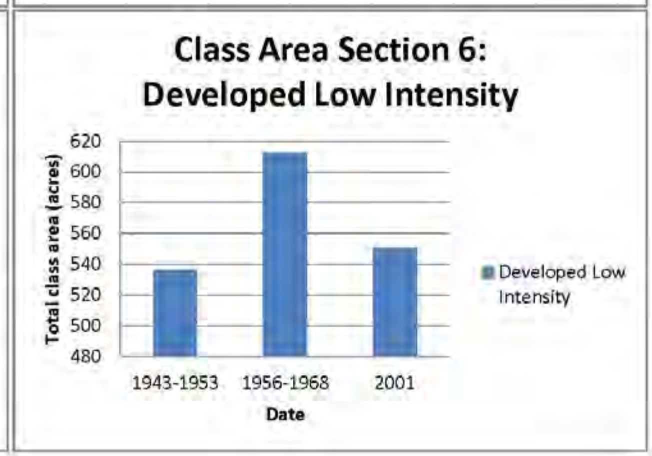

Class Area Section 5:
Woody Wetlands
Total class area (acres)
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

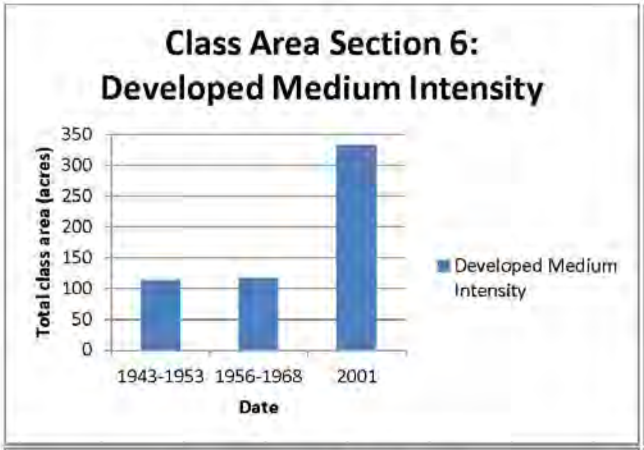

Class Area Section 5:
Shrub/Scrub
Total class area (acres)
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

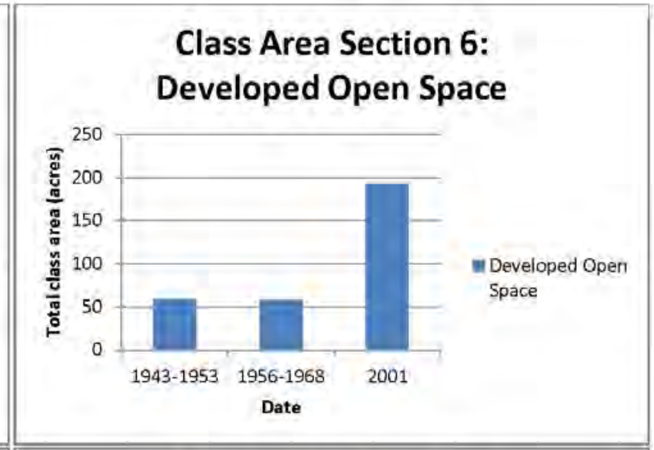

Class Area Section 6:
Barren Land (Rock/Sand/Clay)
Total class area (acres)
3000
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

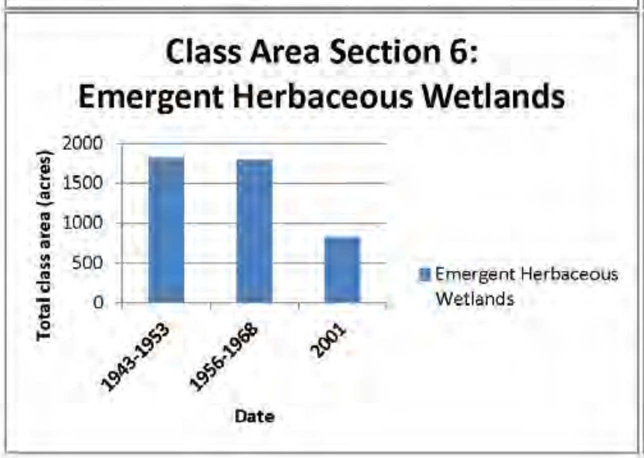

Class Area Section 6:
Deciduous Forest
Total class area (acres)
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

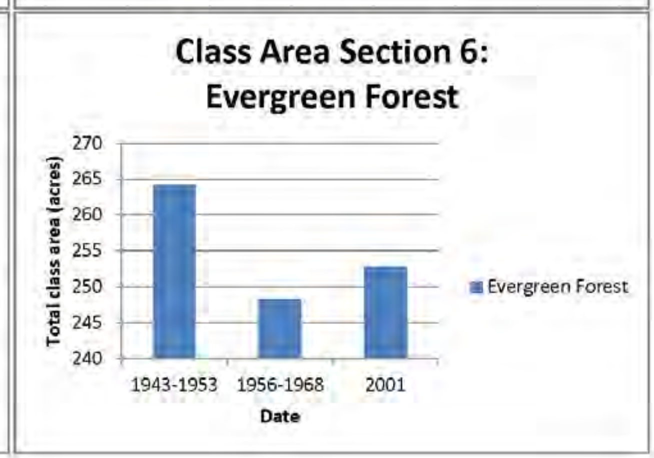

Class Area Section 6:
Developed High Intensity
Total class area (acres)
600
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

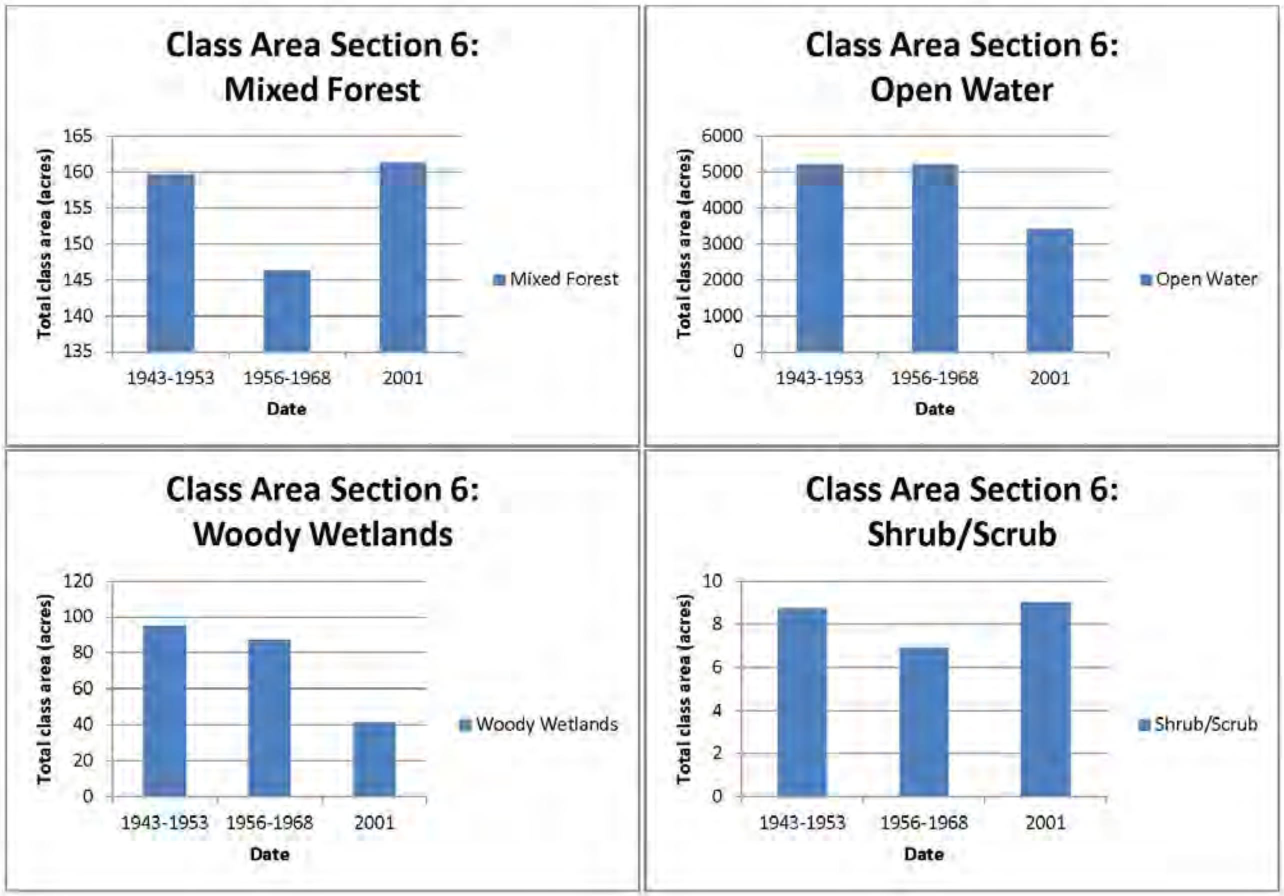

Class Area Section 6:
Developed Low Intensity
Total class area (acres)
620
600
580
560
540
520
500
480
1943-1953
1956-1968
2001
Date
Developed Low Intensity

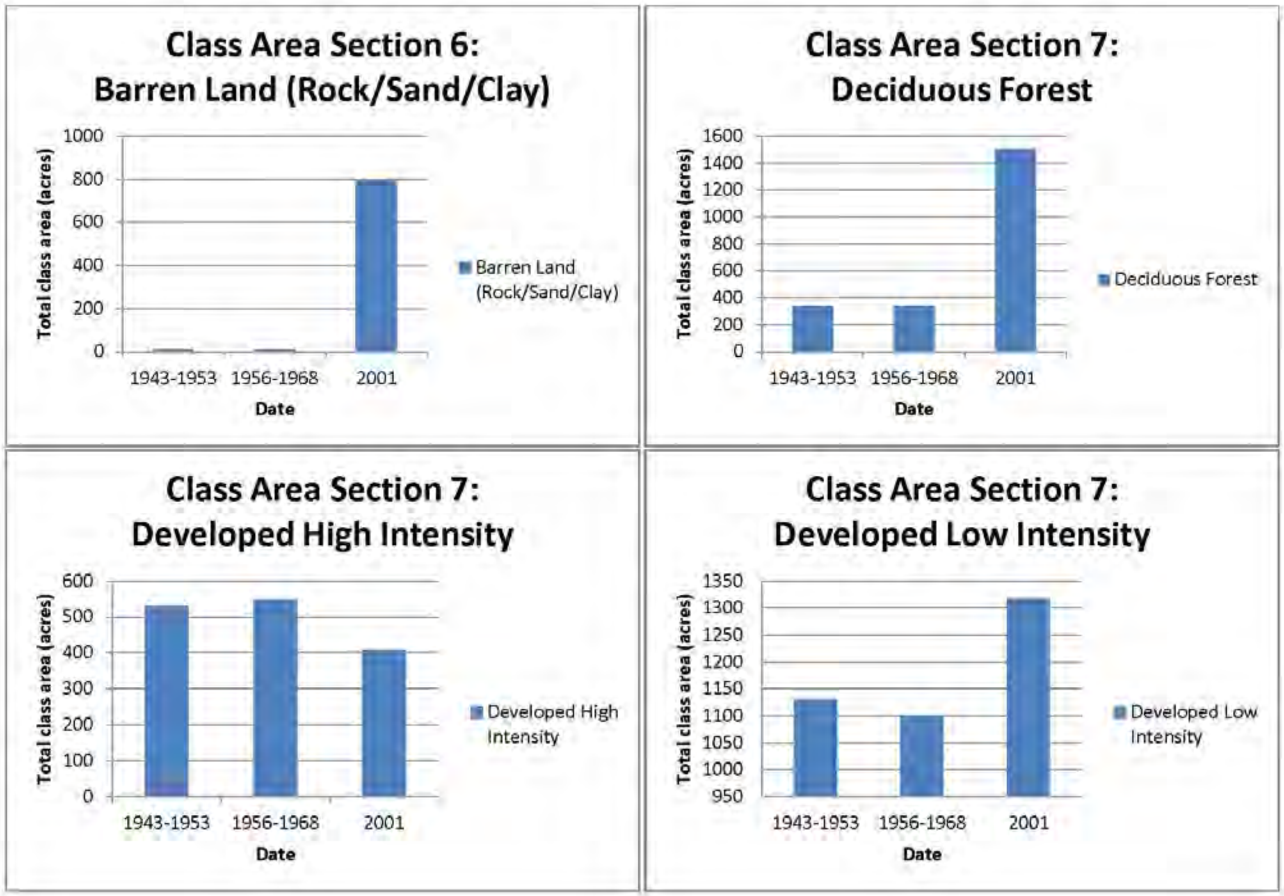

Class Area Section 6:
Developed Medium Intensity
Total class area (acres)
350
300
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

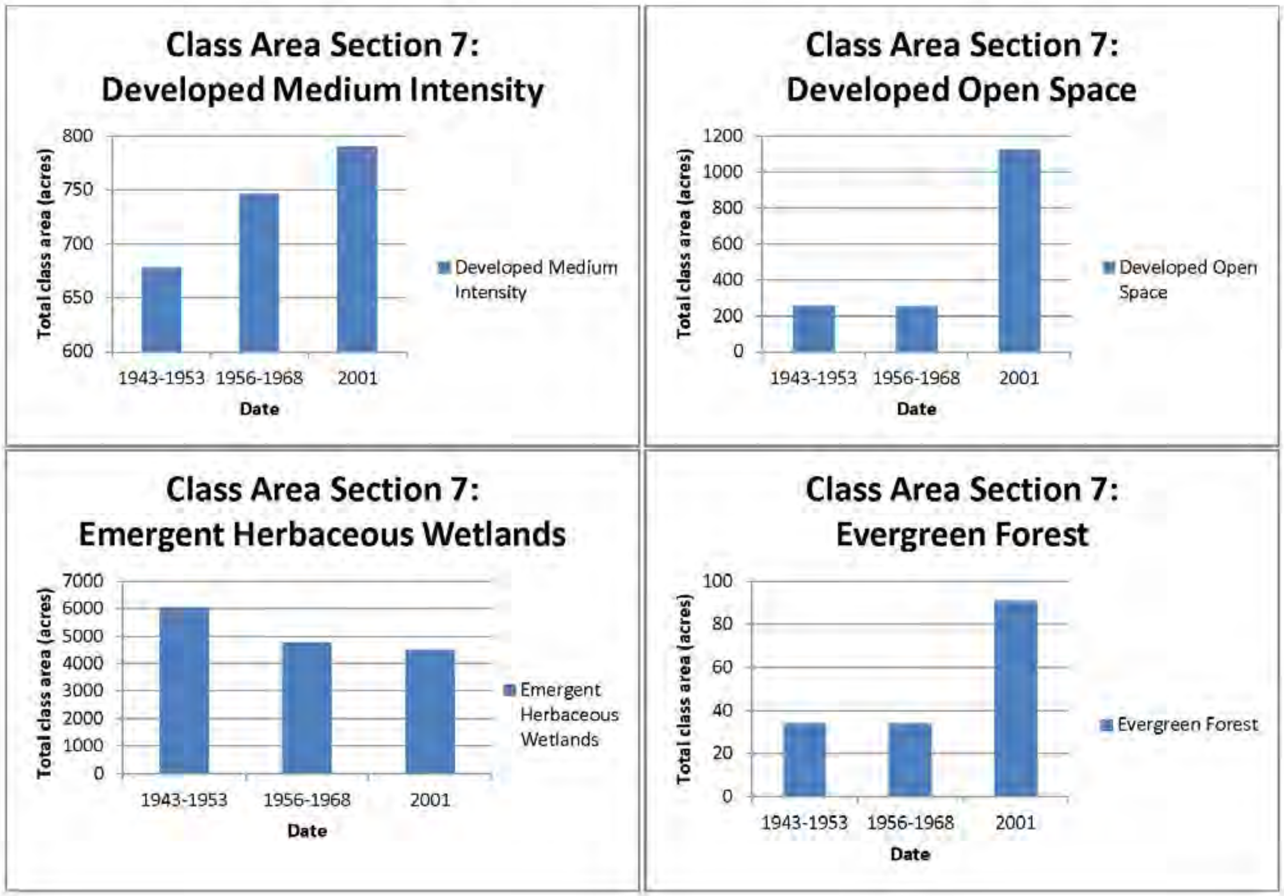

Class Area Section 6:
Developed Open Space
Total class area (acres)
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Developed Open Space


Class Area Section 6:
Emergent Herbaceous Wetlands
Total class area (acres)
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

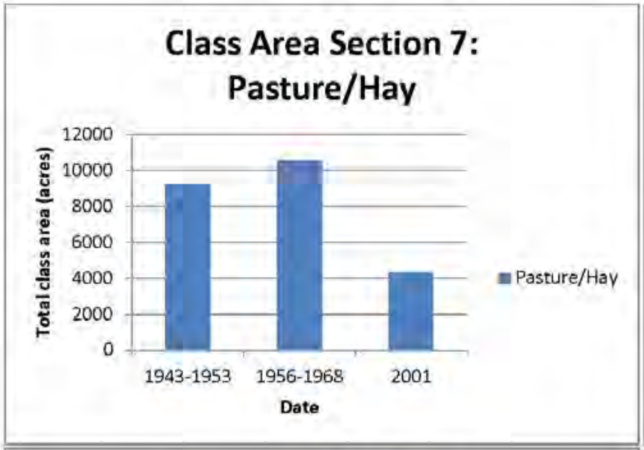

Class Area Section 6:
Evergreen Forest
Total class area (acres)
270
265
260
255
250
245
240
1943-1953
1956-1968
2001
Date
Evergreen Forest

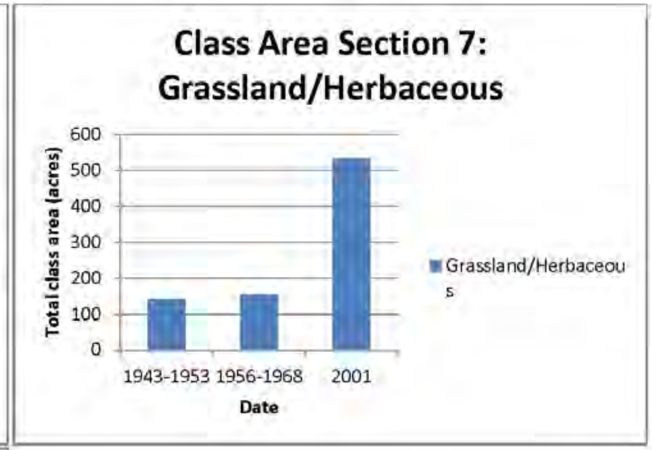

Class Area Section 6: Mixed Forest
Total class area (acres)
165
160
155
150
145
140
135
1943-1953
1956-1968
2001
Date
Mixed Forest
Class Area Section 6: Open Water
Total class area (acres)
6000
5000
4000
3000
2000
1000
0
1943-1953
1956-1968
2001
Date
Open Water
Class Area Section 6: Woody Wetlands
Total class area (acres)
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Woody Wetlands
Class Area Section 6: Shrub/Scrub
Total class area (acres)
10
8
6
4
2
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

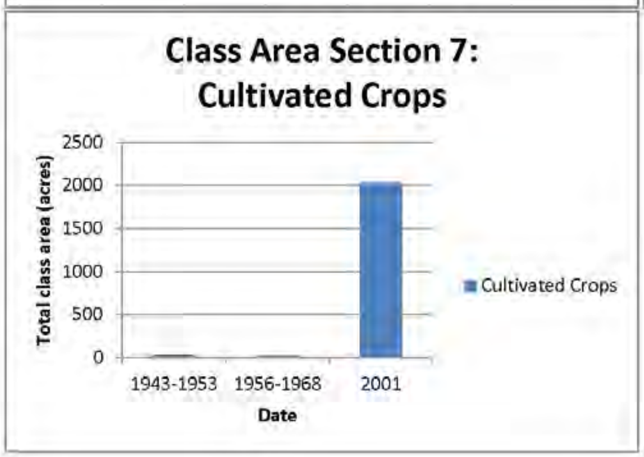

Class Area Section 6:
Barren Land (Rock/Sand/Clay)
Total class area (acres)
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)
Class Area Section 7:
Deciduous Forest
Total class area (acres)
1600
1400
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Deciduous Forest
Class Area Section 7:
Developed High Intensity
Total class area (acres)
600
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Developed High Intensity
Class Area Section 7:
Developed Low Intensity
Total class area (acres)
1350
1300
1250
1200
1150
1100
1050
1000
950
1943-1953
1956-1968
2001
Date
Developed Low Intensity

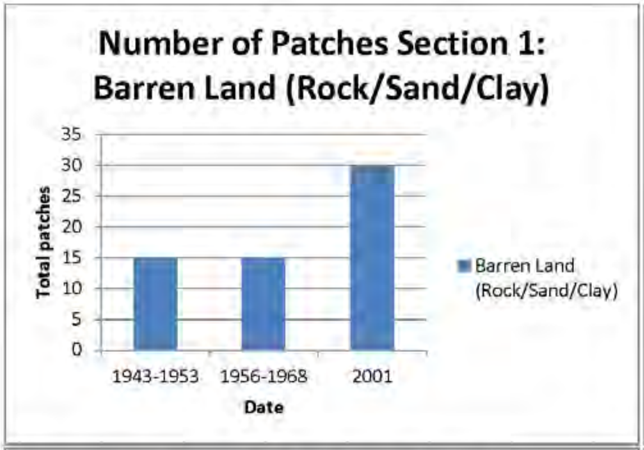

Class Area Section 7:
Developed Medium Intensity
Total class area (acres)
800
750
700
650
600
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Class Area Section 7:
Developed Open Space
Total class area (acres)
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Class Area Section 7:
Emergent Herbaceous Wetlands
Total class area (acres)
7000
6000
5000
4000
3000
2000
1000
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Class Area Section 7:
Evergreen Forest
Total class area (acres)
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

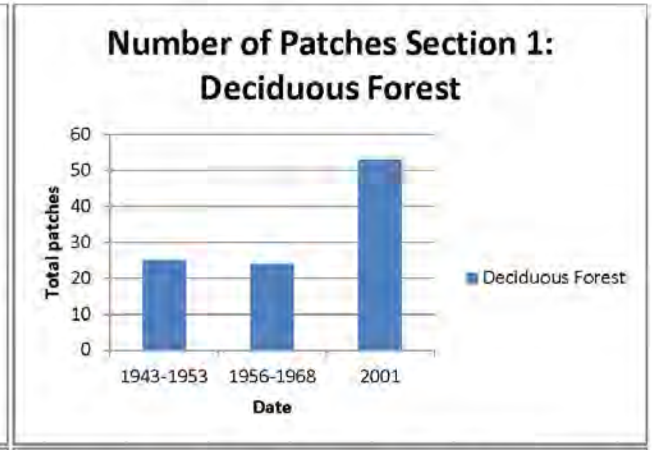

Class Area Section 7:
Mixed Forest
Total class area (acres)
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Mixed Forest
Class Area Section 7:
Open Water
Total class area (acres)
1400
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Open Water
Class Area Section 7:
Woody Wetlands
Total class area (acres)
3000
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Woody Wetlands
Class Area Section 7:
Shrub/Scrub
Total class area (acres)
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

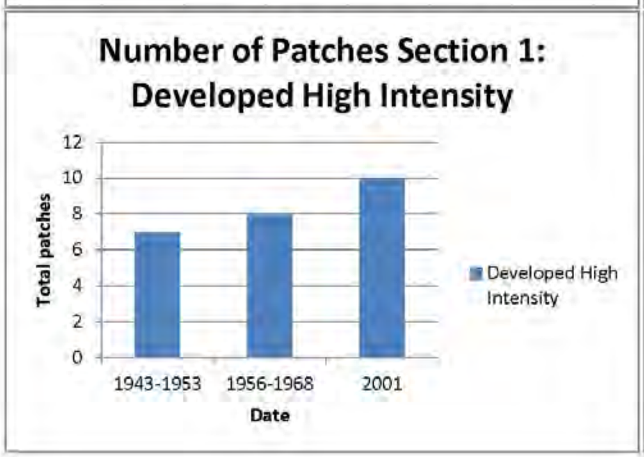

Class Area Section 7: Pasture/Hay
Total class area (acres)
12000
10000
8000
6000
4000
2000
0
1943-1953
1956-1968
2001
Date
Pasture/Hay

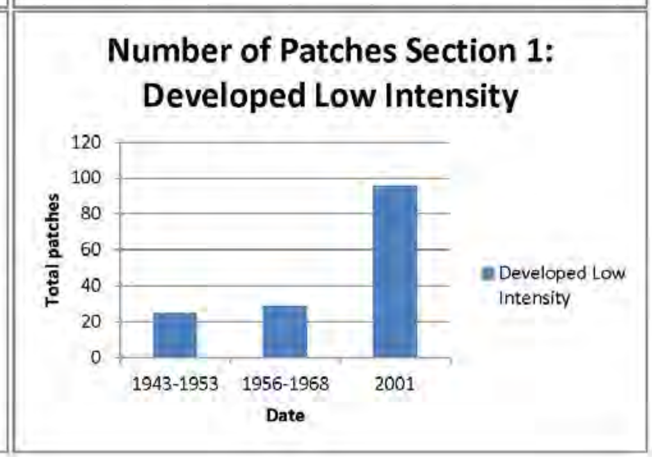

Class Area Section 7: Grassland/Herbaceous
Total class area (acres)
600
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Grassland/Herbaceous

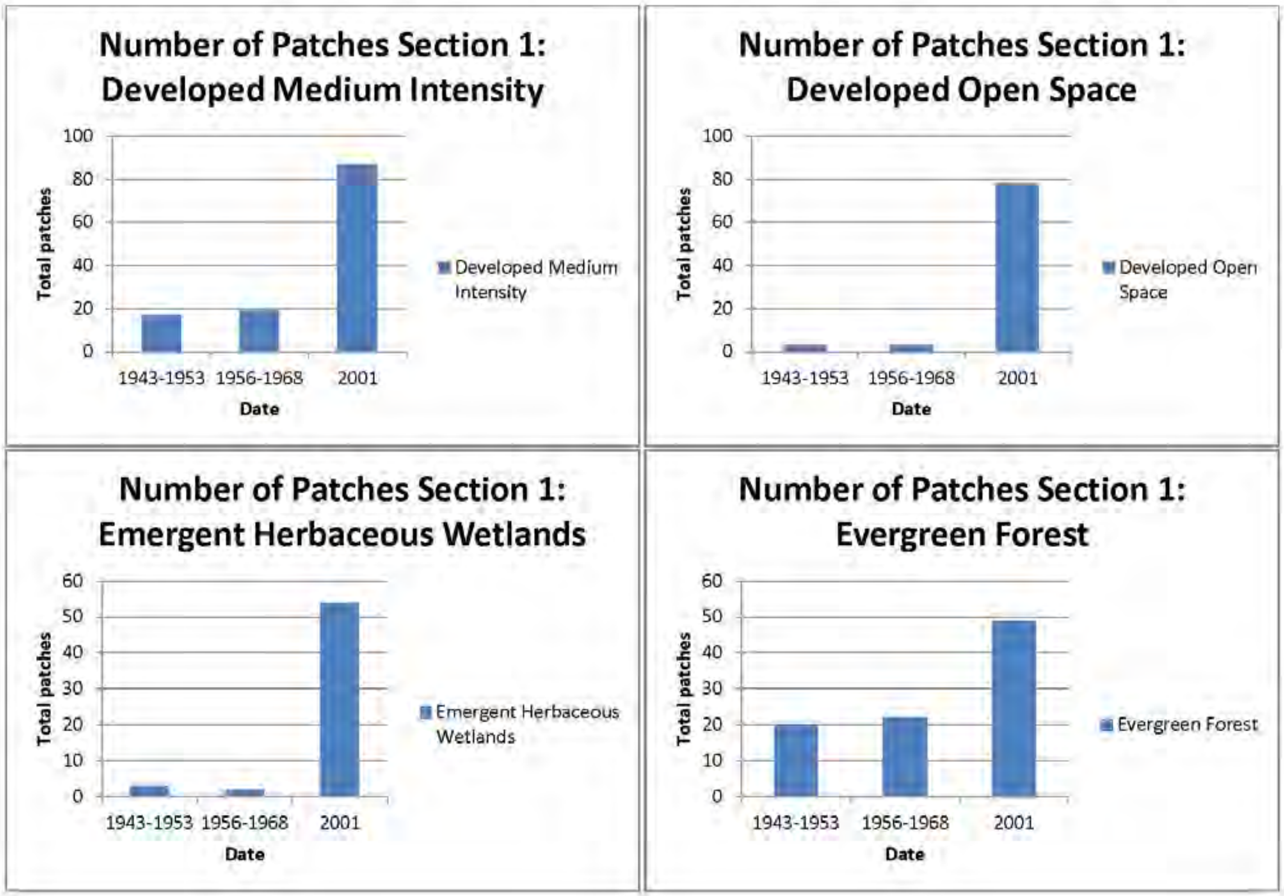

Class Area Section 7: Cultivated Crops
Total class area (acres)
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Cultivated Crops

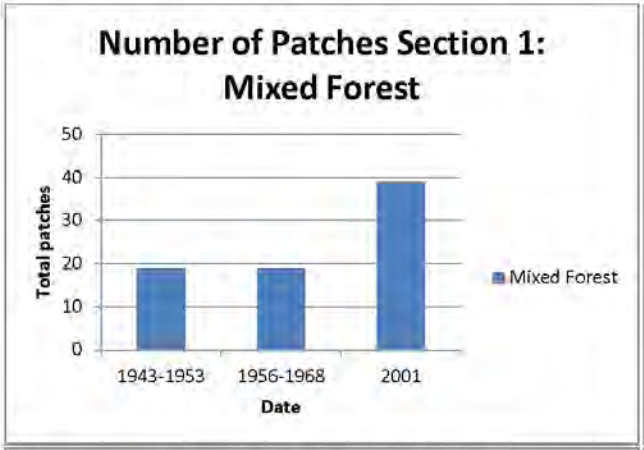

Number of Patches Section 1:
Barren Land (Rock/Sand/Clay)
Total patches
35
30
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

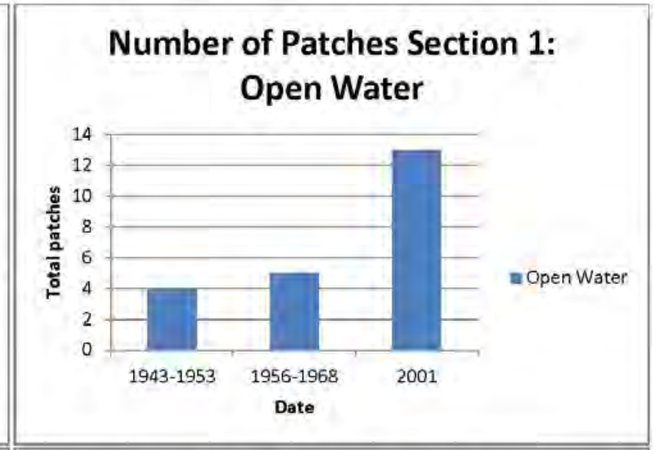

Number of Patches Section 1:
Deciduous Forest
Total patches
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

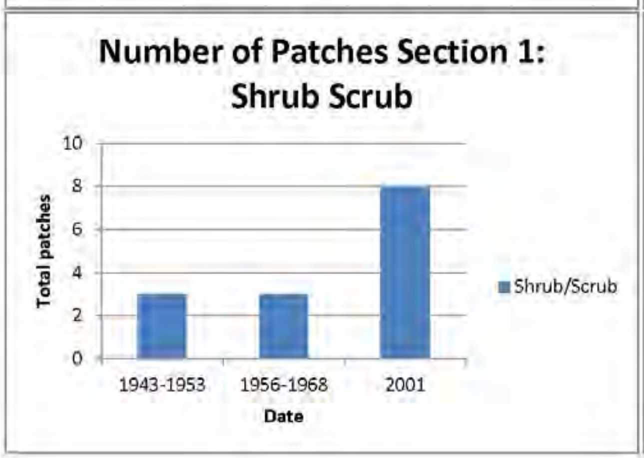

Number of Patches Section 1:
Developed High Intensity
Total patches
12
10
8
6
4
2
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

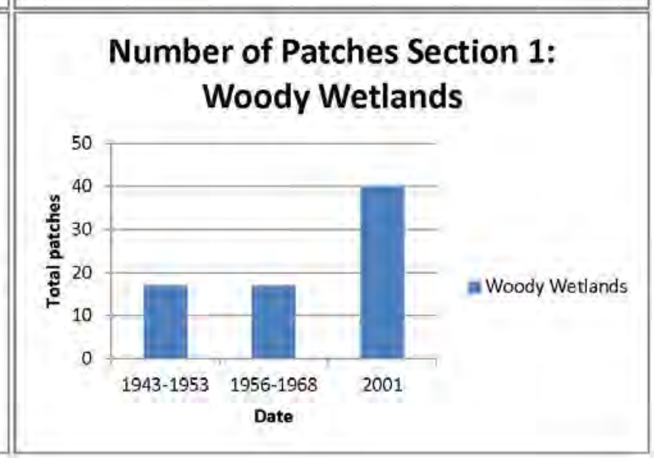

Number of Patches Section 1:
Developed Low Intensity
Total patches
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

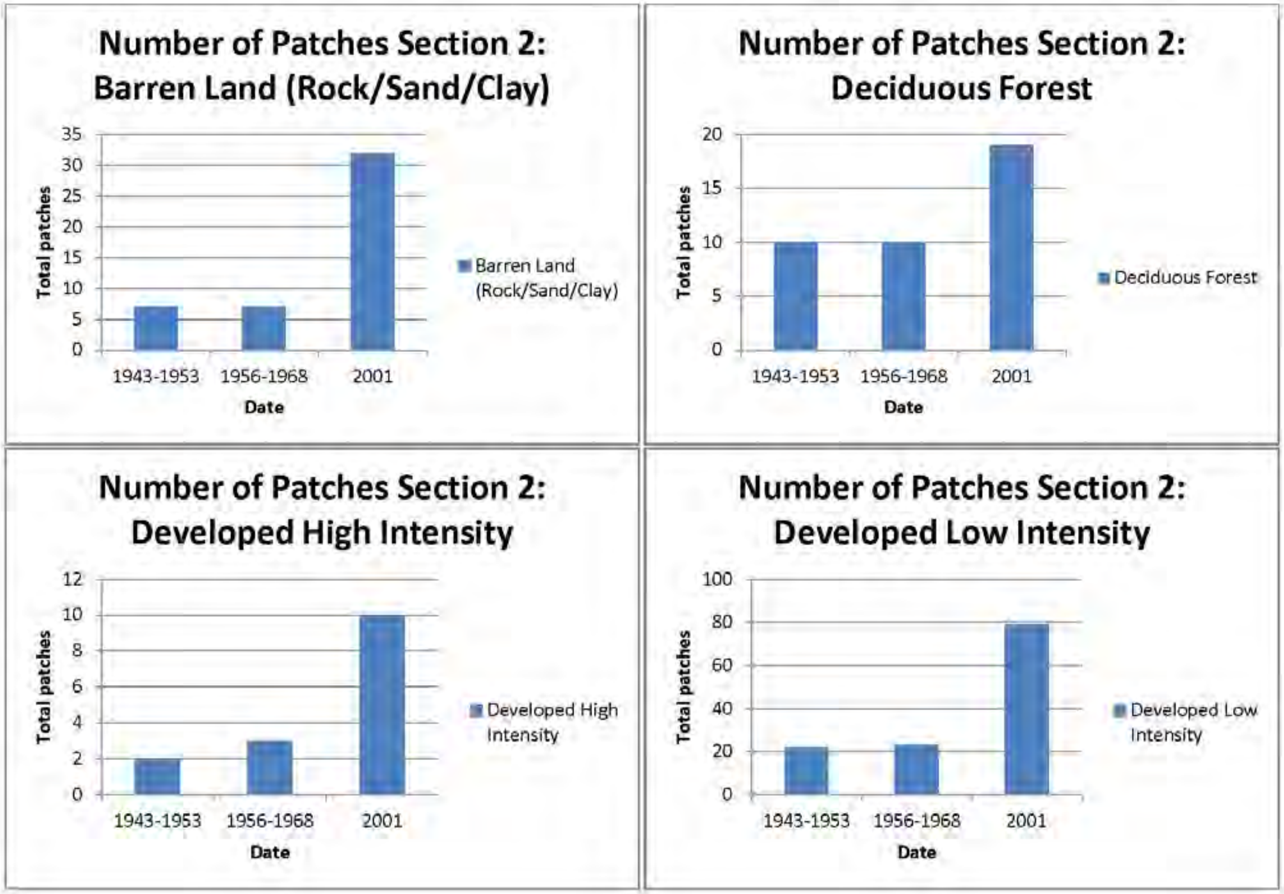

Number of Patches Section 1: Developed Medium Intensity
Total patches
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Number of Patches Section 1: Developed Open Space
Total patches
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Number of Patches Section 1: Emergent Herbaceous Wetlands
Total patches
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Number of Patches Section 1: Evergreen Forest
Total patches
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

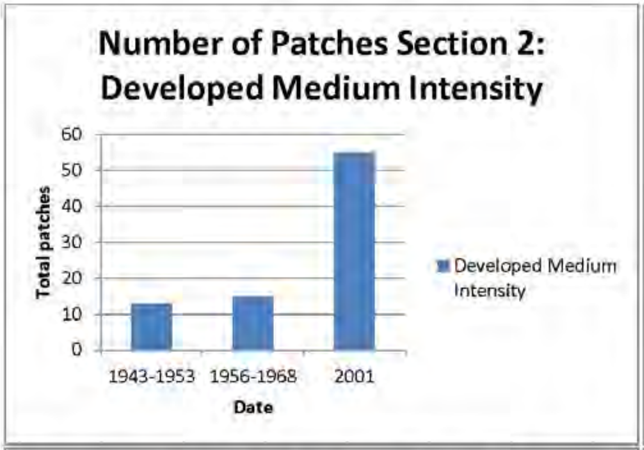

Number of Patches Section 1:
Mixed Forest
Total patches
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Mixed Forest

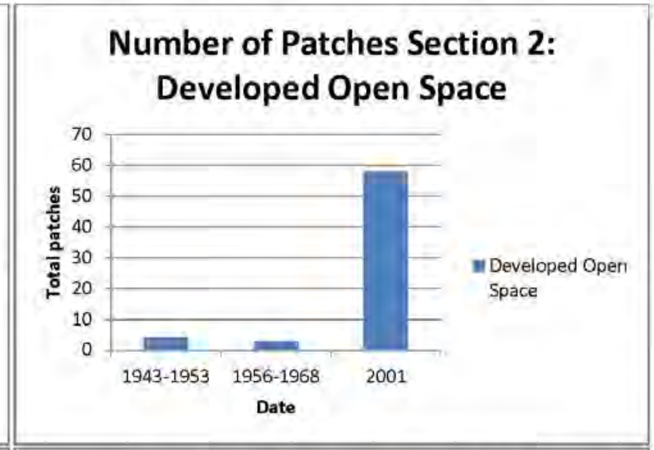

Number of Patches Section 1:
Open Water
Total patches
14
12
10
8
6
4
2
0
1943-1953
1956-1968
2001
Date
Open Water

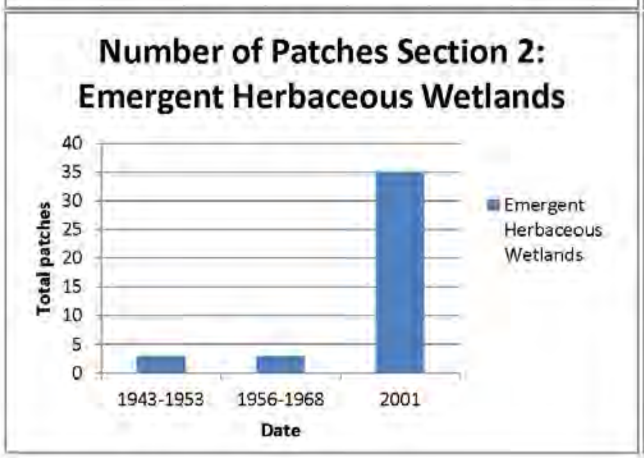

Number of Patches Section 1:
Shrub Scrub
Total patches
10
8
6
4
2
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

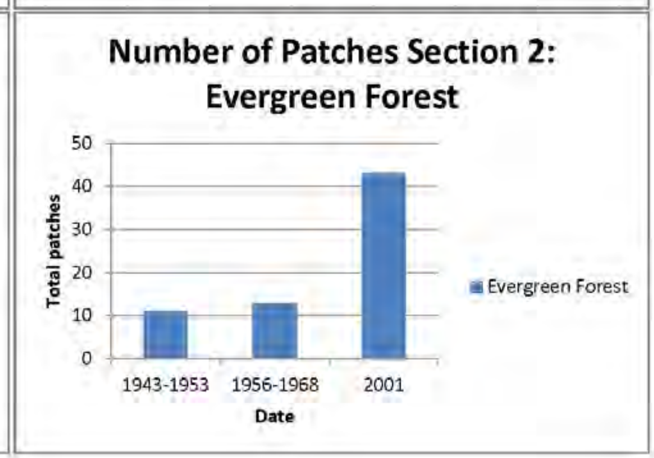

Number of Patches Section 1:
Woody Wetlands
Total patches
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

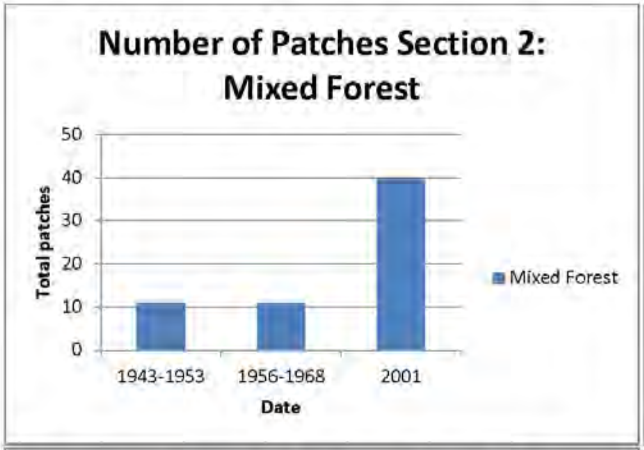

Number of Patches Section 2: Barren Land (Rock/Sand/Clay)
Total patches
35
30
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)
Number of Patches Section 2: Deciduous Forest
Total patches
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Deciduous Forest
Number of Patches Section 2: Developed High Intensity
Total patches
12
10
8
6
4
2
0
1943-1953
1956-1968
2001
Date
Developed High Intensity
Number of Patches Section 2: Developed Low Intensity
Total patches
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity


Number of Patches Section 2:
Developed Medium Intensity
60
50
40
30
20
10
0
Total patches
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

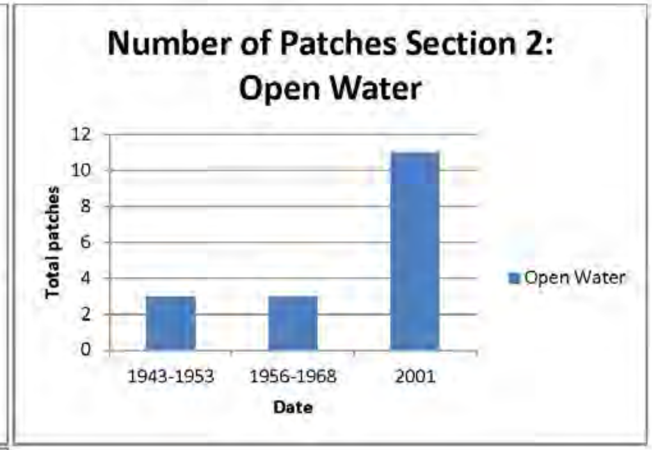

Number of Patches Section 2:
Developed Open Space
70
60
50
40
30
20
10
0
Total patches
1943-1953
1956-1968
2001
Date
Developed Open Space


Number of Patches Section 2:
Emergent Herbaceous Wetlands
40
35
30
25
20
15
10
5
0
Total patches
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

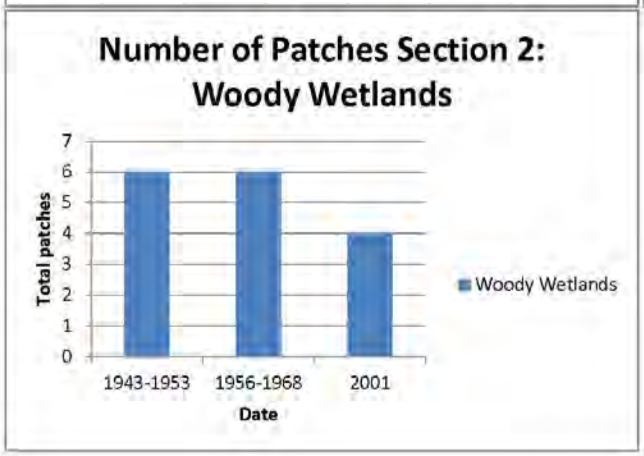

Number of Patches Section 2:
Evergreen Forest
50
40
30
20
10
0
Total patches
1943-1953
1956-1968
2001
Date
Evergreen Forest



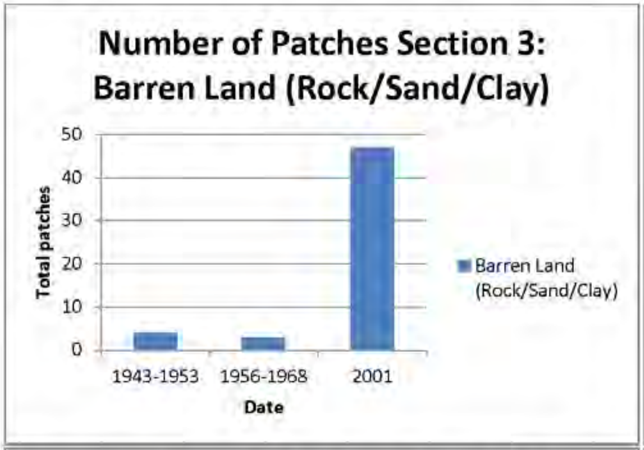
Number of Patches Section 2: Mixed Forest
Total patches
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Mixed Forest

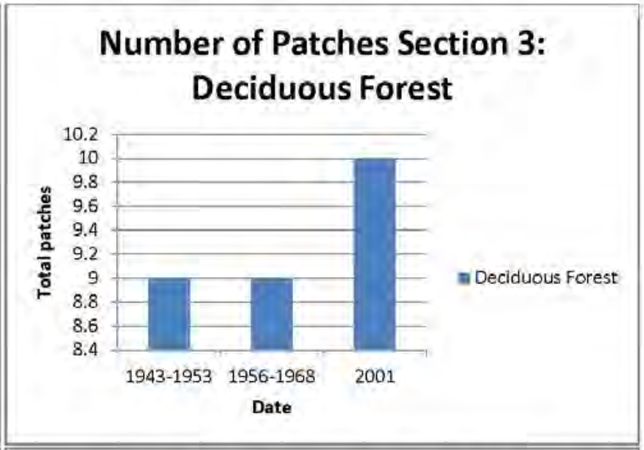


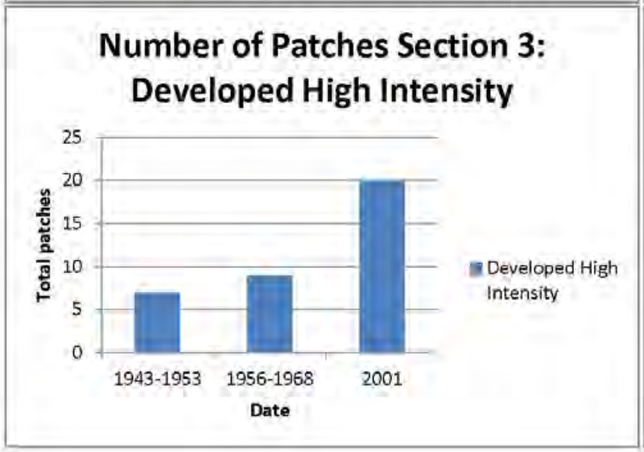
Number of Patches Section 2: Open Water
Total patches
12
10
8
6
4
2
0
1943-1953
1956-1968
2001
Date
Open Water

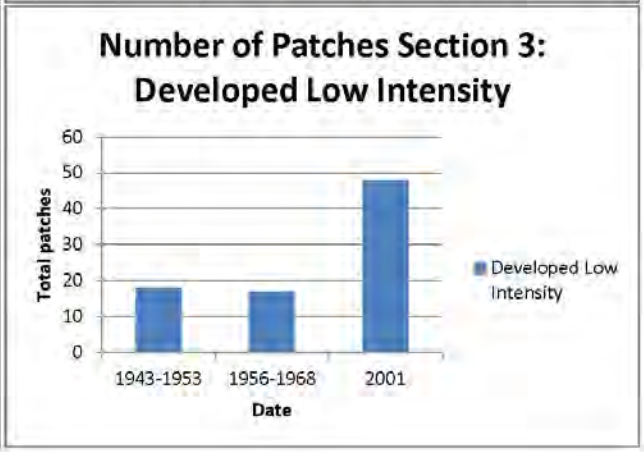


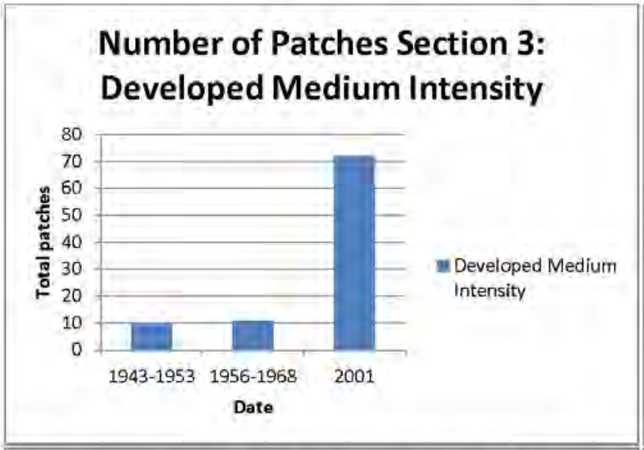
Number of Patches Section 2: Woody Wetlands
Total patches
7
6
5
4
3
2
1
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

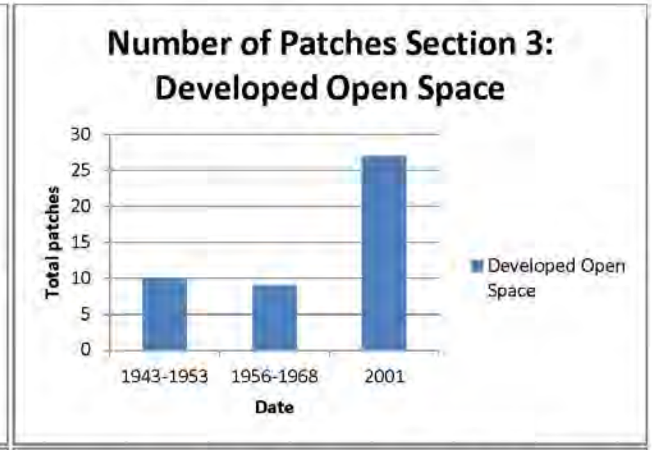

Number of Patches Section 3:
Barren Land (Rock/Sand/Clay)
Total patches
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

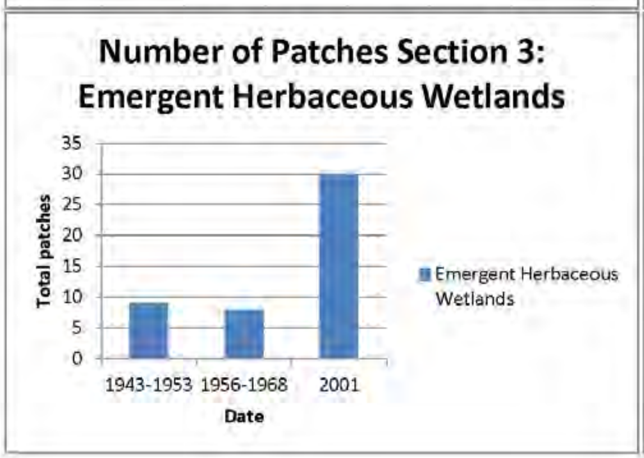

Number of Patches Section 3:
Deciduous Forest
Total patches
10.2
10
9.8
9.6
9.4
9.2
9
8.8
8.6
8.4
1943-1953
1956-1968
2001
Date
Deciduous Forest

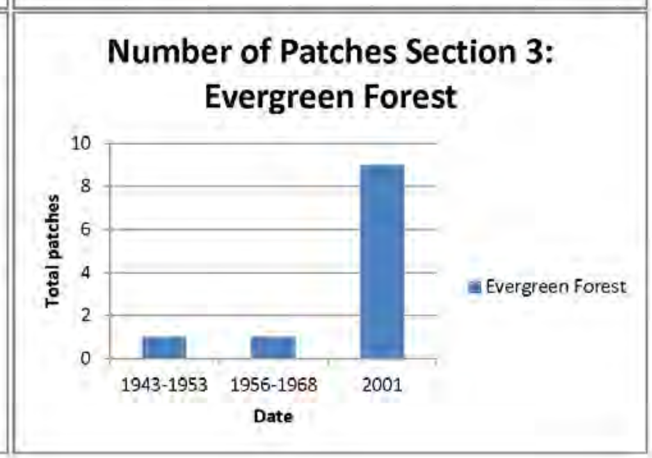

Number of Patches Section 3:
Developed High Intensity
Total patches
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

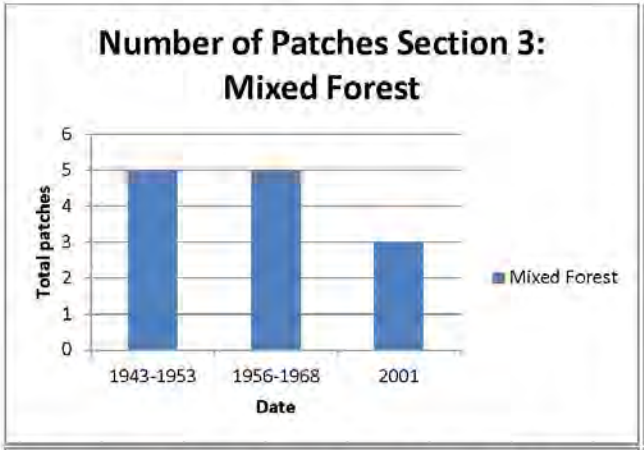

Number of Patches Section 3:
Developed Low Intensity
Total patches
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

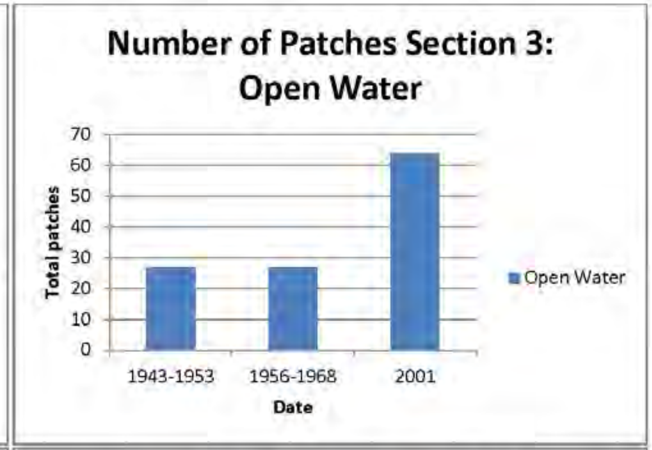

Number of Patches Section 3:
Developed Medium Intensity
Total patches
0
10
20
30
40
50
60
70
80
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

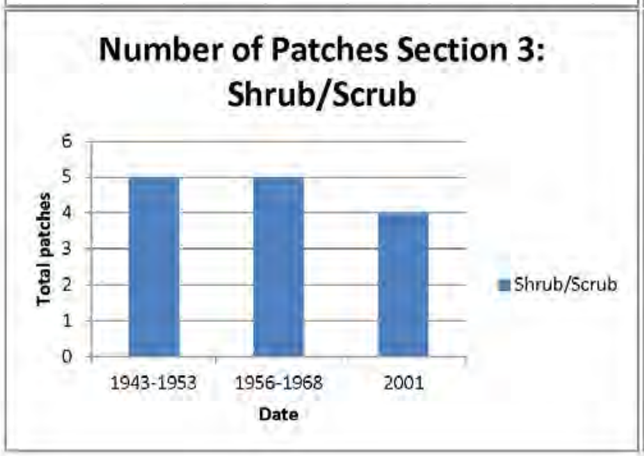

Number of Patches Section 3:
Developed Open Space
Total patches
0
5
10
15
20
25
30
1943-1953
1956-1968
2001
Date
Developed Open Space

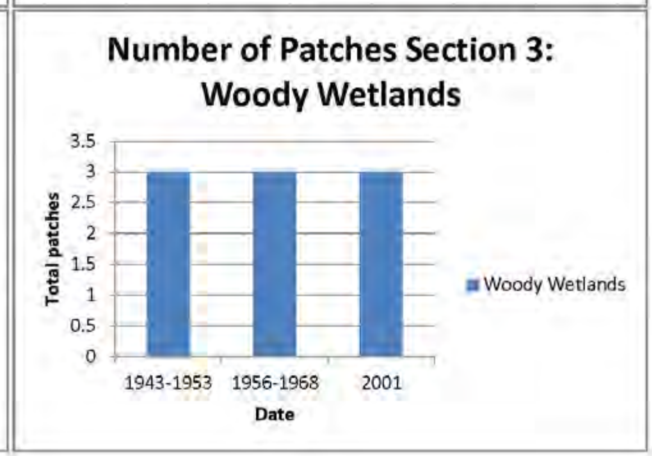

Number of Patches Section 3:
Emergent Herbaceous Wetlands
Total patches
0
5
10
15
20
25
30
35
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

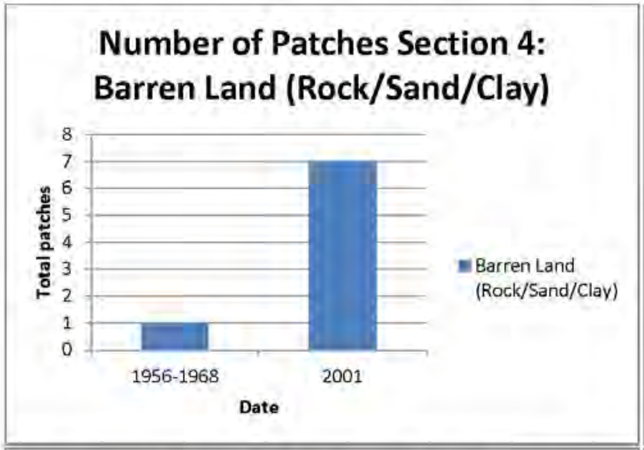

Number of Patches Section 3:
Evergreen Forest
Total patches
0
2
4
6
8
10
1943-1953
1956-1968
2001
Date
Evergreen Forest

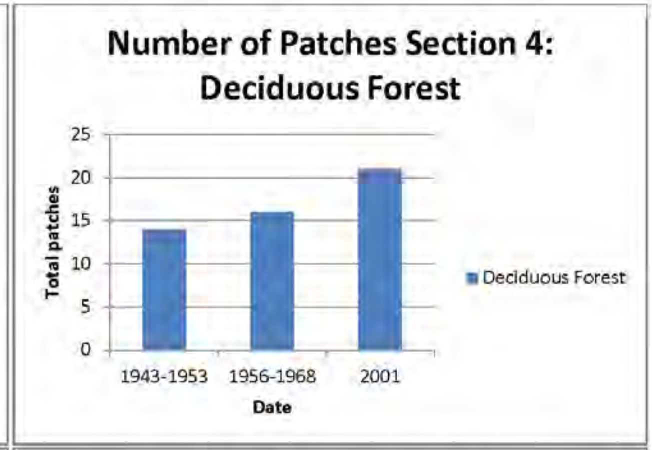

Number of Patches Section 3:
Mixed Forest
Total patches
0
1
2
3
4
5
6
1943-1953
1956-1968
2001
Date
Mixed Forest

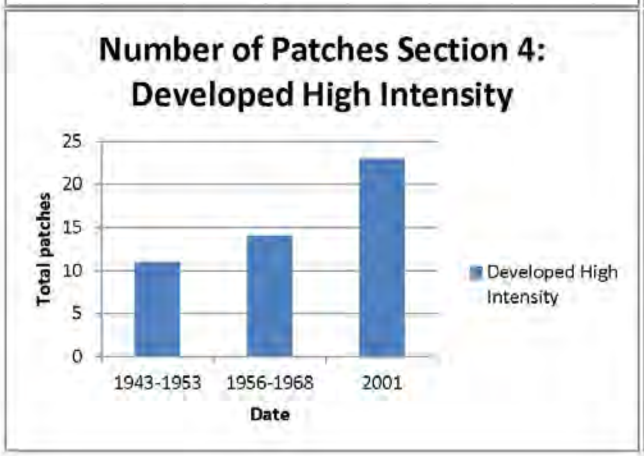

Number of Patches Section 3:
Open Water
Total patches
0
10
20
30
40
50
60
70
1943-1953
1956-1968
2001
Date
Open Water

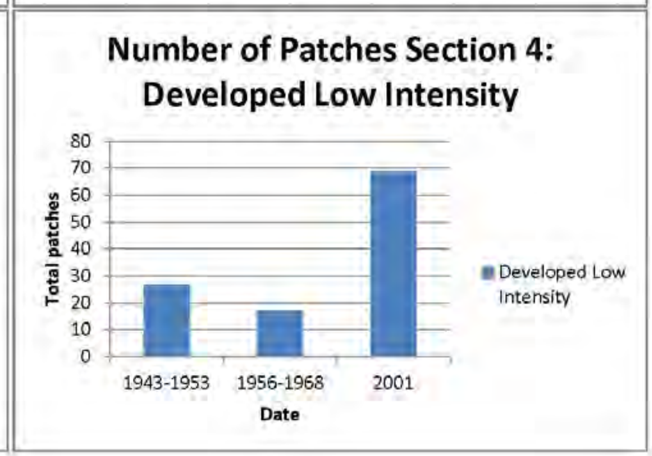

Number of Patches Section 3:
Shrub/Scrub
Total patches
0
1
2
3
4
5
6
1943-1953
1956-1968
2001
Date
Shrub/Scrub

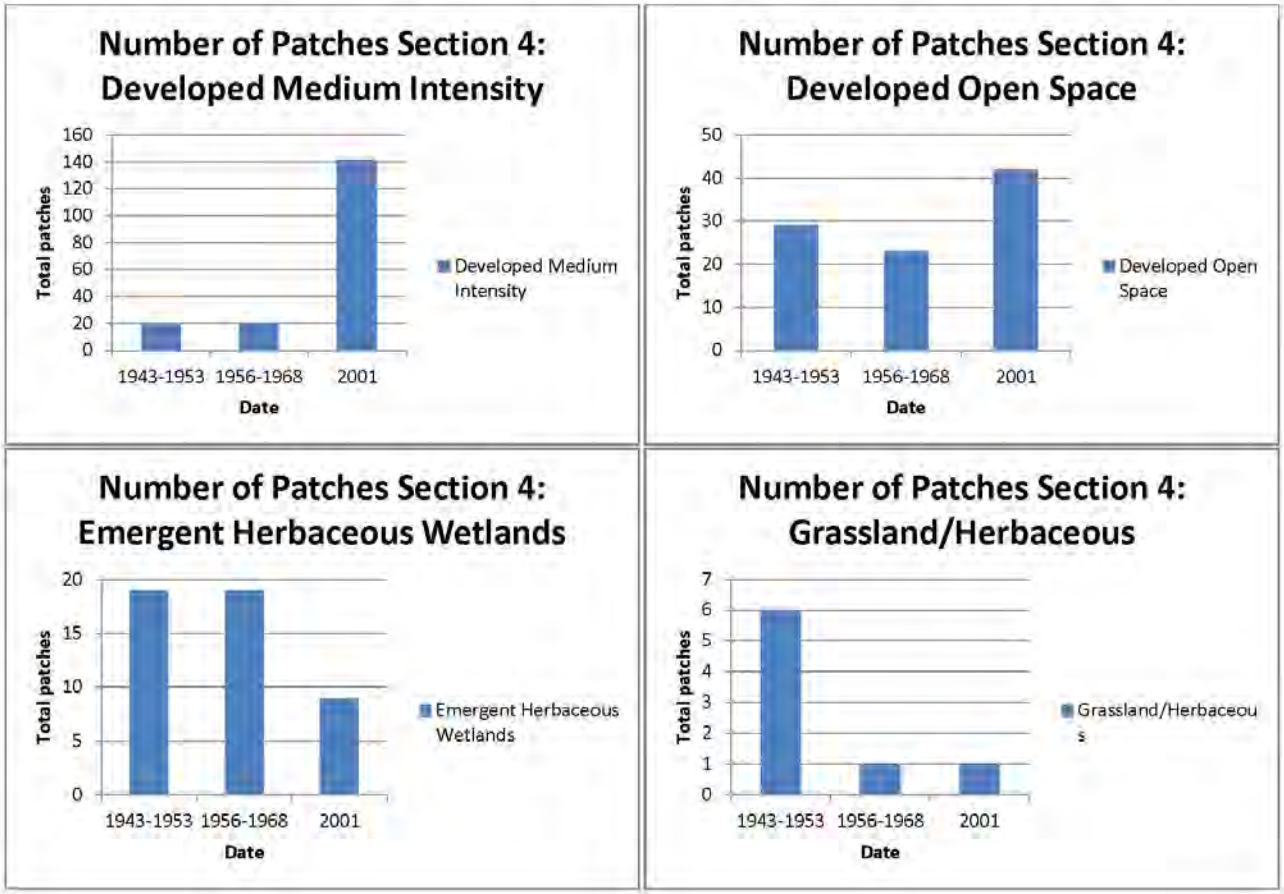

Number of Patches Section 3:
Woody Wetlands
Total patches
0
0.5
1
1.5
2
2.5
3
3.5
1943-1953
1956-1968
2001
Date
Woody Wetlands

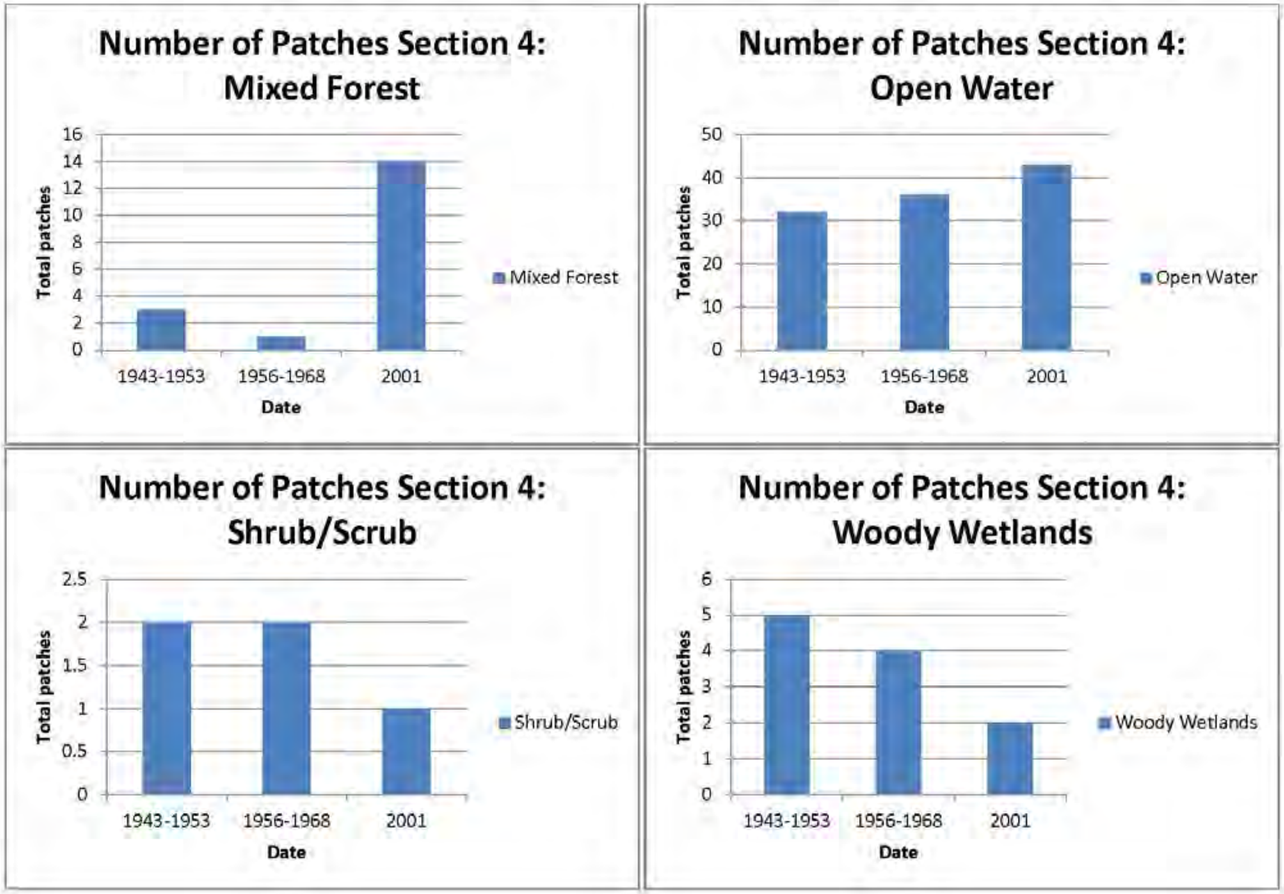

Number of Patches Section 4:
Barren Land (Rock/Sand/Clay)
Total patches
0
1
2
3
4
5
6
7
8
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

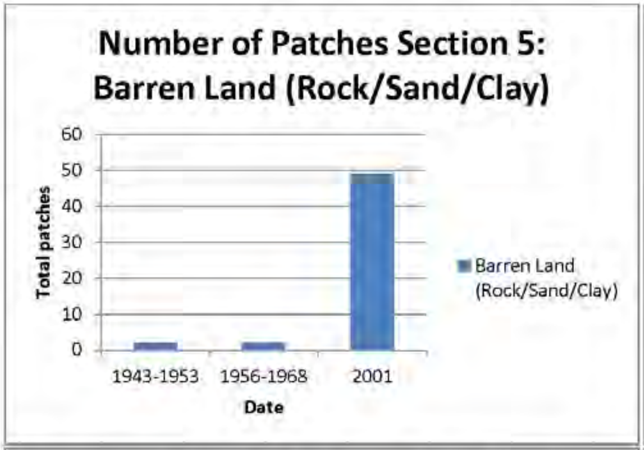

Number of Patches Section 4:
Deciduous Forest
Total patches
0
5
10
15
20
25
1943-1953
1956-1968
2001
Date
Deciduous Forest

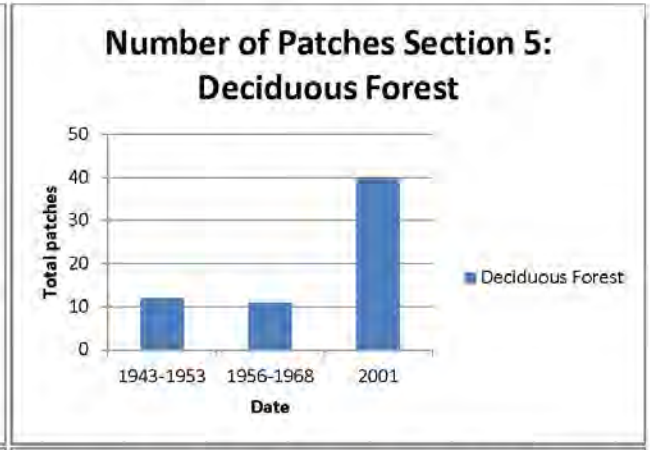

Number of Patches Section 4:
Developed High Intensity
Total patches
0
5
10
15
20
25
1943-1953
1956-1968
2001
Date
Developed High Intensity

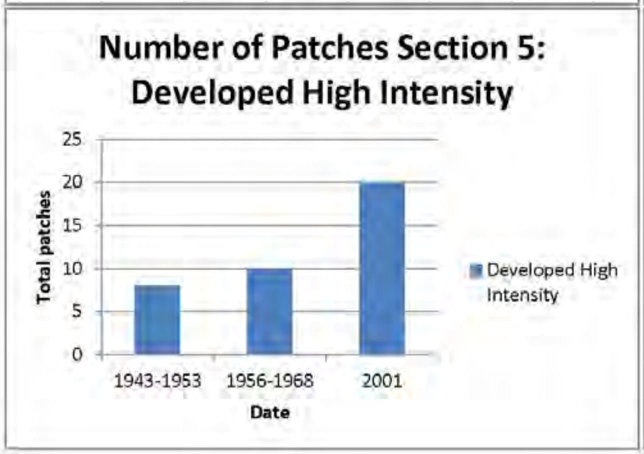

Number of Patches Section 4:
Developed Low Intensity
Total patches
0
10
20
30
40
50
60
70
80
1943-1953
1956-1968
2001
Date
Developed Low Intensity

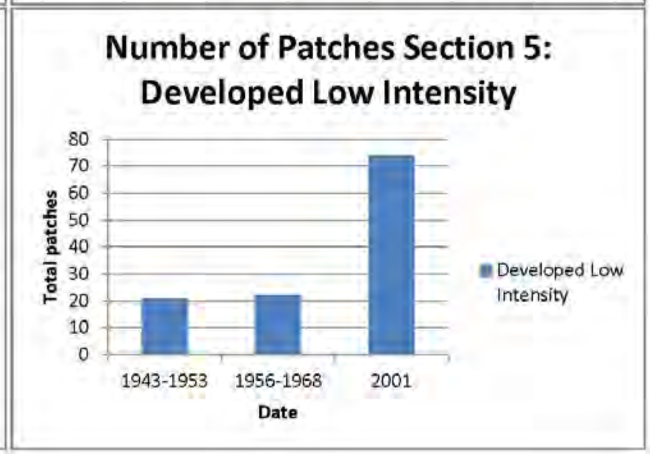

Number of Patches Section 4: Developed Medium Intensity
Total patches
160
140
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Number of Patches Section 4: Developed Open Space
Total patches
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Number of Patches Section 4: Emergent Herbaceous Wetlands
Total patches
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Number of Patches Section 4: Grassland/Herbaceous
Total patches
7
6
5
4
3
2
1
0
1943-1953
1956-1968
2001
Date
Grassland/Herbaceous

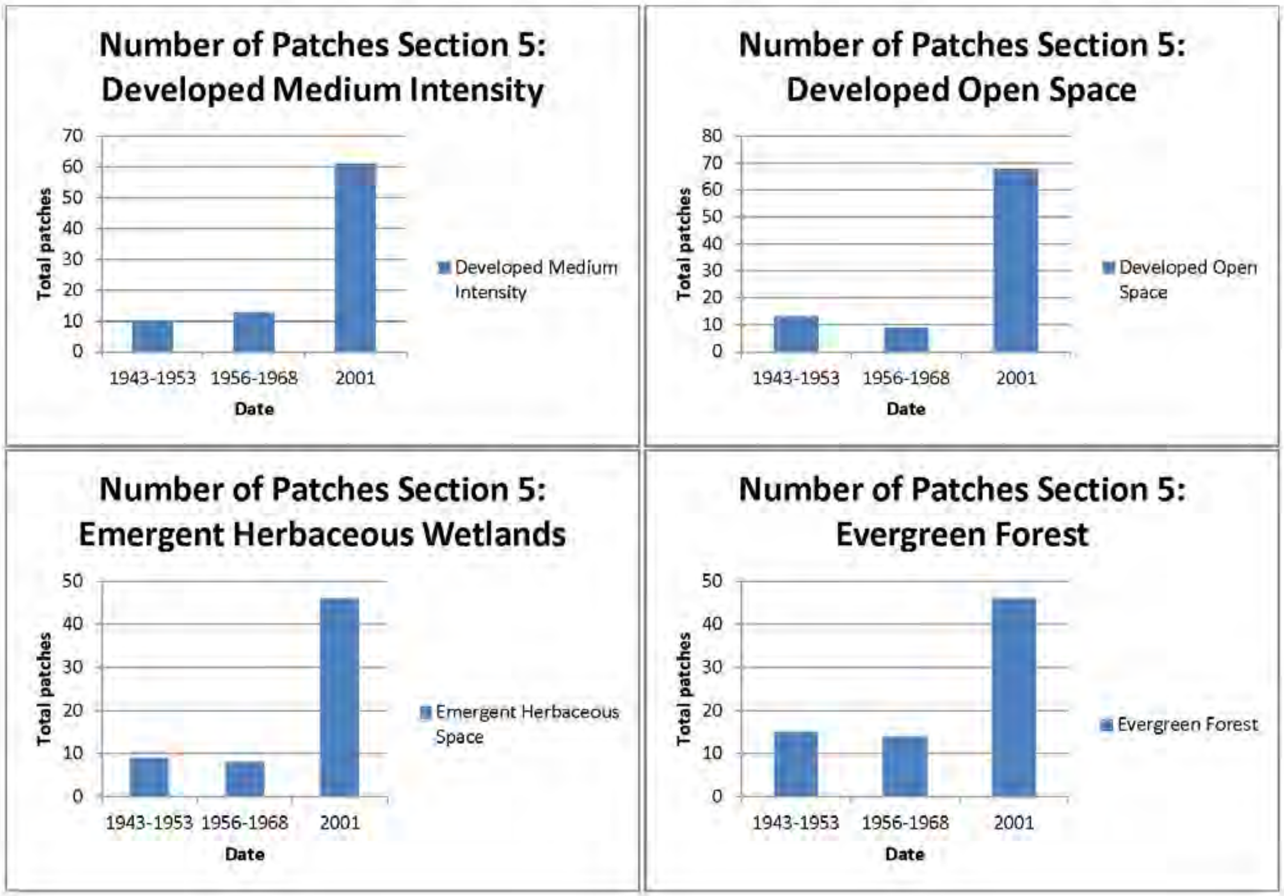

Number of Patches Section 4: Mixed Forest
Total patches
Date
1943-1953
1956-1968
2001
Mixed Forest
Number of Patches Section 4: Open Water
Total patches
Date
1943-1953
1956-1968
2001
Open Water
Number of Patches Section 4: Shrub/Scrub
Total patches
Date
1943-1953
1956-1968
2001
Shrub/Scrub
Number of Patches Section 4: Woody Wetlands
Total patches
Date
1943-1953
1956-1968
2001
Woody Wetlands

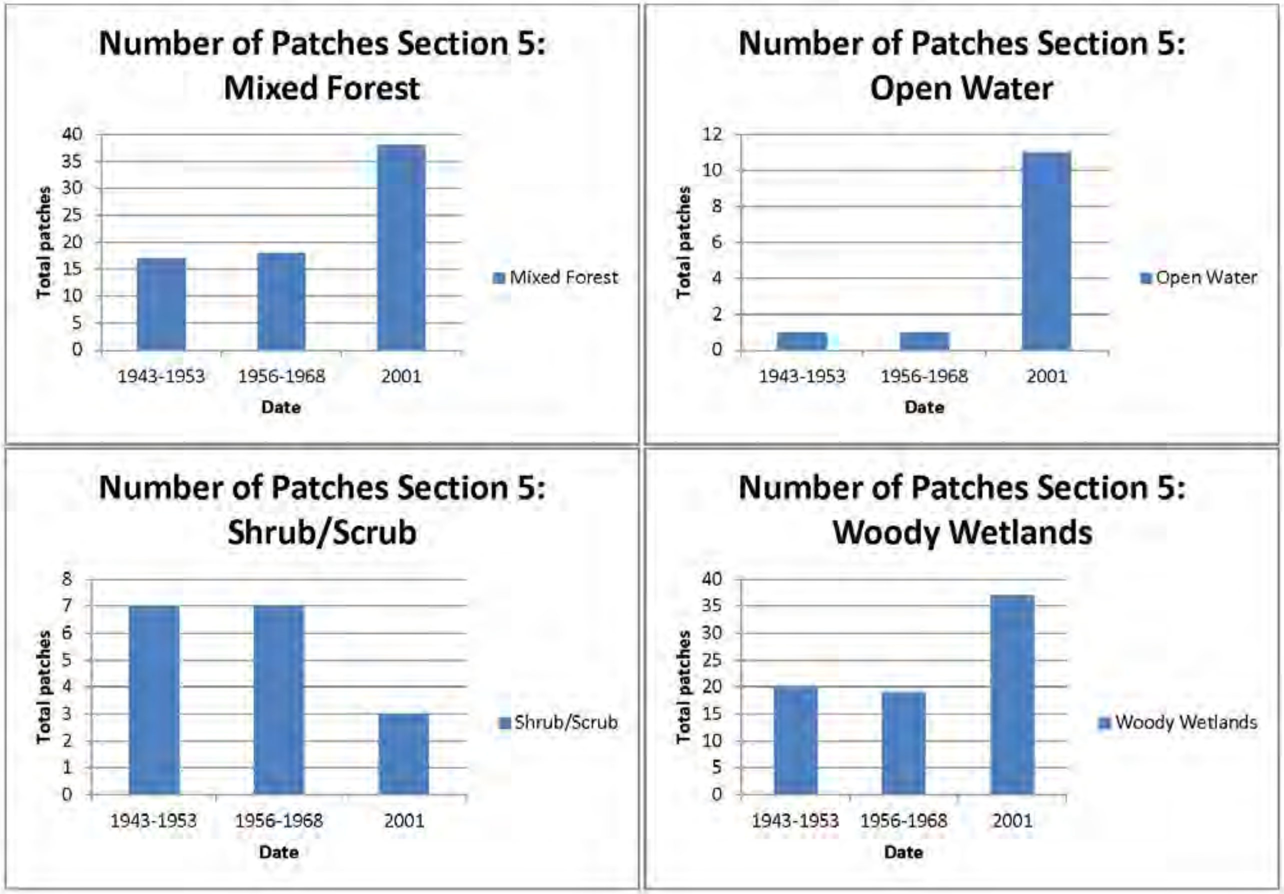

Number of Patches Section 5:
Barren Land (Rock/Sand/Clay)
60
50
40
30
20
10
0
Total patches
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

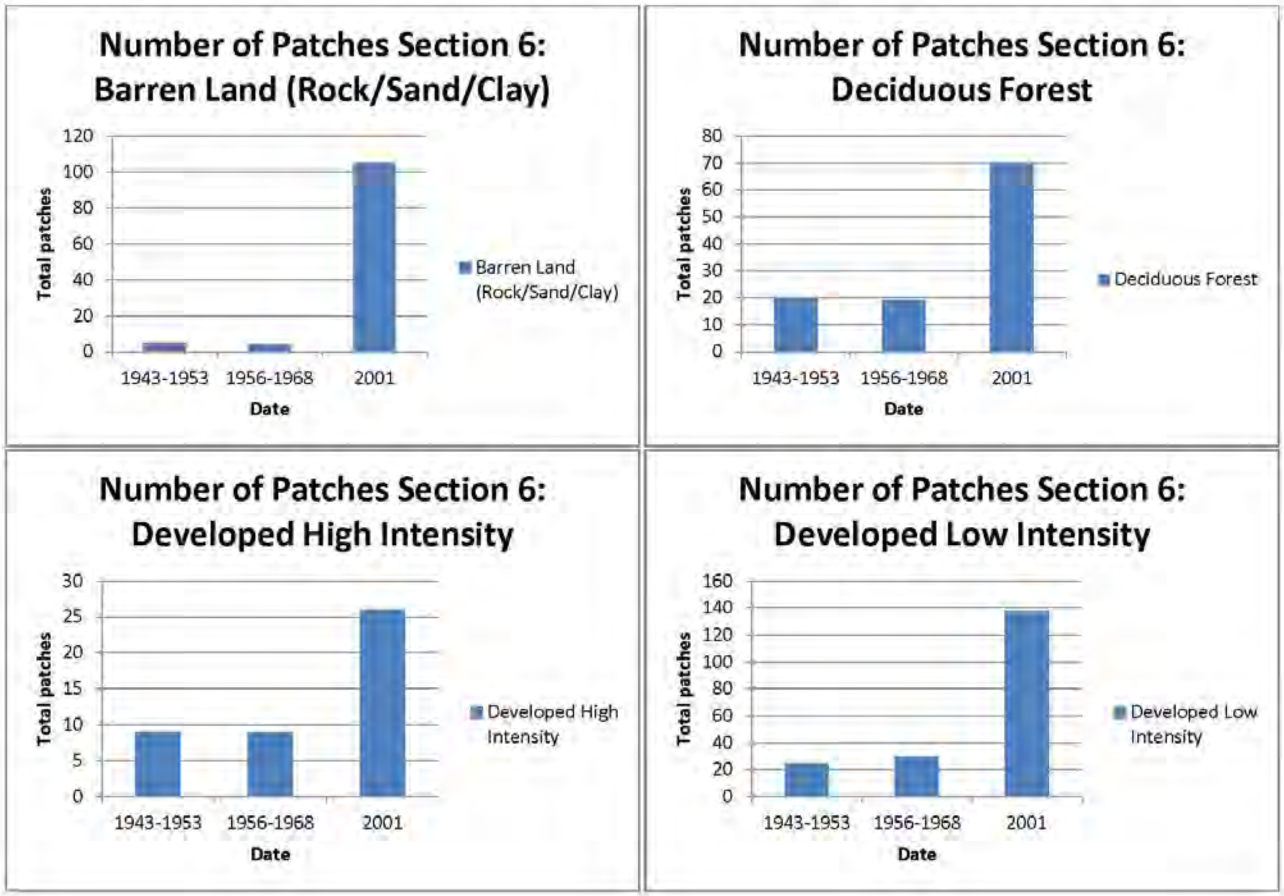

Number of Patches Section 5:
Deciduous Forest
50
40
30
20
10
0
Total patches
1943-1953
1956-1968
2001
Date
Deciduous Forest

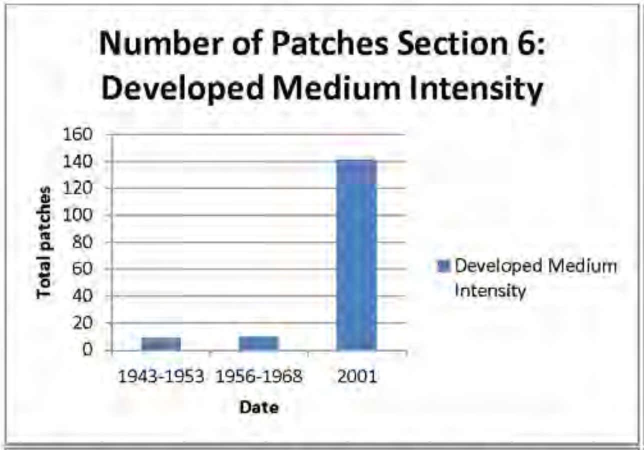

Number of Patches Section 5:
Developed High Intensity
25
20
15
10
5
0
Total patches
1943-1953
1956-1968
2001
Date
Developed High Intensity

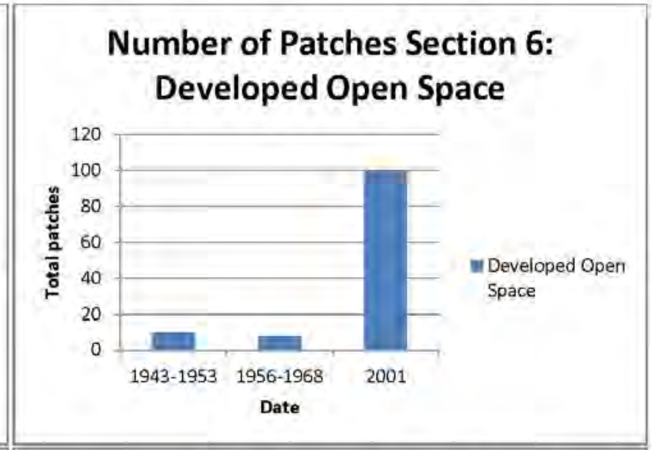

Number of Patches Section 5:
Developed Low Intensity
80
70
60
50
40
30
20
10
0
Total patches
1943-1953
1956-1968
2001
Date
Developed Low Intensity

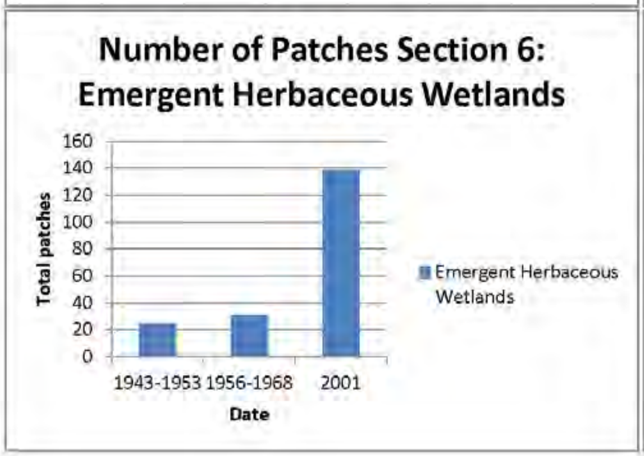

Number of Patches Section 5: Developed Medium Intensity
70
60
50
40
30
20
10
0
Total patches
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Number of Patches Section 5: Developed Open Space
80
70
60
50
40
30
20
10
0
Total patches
1943-1953
1956-1968
2001
Date
Developed Open Space
Number of Patches Section 5: Emergent Herbaceous Wetlands
50
40
30
20
10
0
Total patches
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Space
Number of Patches Section 5: Evergreen Forest
50
40
30
20
10
0
Total patches
1943-1953
1956-1968
2001
Date
Evergreen Forest

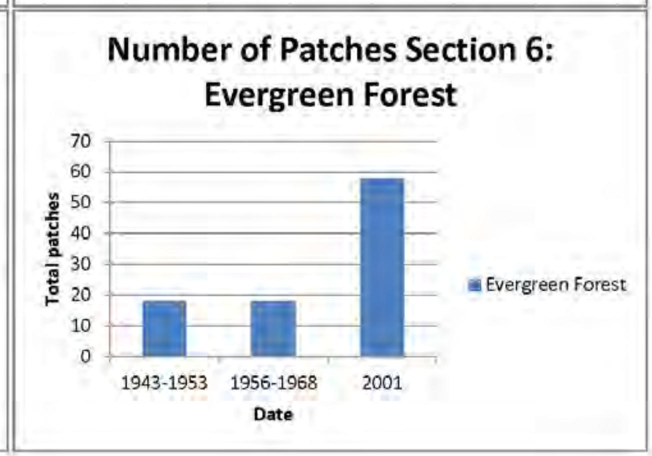

Number of Patches Section 5: Mixed Forest
Total patches
0
5
10
15
20
25
30
35
40
1943-1953
1956-1968
2001
Date
Mixed Forest
Number of Patches Section 5: Open Water
Total patches
0
2
4
6
8
10
12
1943-1953
1956-1968
2001
Date
Open Water
Number of Patches Section 5: Shrub/Scrub
Total patches
0
1
2
3
4
5
6
7
8
1943-1953
1956-1968
2001
Date
Shrub/Scrub
Number of Patches Section 5: Woody Wetlands
Total patches
0
5
10
15
20
25
30
35
40
1943-1953
1956-1968
2001
Date
Woody Wetlands

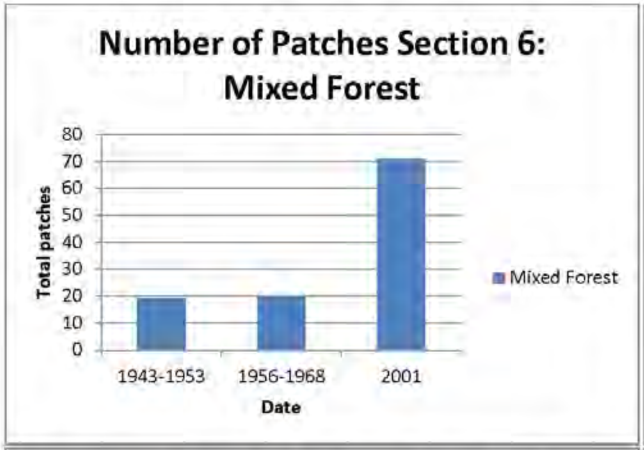

Number of Patches Section 6: Barren Land (Rock/Sand/Clay)
Total patches
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)
Number of Patches Section 6: Deciduous Forest
Total patches
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Deciduous Forest
Number of Patches Section 6: Developed High Intensity
Total patches
30
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Developed High Intensity
Number of Patches Section 6: Developed Low Intensity
Total patches
160
140
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

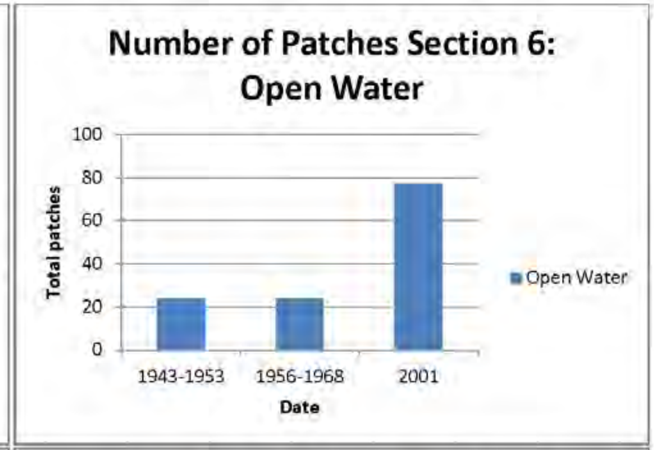

Number of Patches Section 6:
Developed Medium Intensity
160
140
120
100
80
60
40
20
0
Total patches
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

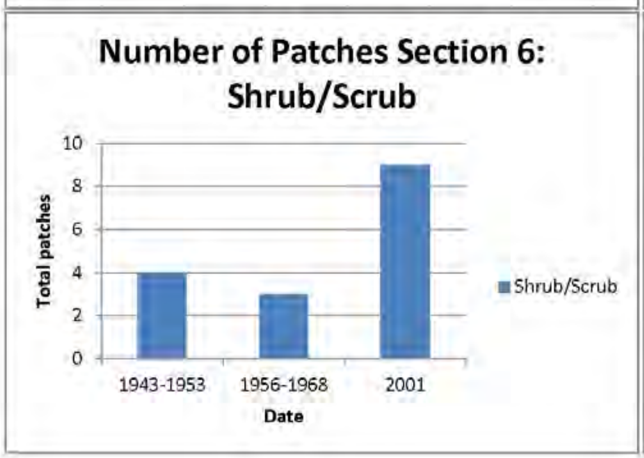

Number of Patches Section 6:
Developed Open Space
120
100
80
60
40
20
0
Total patches
1943-1953
1956-1968
2001
Date
Developed Open Space

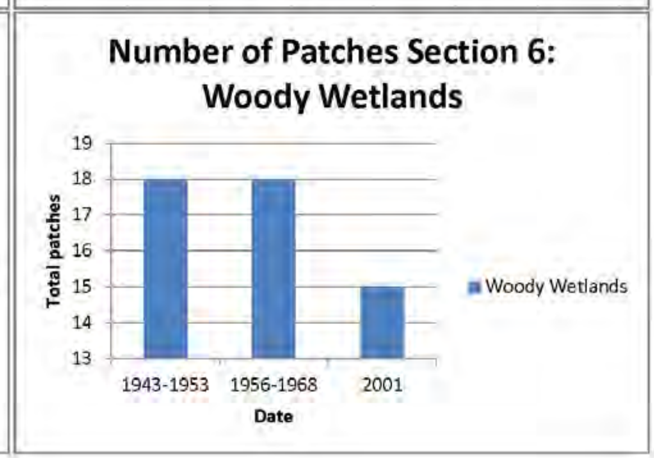

Number of Patches Section 6:
Emergent Herbaceous Wetlands
160
140
120
100
80
60
40
20
0
Total patches
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

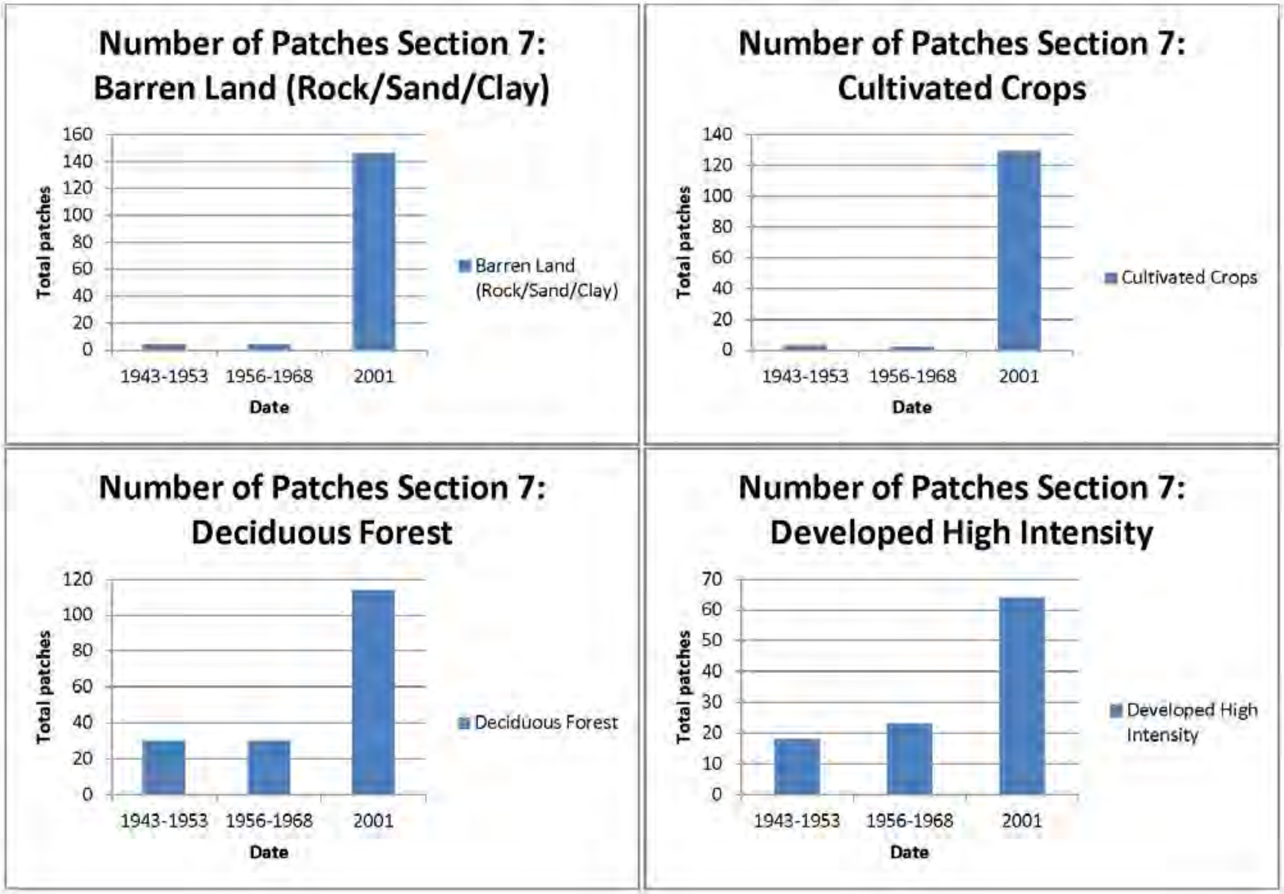

Number of Patches Section 6:
Evergreen Forest
70
60
50
40
30
20
10
0
Total patches
1943-1953
1956-1968
2001
Date
Evergreen Forest

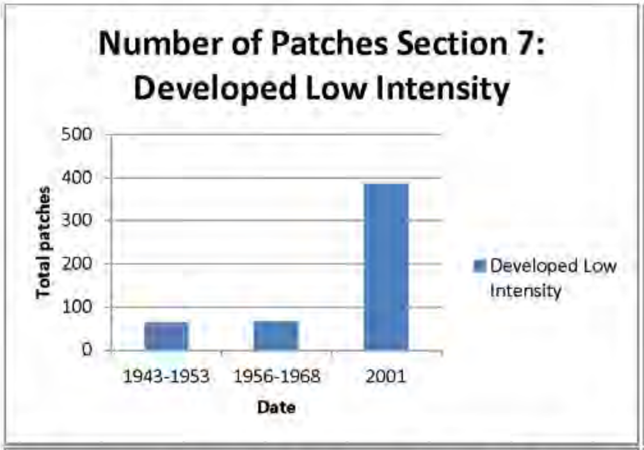

Number of Patches Section 6:
Mixed Forest
Total patches
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Mixed Forest

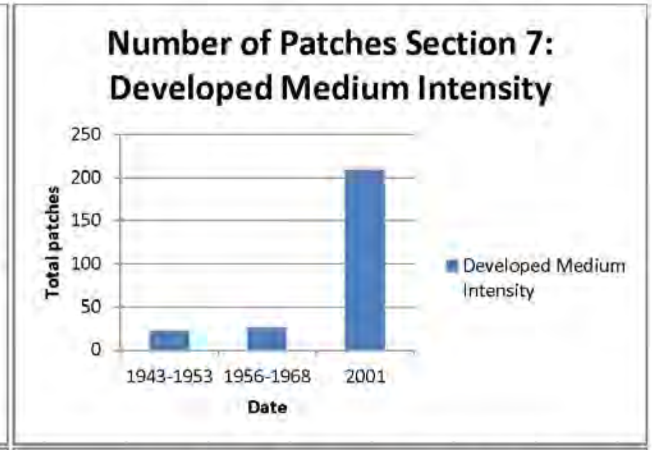

Number of Patches Section 6:
Open Water
Total patches
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Open Water

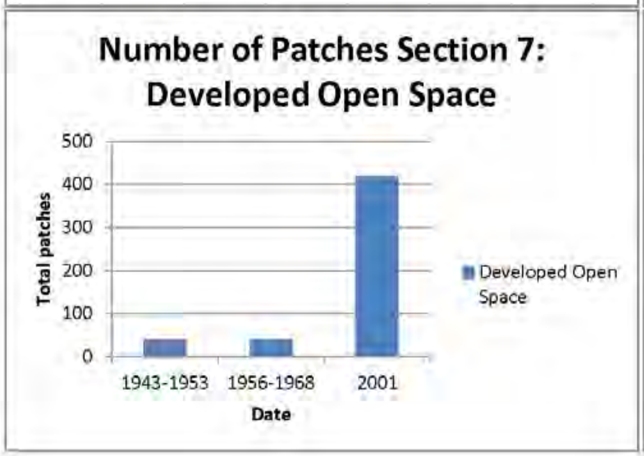

Number of Patches Section 6:
Shrub/Scrub
Total patches
10
8
6
4
2
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

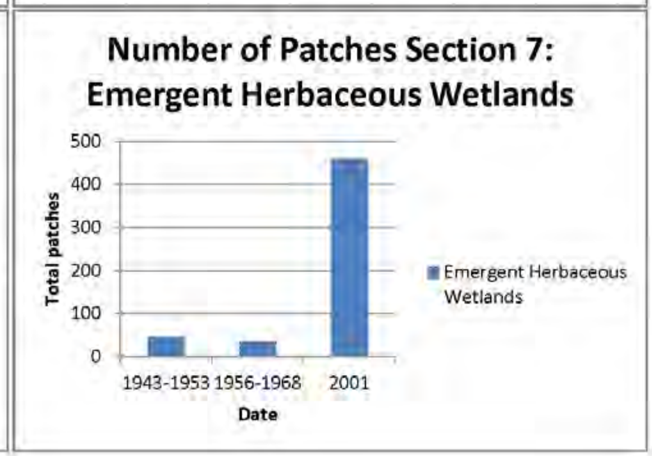

Number of Patches Section 6:
Woody Wetlands
Total patches
19
18
17
16
15
14
13
1943-1953
1956-1968
2001
Date
Woody Wetlands

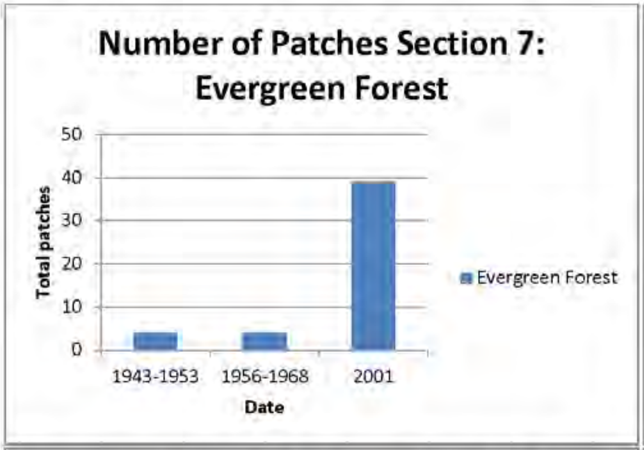

Number of Patches Section 7: Barren Land (Rock/Sand/Clay)
Total patches
160
140
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)
Number of Patches Section 7: Cultivated Crops
Total patches
140
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Cultivated Crops
Number of Patches Section 7: Deciduous Forest
Total patches
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Deciduous Forest
Number of Patches Section 7: Developed High Intensity
Total patches
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

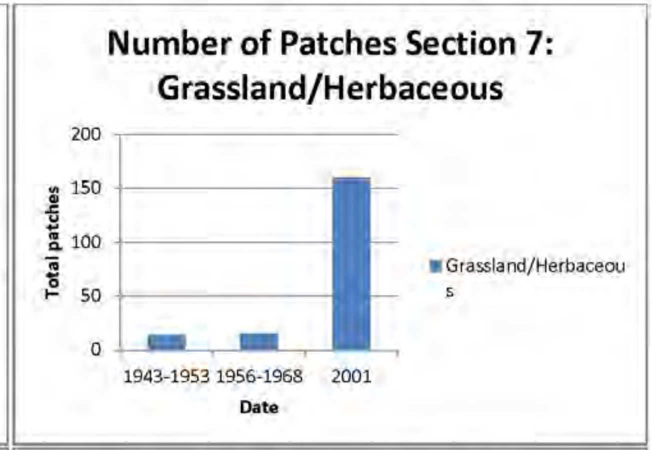

Number of Patches Section 7: Developed Low Intensity
Total patches
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

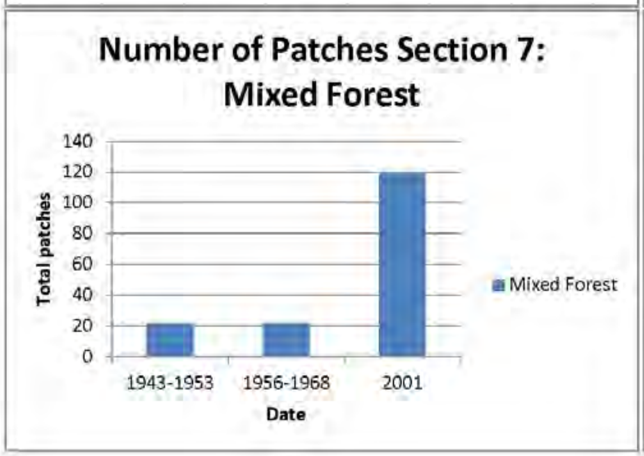

Number of Patches Section 7: Developed Medium Intensity
Total patches
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

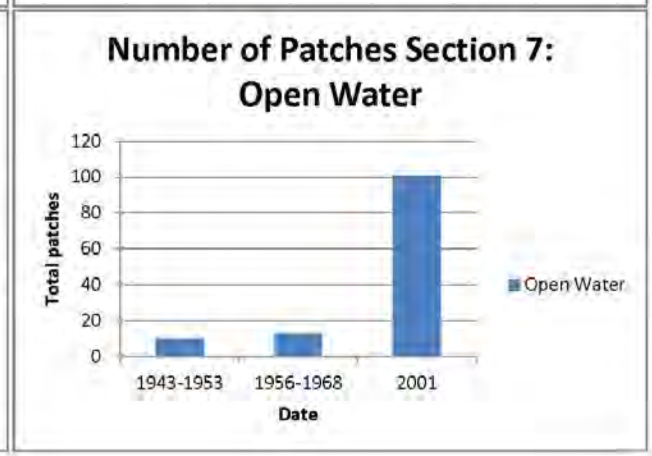

Number of Patches Section 7: Developed Open Space
Total patches
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Developed Open Space

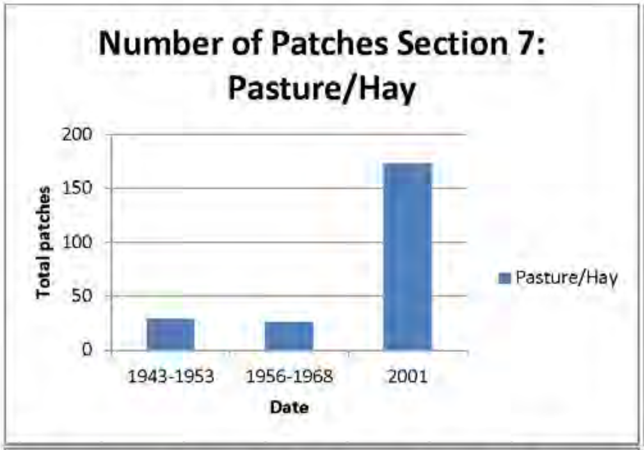

Number of Patches Section 7: Emergent Herbaceous Wetlands
Total patches
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

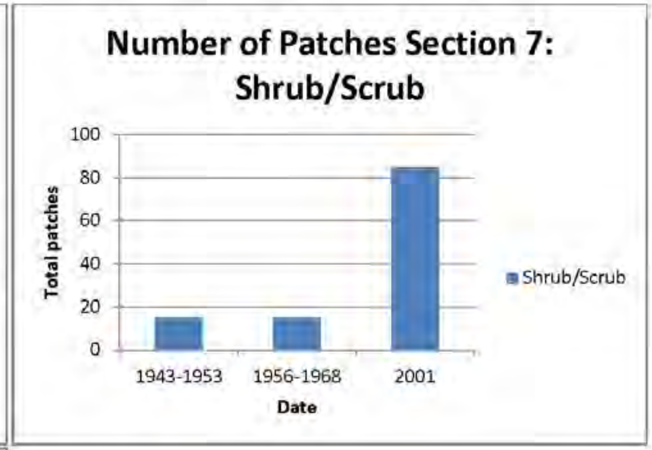

Number of Patches Section 7:
Evergreen Forest
Total patches
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

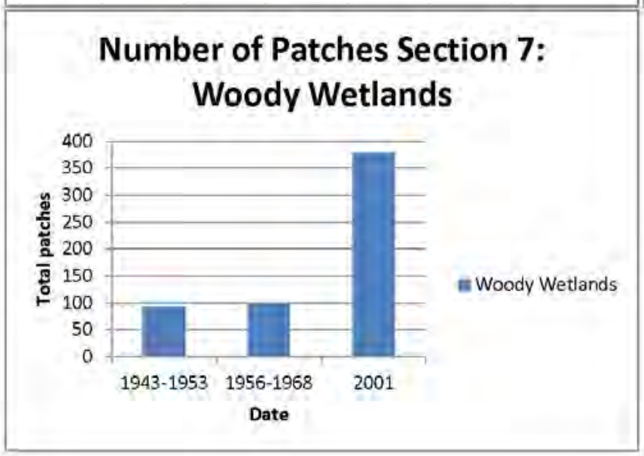

Number of Patches Section 7:
Grassland/Herbaceous
Total patches
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Grassland/Herbaceou
s

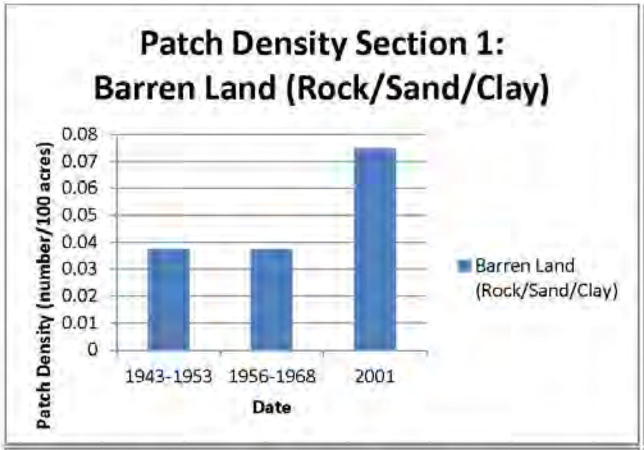

Number of Patches Section 7:
Mixed Forest
Total patches
140
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Mixed Forest

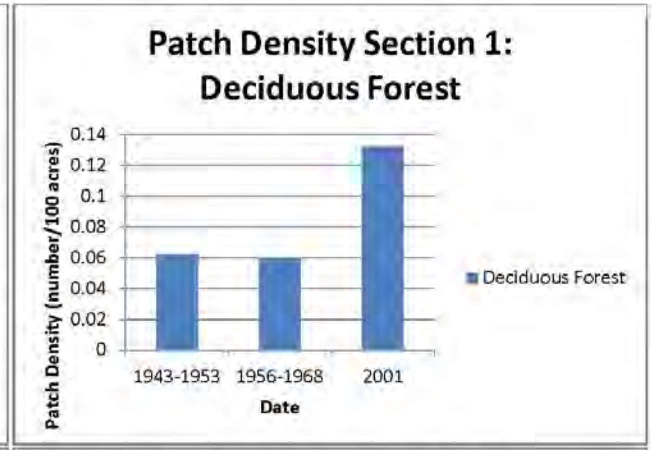

Number of Patches Section 7:
Open Water
Total patches
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Open Water

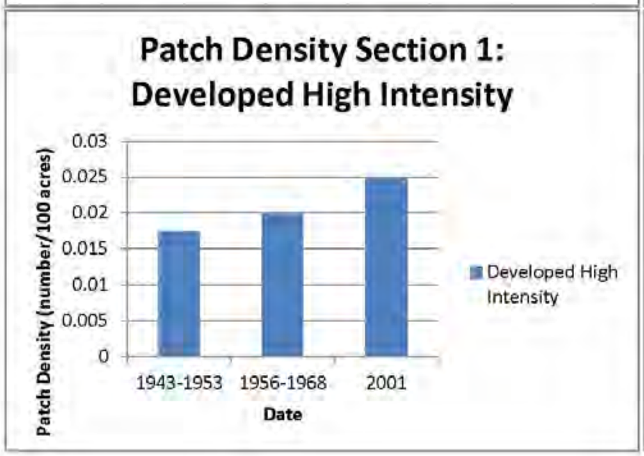

Number of Patches Section 7: Pasture/Hay
200
150
100
50
0
Total patches
1943-1953
1956-1968
2001
Date
Pasture/Hay

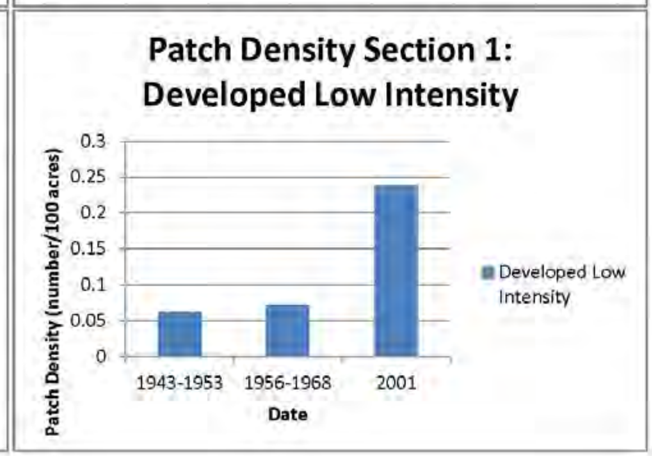

Number of Patches Section 7: Shrub/Scrub
100
80
60
40
20
0
Total patches
1943-1953
1956-1968
2001
Date
Shrub/Scrub

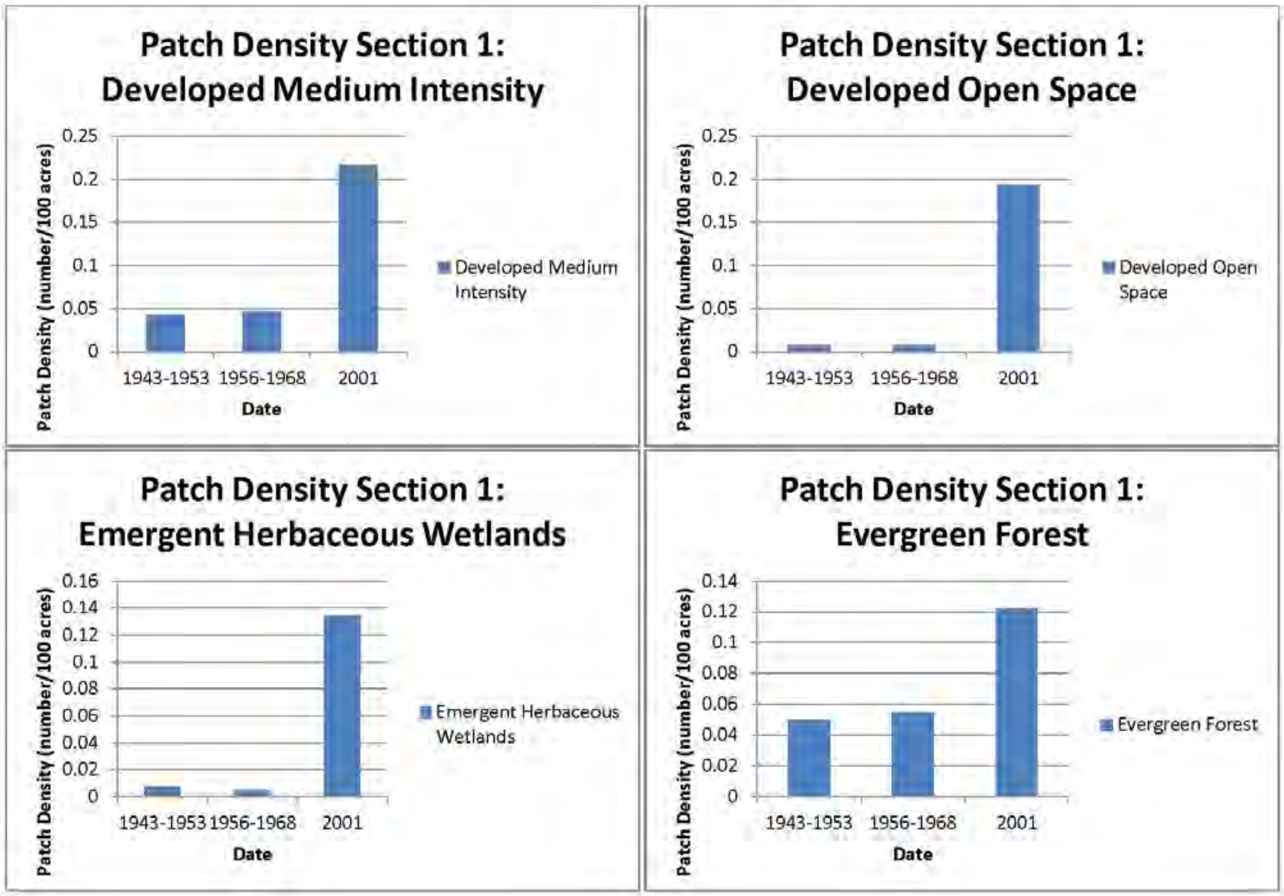

Number of Patches Section 7: Woody Wetlands
400
350
300
250
200
150
100
50
0
Total patches
1943-1953
1956-1968
2001
Date
Woody Wetlands

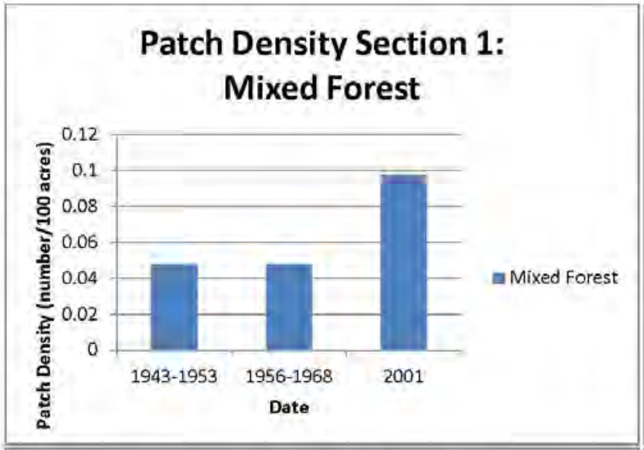

Patch Density Section 1:
Barren Land (Rock/Sand/Clay)
Patch Density (number/100 acres)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

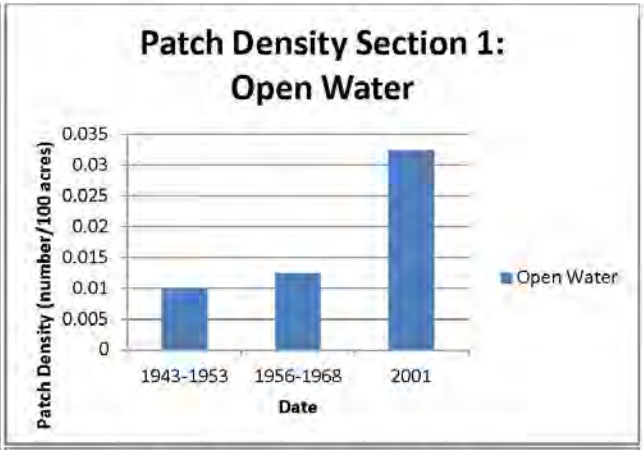

Patch Density Section 1:
Deciduous Forest
Patch Density (number/100 acres)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

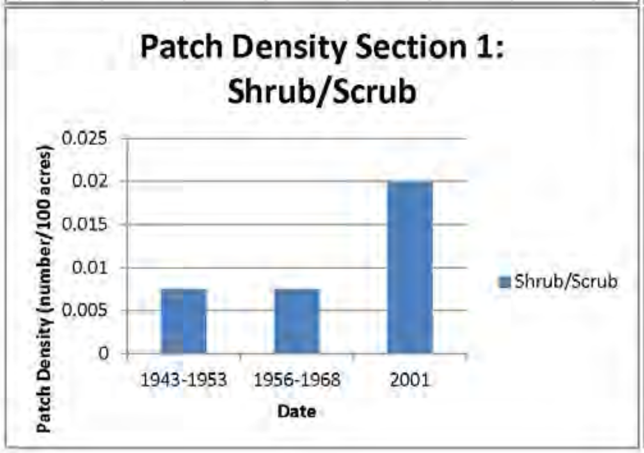

Patch Density Section 1:
Developed High Intensity
Patch Density (number/100 acres)
0.03
0.025
0.02
0.015
0.01
0.005
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

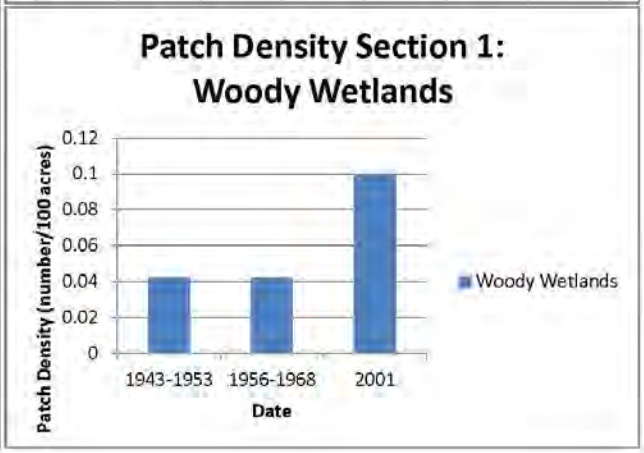

Patch Density Section 1:
Developed Low Intensity
Patch Density (number/100 acres)
0.3
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

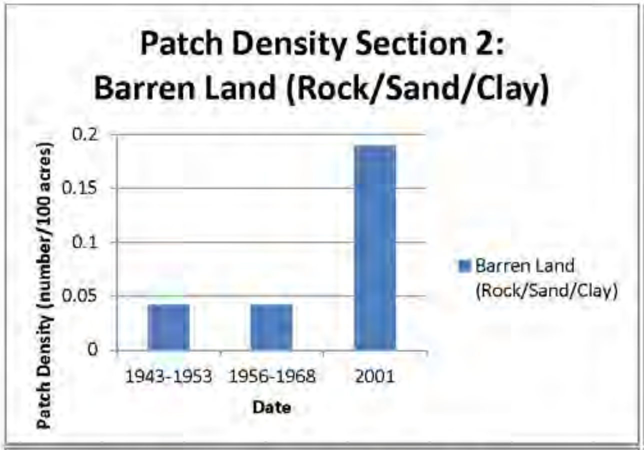

Patch Density Section 1: Developed Medium Intensity
Patch Density (number/100 acres)
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Patch Density Section 1: Developed Open Space
Patch Density (number/100 acres)
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Patch Density Section 1: Emergent Herbaceous Wetlands
Patch Density (number/100 acres)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Patch Density Section 1: Evergreen Forest
Patch Density (number/100 acres)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

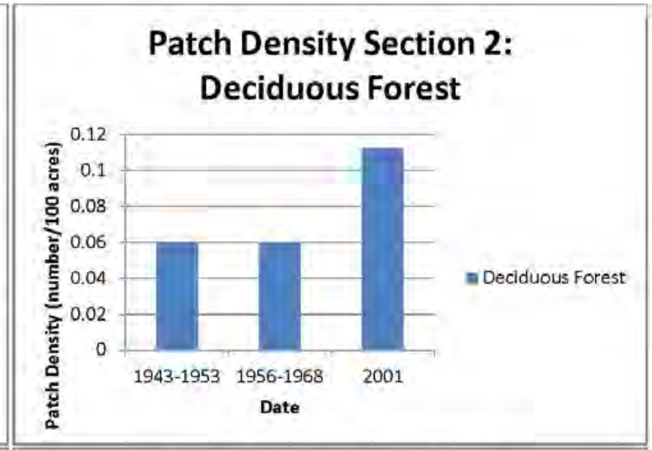

Patch Density Section 1:
Mixed Forest
Patch Density (number/100 acres)
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Mixed Forest

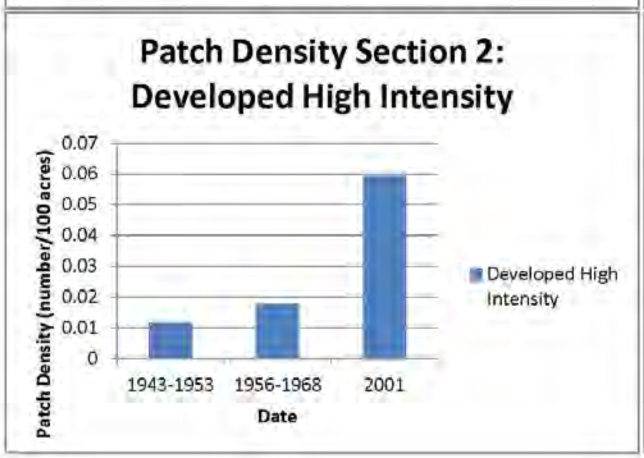

Patch Density Section 1:
Open Water
Patch Density (number/100 acres)
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1943-1953
1956-1968
2001
Date
Open Water

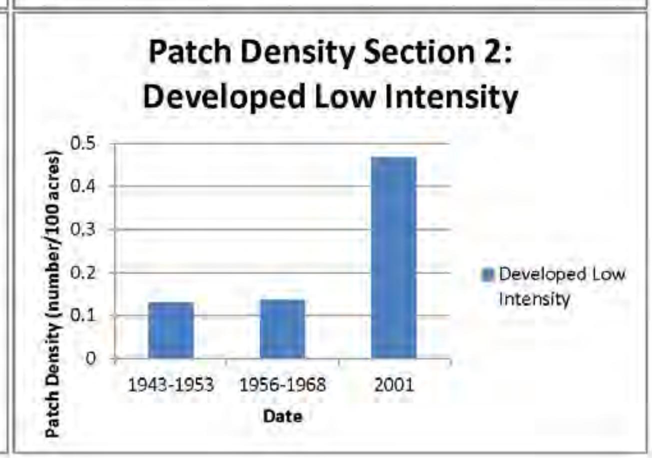

Patch Density Section 1:
Shrub/Scrub
Patch Density (number/100 acres)
0.025
0.02
0.015
0.01
0.005
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

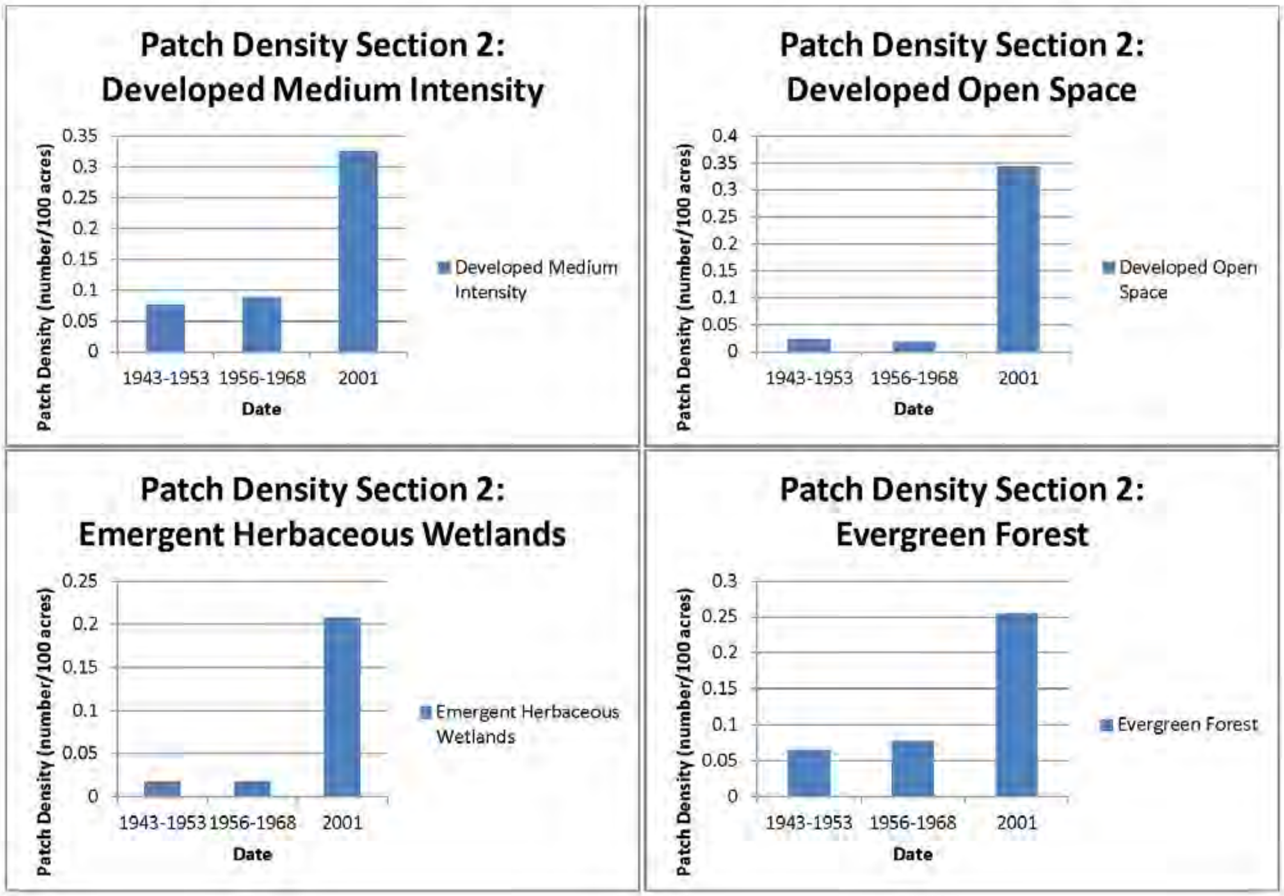

Patch Density Section 1:
Woody Wetlands
Patch Density (number/100 acres)
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

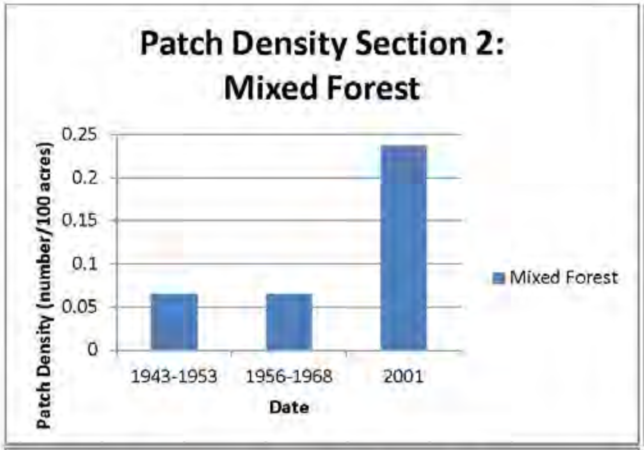

Patch Density Section 2:
Barren Land (Rock/Sand/Clay)
Patch Density (number/100 acres)
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

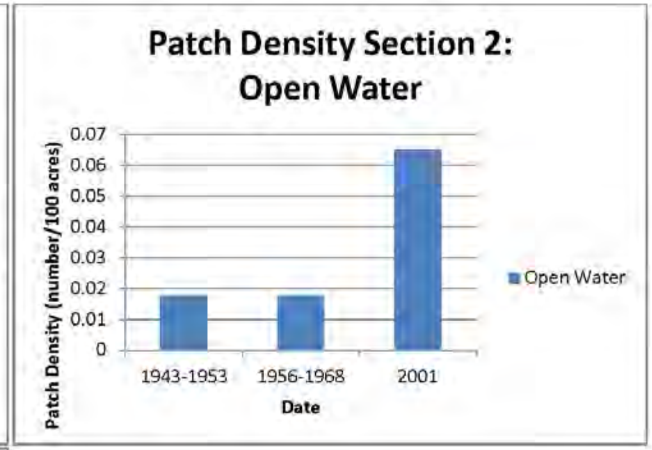

Patch Density Section 2:
Deciduous Forest
Patch Density (number/100 acres)
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

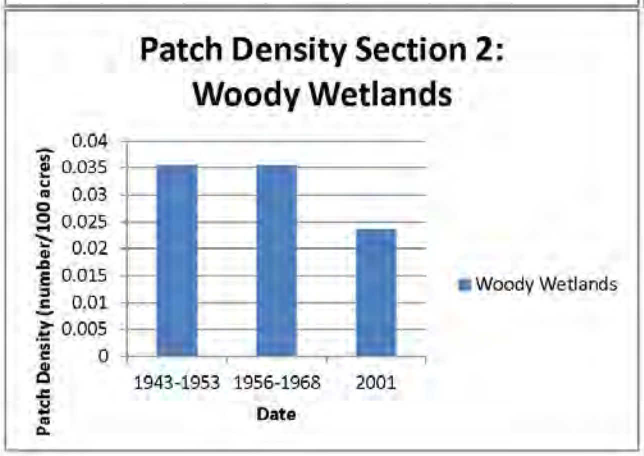

Patch Density Section 2:
Developed High Intensity
Patch Density (number/100 acres)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

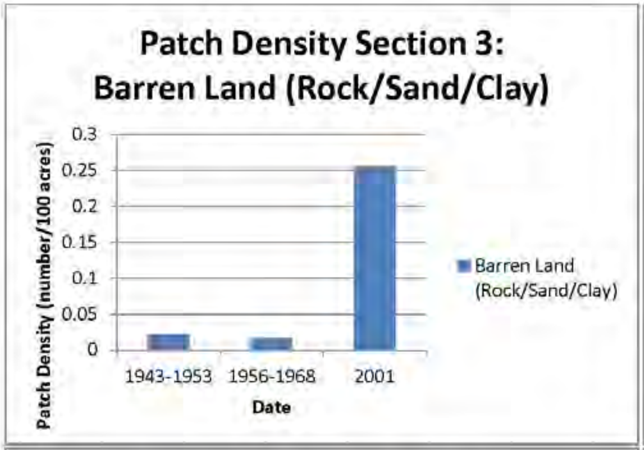

Patch Density Section 2:
Developed Low Intensity
Patch Density (number/100 acres)
0.5
0.4
0.3
0.2
0.1
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

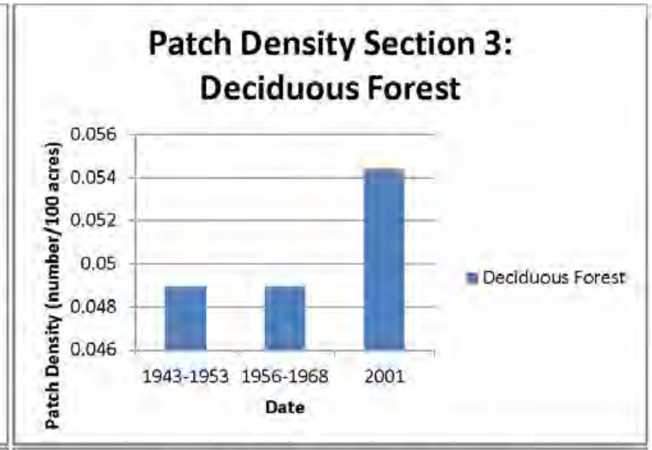

Patch Density Section 2: Developed Medium Intensity
Patch Density (number/100 acres)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Patch Density Section 2: Developed Open Space
Patch Density (number/100 acres)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Patch Density Section 2: Emergent Herbaceous Wetlands
Patch Density (number/100 acres)
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Patch Density Section 2: Evergreen Forest
Patch Density (number/100 acres)
0.3
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

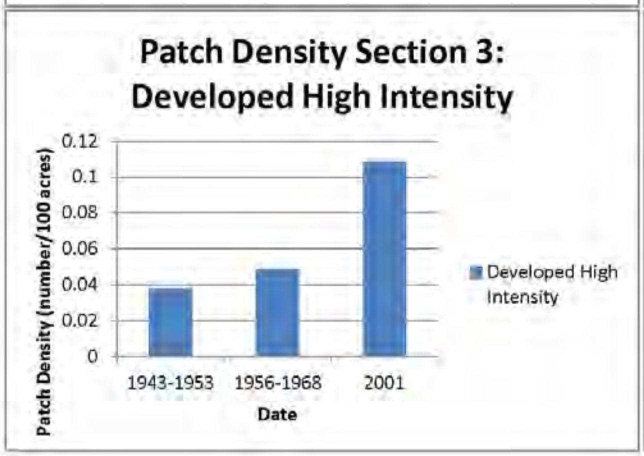

Patch Density Section 2: Mixed Forest
Patch Density (number/100 acres)
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Mixed Forest

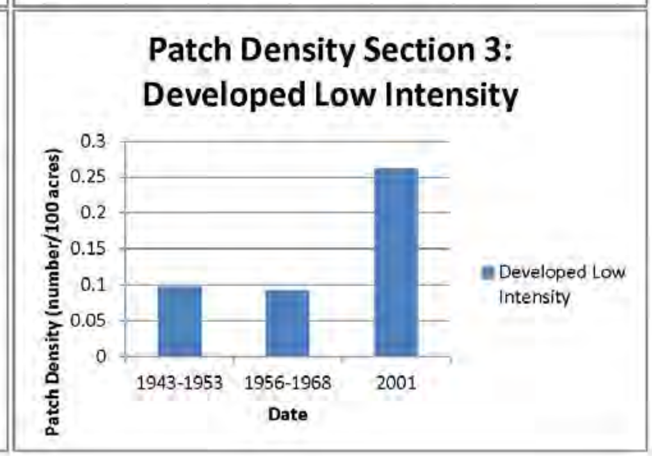

Patch Density Section 2: Open Water
Patch Density (number/100 acres)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1943-1953
1956-1968
2001
Date
Open Water

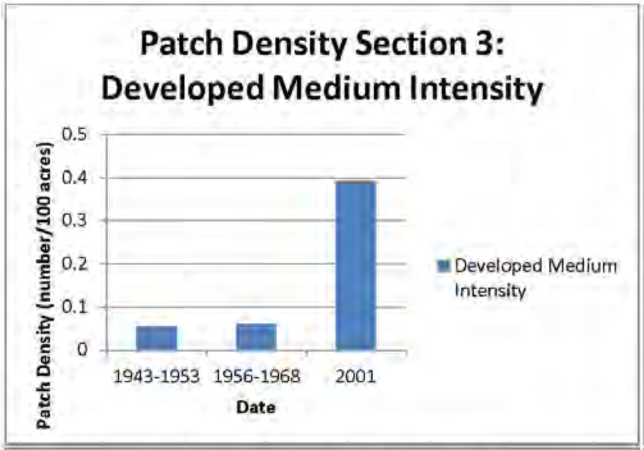

Patch Density Section 2: Woody Wetlands
Patch Density (number/100 acres)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

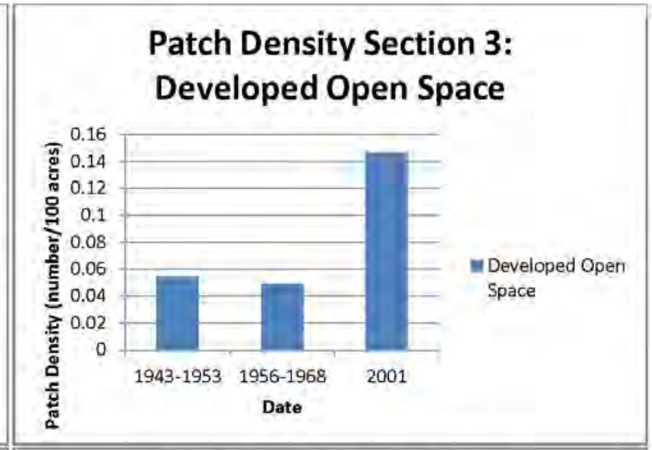

Patch Density Section 3:
Barren Land (Rock/Sand/Clay)
Patch Density (number/100 acres)
0.3
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

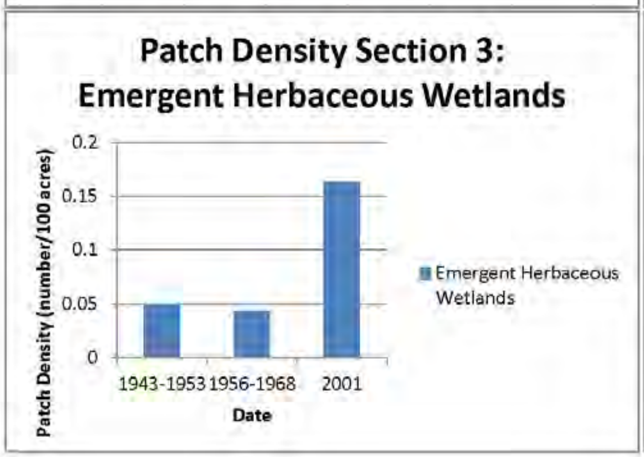

Patch Density Section 3:
Deciduous Forest
Patch Density (number/100 acres)
0.056
0.054
0.052
0.05
0.048
0.046
1943-1953
1956-1968
2001
Date
Deciduous Forest

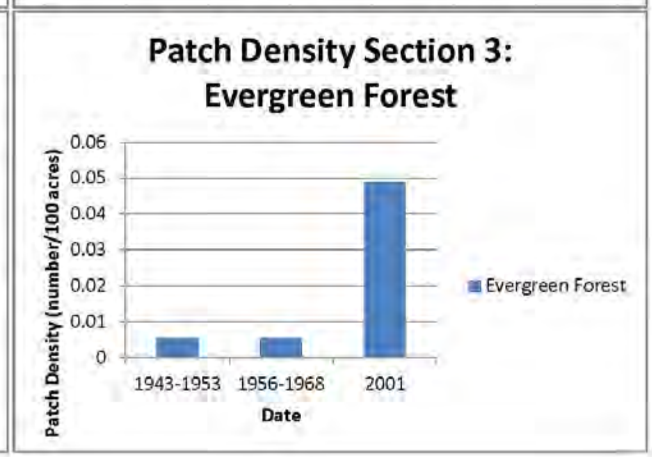

Patch Density Section 3:
Developed High Intensity
Patch Density (number/100 acres)
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

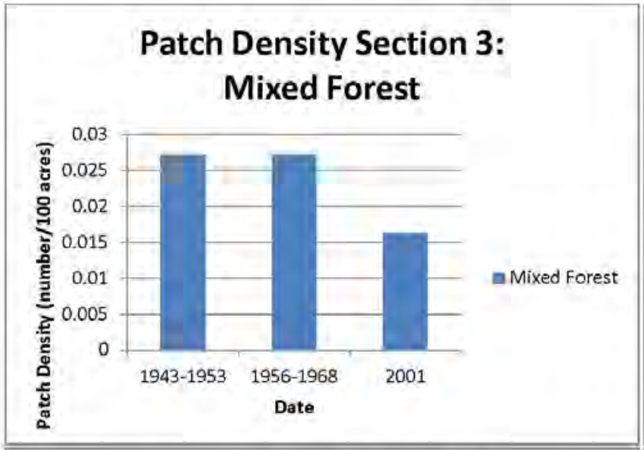

Patch Density Section 3:
Developed Low Intensity
Patch Density (number/100 acres)
0.3
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

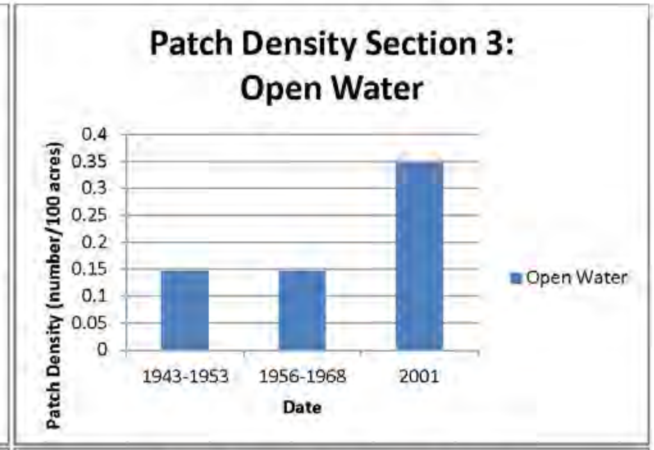

Patch Density Section 3:
Developed Medium Intensity
Patch Density (number/100 acres)
0.5
0.4
0.3
0.2
0.1
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

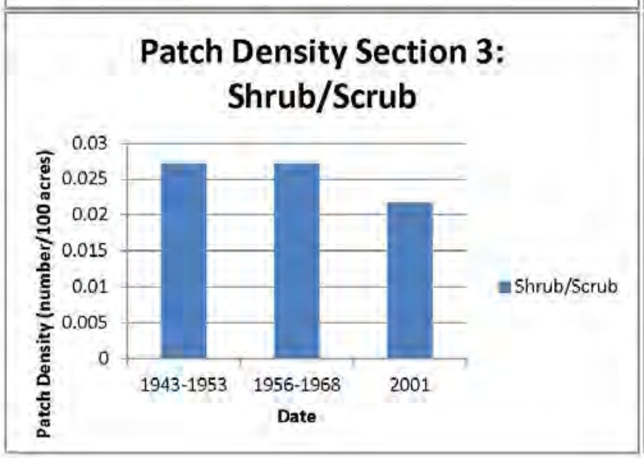

Patch Density Section 3:
Developed Open Space
Patch Density (number/100 acres)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Developed Open Space

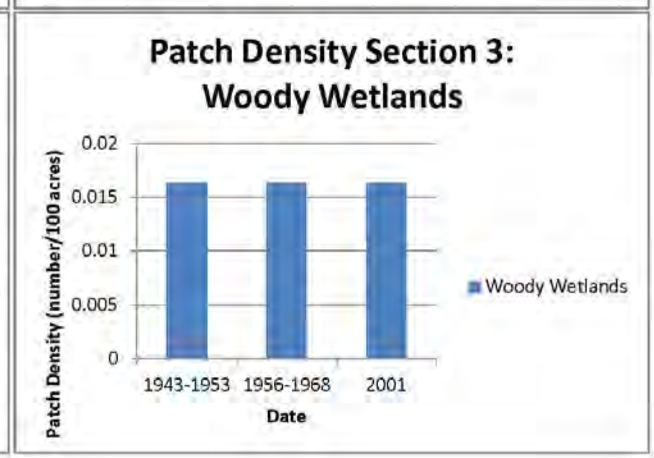

Patch Density Section 3:
Emergent Herbaceous Wetlands
Patch Density (number/100 acres)
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

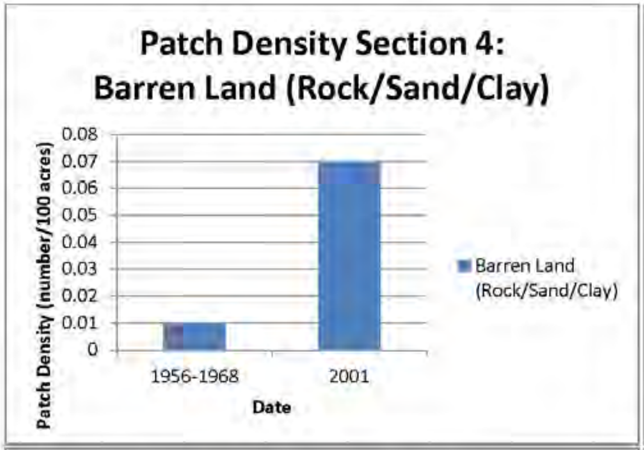

Patch Density Section 3:
Evergreen Forest
Patch Density (number/100 acres)
0.06
0.05
0.04
0.03
0.02
0.01
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

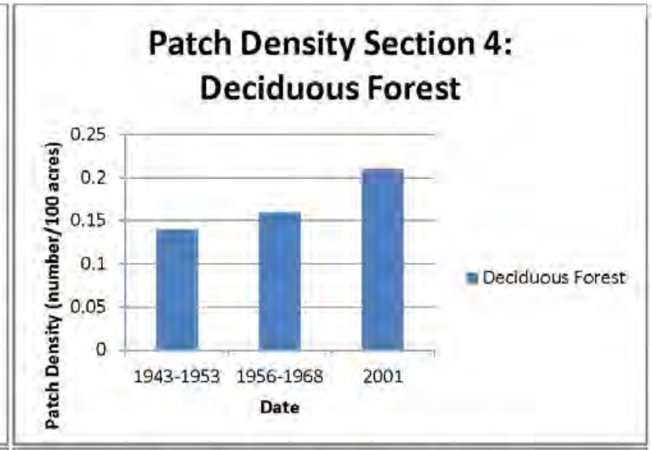

Patch Density Section 3:
Mixed Forest
Patch Density (number/100 acres)
0.03
0.025
0.02
0.015
0.01
0.005
0
1943-1953
1956-1968
2001
Date
Mixed Forest

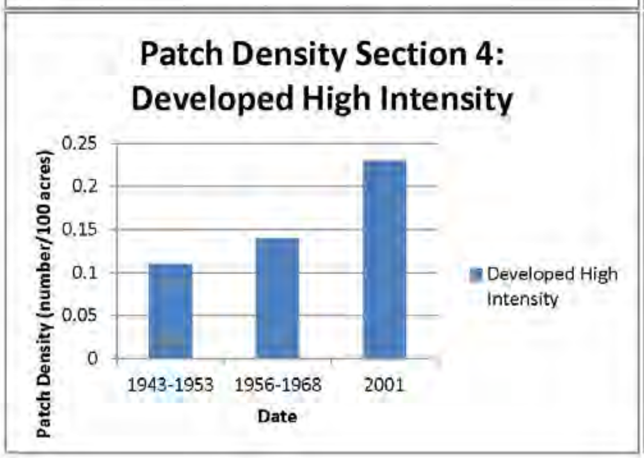

Patch Density Section 3:
Open Water
Patch Density (number/100 acres)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Open Water

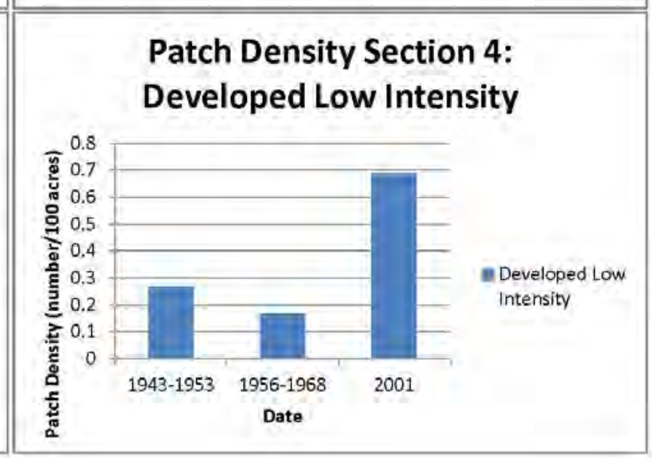

Patch Density Section 3:
Shrub/Scrub
Patch Density (number/100 acres)
0.03
0.025
0.02
0.015
0.01
0.005
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

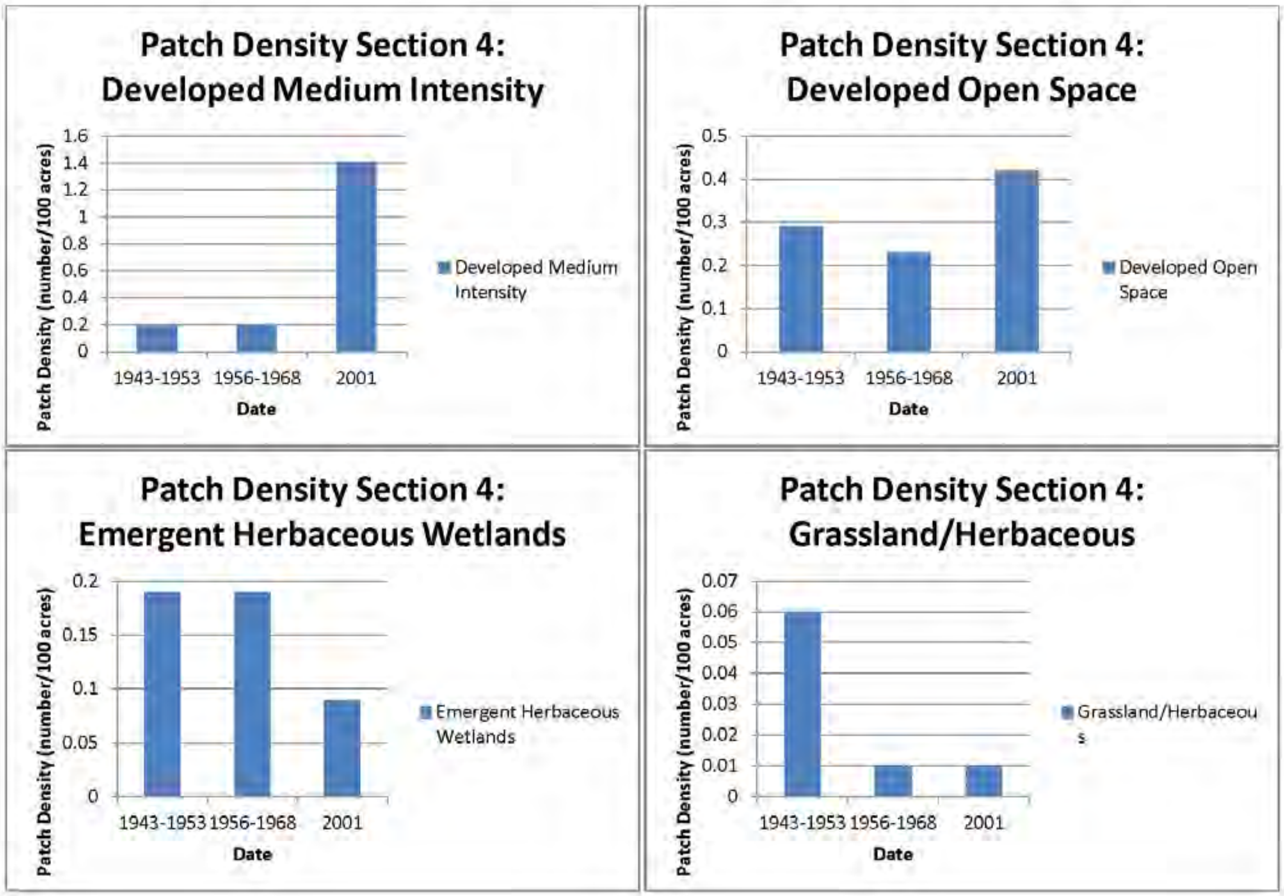

Patch Density Section 3:
Woody Wetlands
Patch Density (number/100 acres)
0.02
0.015
0.01
0.005
0
1943-1953
1956-1968
2001
Date
Woody Wetlands


Patch Density Section 4:
Barren Land (Rock/Sand/Clay)
Patch Density (number/100 acres)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

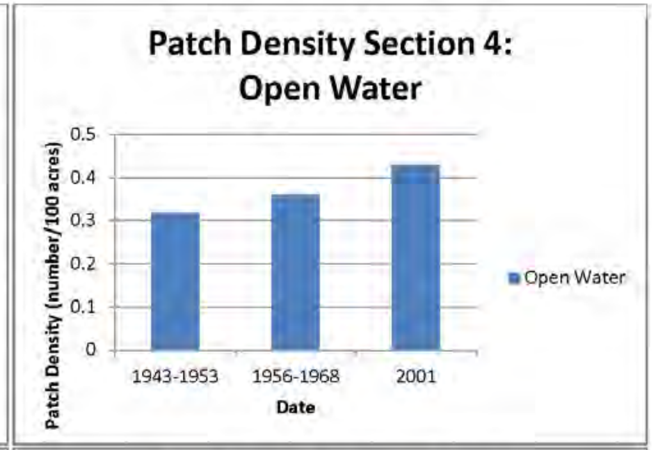

Patch Density Section 4:
Deciduous Forest
Patch Density (number/100 acres)
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

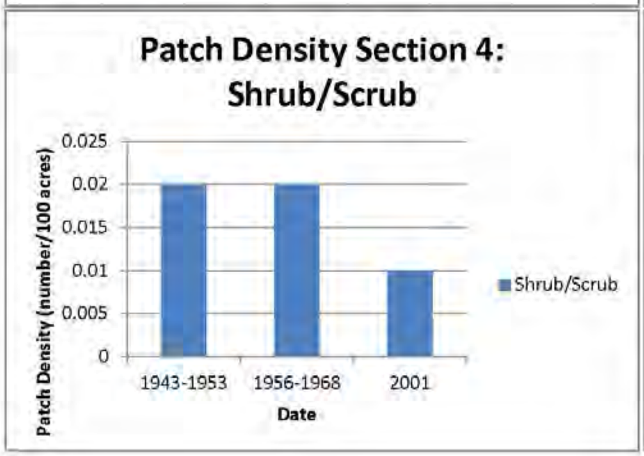

Patch Density Section 4:
Developed High Intensity
Patch Density (number/100 acres)
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

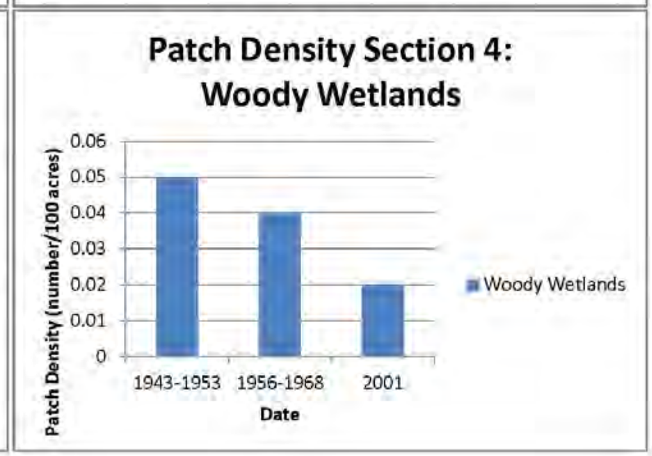

Patch Density Section 4:
Developed Low Intensity
Patch Density (number/100 acres)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

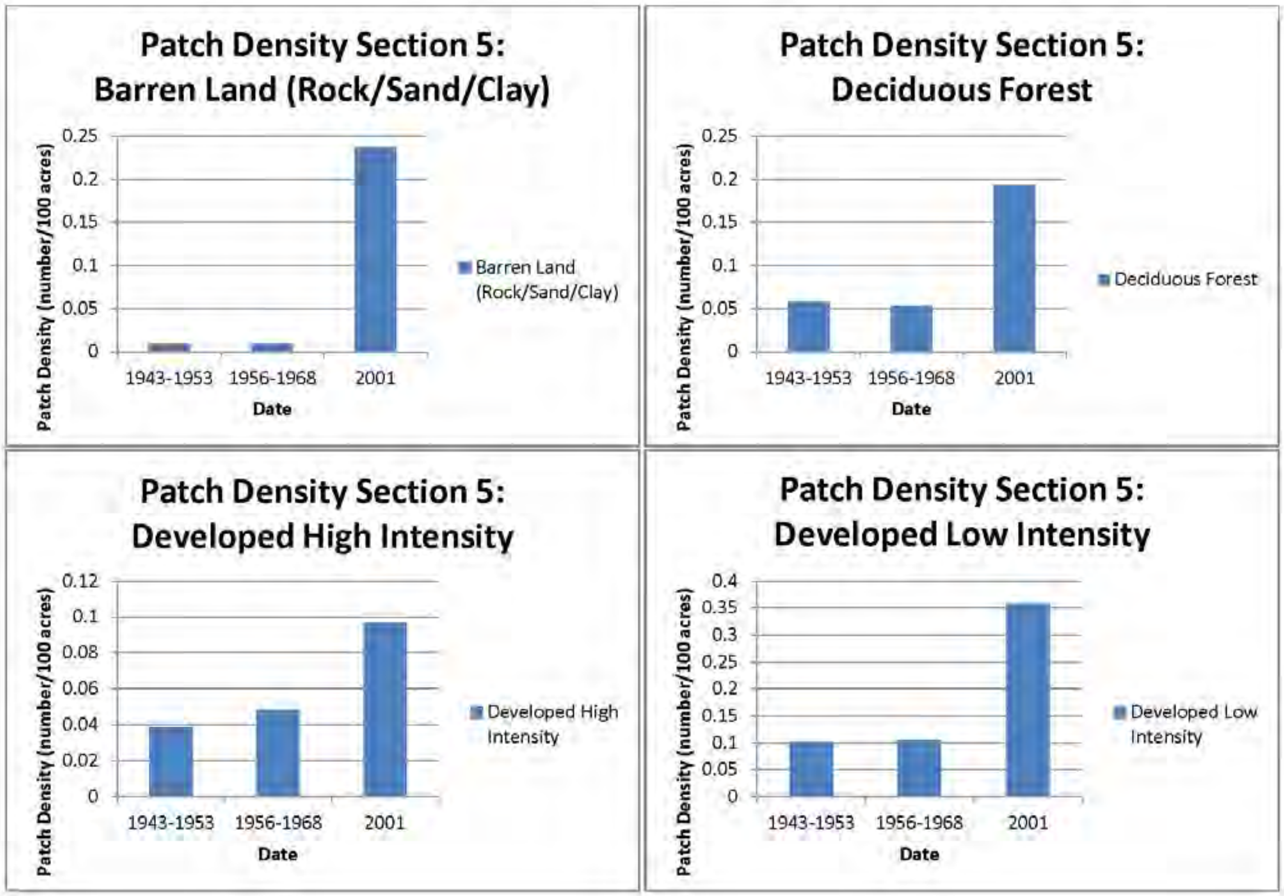

Patch Density Section 4: Developed Medium Intensity
Patch Density (number/100 acres)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Patch Density Section 4: Developed Open Space
Patch Density (number/100 acres)
0.5
0.4
0.3
0.2
0.1
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Patch Density Section 4: Emergent Herbaceous Wetlands
Patch Density (number/100 acres)
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Patch Density Section 4: Grassland/Herbaceous
Patch Density (number/100 acres)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1943-1953
1956-1968
2001
Date
Grassland/Herbaceou s

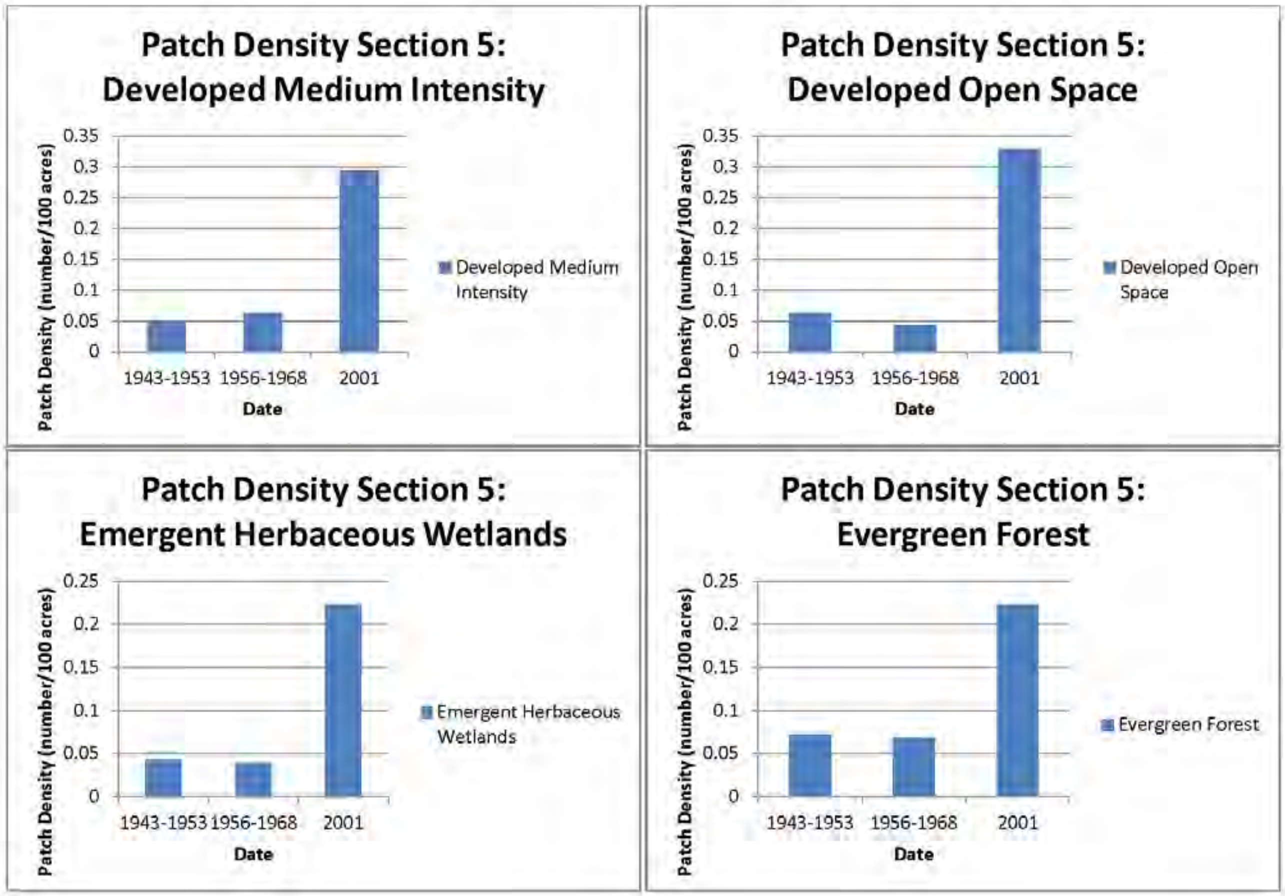

Patch Density Section 4:
Mixed Forest
Patch Density (number/100 acres)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Mixed Forest

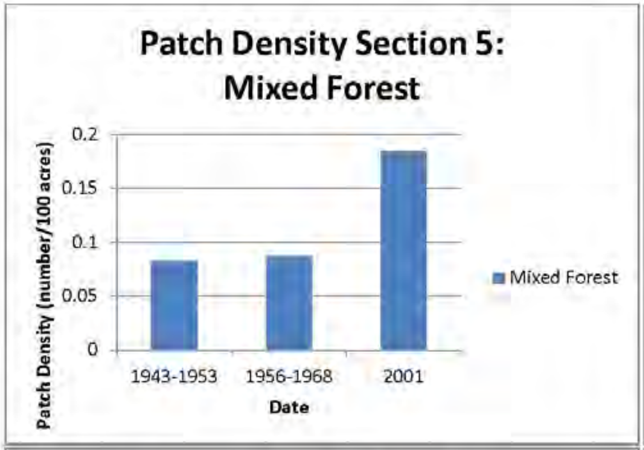

Patch Density Section 4:
Open Water
Patch Density (number/100 acres)
0.5
0.4
0.3
0.2
0.1
0
1943-1953
1956-1968
2001
Date
Open Water

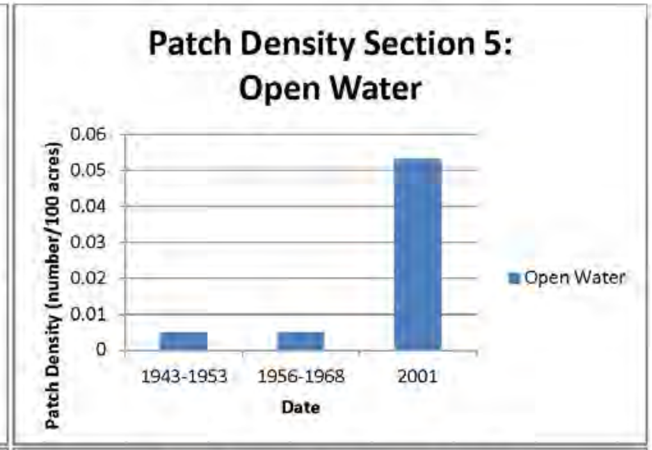

Patch Density Section 4:
Shrub/Scrub
Patch Density (number/100 acres)
0.025
0.02
0.015
0.01
0.005
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

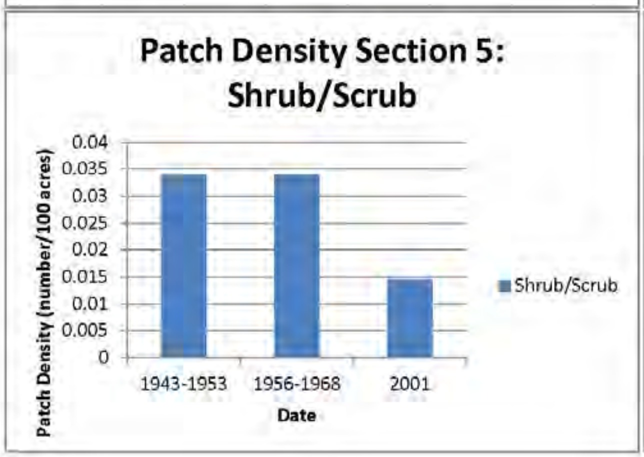

Patch Density Section 4:
Woody Wetlands
Patch Density (number/100 acres)
0.06
0.05
0.04
0.03
0.02
0.01
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

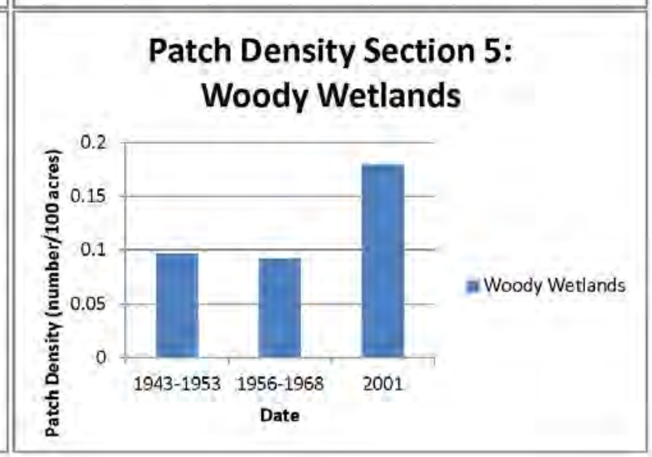

Patch Density Section 5: Barren Land (Rock/Sand/Clay)
Patch Density (number/100 acres)
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)
Patch Density Section 5: Deciduous Forest
Patch Density (number/100 acres)
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Deciduous Forest
Patch Density Section 5: Developed High Intensity
Patch Density (number/100 acres)
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Developed High Intensity
Patch Density Section 5: Developed Low Intensity
Patch Density (number/100 acres)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

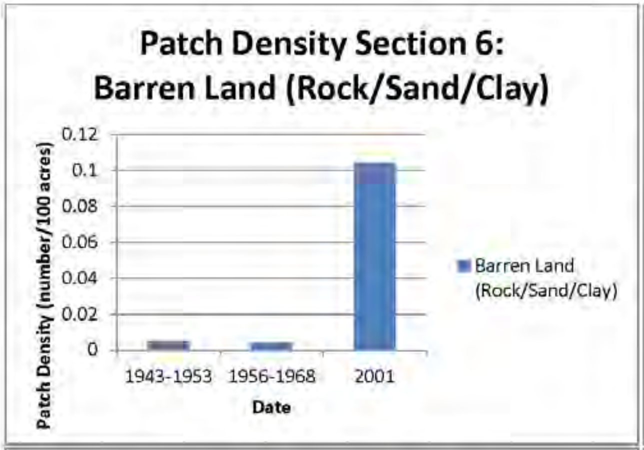

Patch Density Section 5: Developed Medium Intensity
Patch Density (number/100 acres)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Patch Density Section 5: Developed Open Space
Patch Density (number/100 acres)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Patch Density Section 5: Emergent Herbaceous Wetlands
Patch Density (number/100 acres)
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Patch Density Section 5: Evergreen Forest
Patch Density (number/100 acres)
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

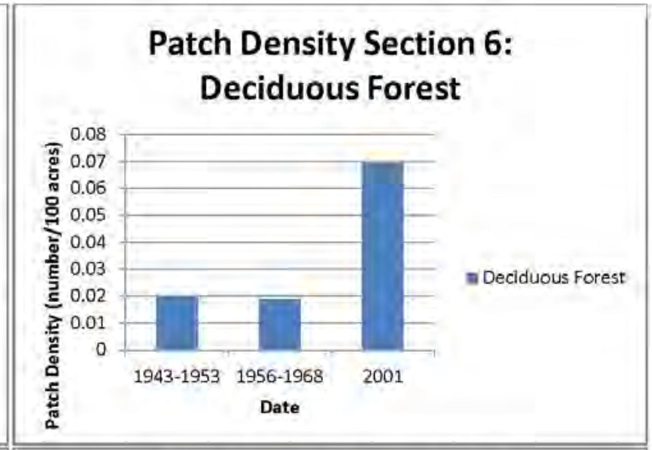

Patch Density Section 5:
Mixed Forest
Patch Density (number/100 acres)
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Mixed Forest

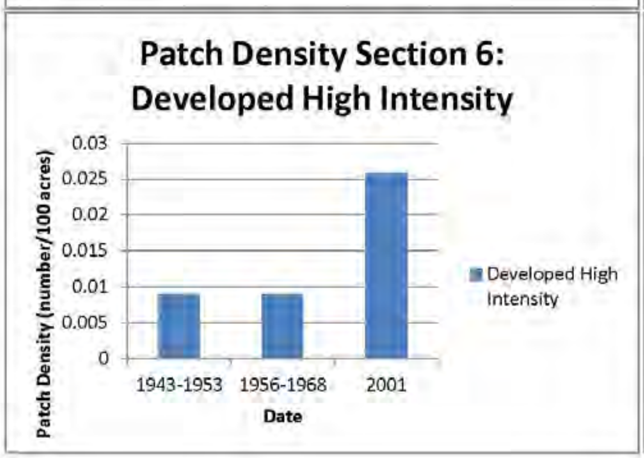

Patch Density Section 5:
Open Water
Patch Density (number/100 acres)
0.06
0.05
0.04
0.03
0.02
0.01
0
1943-1953
1956-1968
2001
Date
Open Water

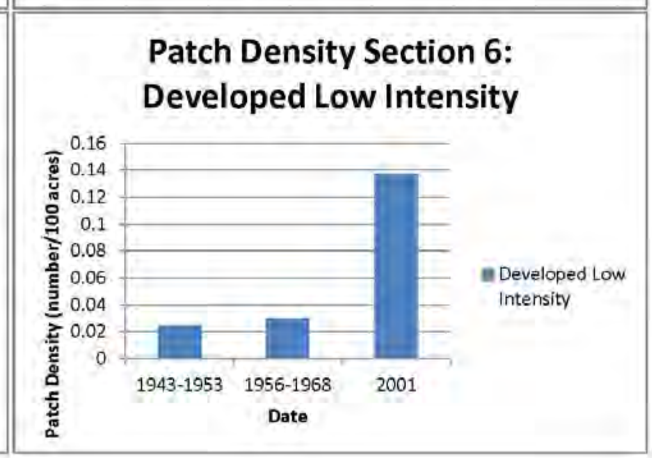

Patch Density Section 5:
Shrub/Scrub
Patch Density (number/100 acres)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

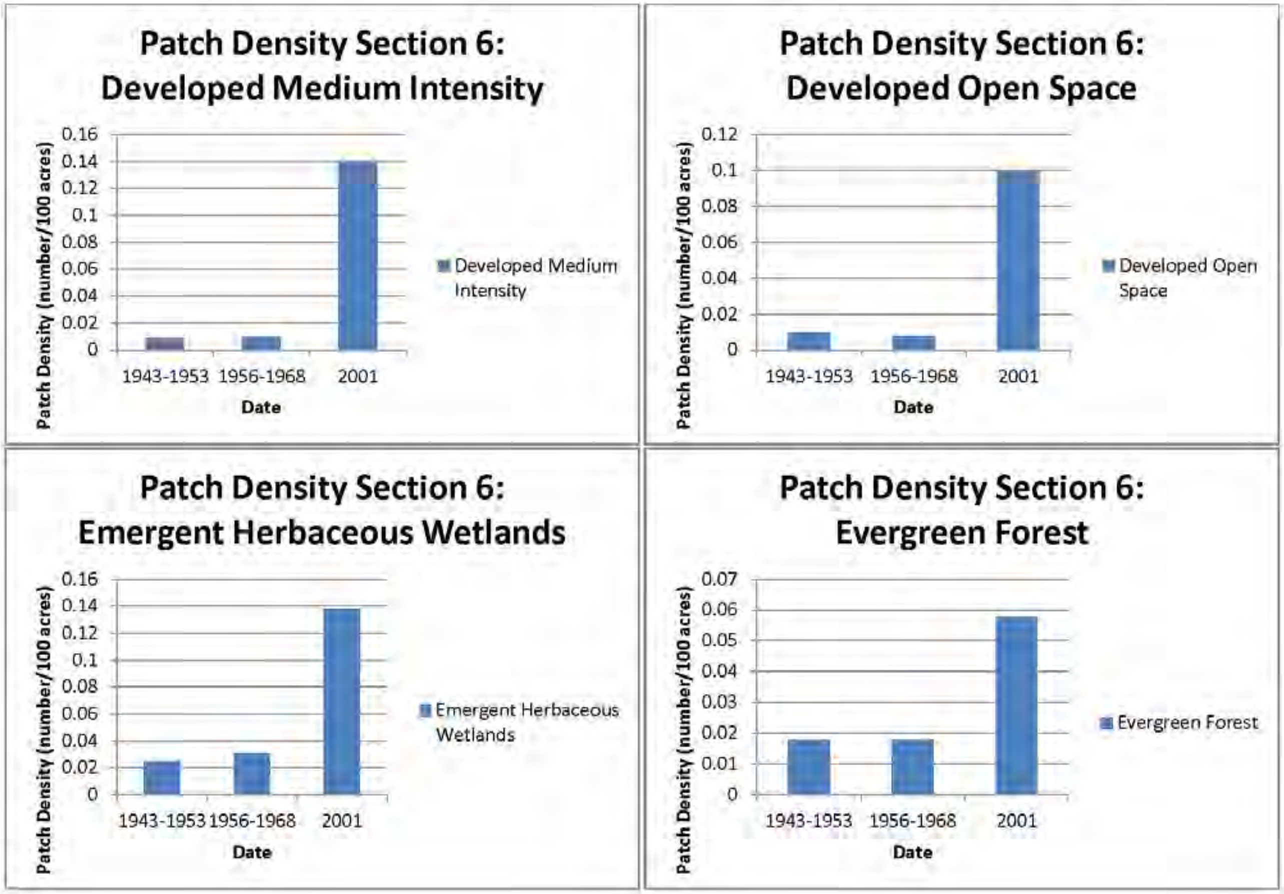

Patch Density Section 5:
Woody Wetlands
Patch Density (number/100 acres)
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Woody Wetlands


Patch Density Section 6:
Barren Land (Rock/Sand/Clay)
Patch Density (number/100 acres)
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

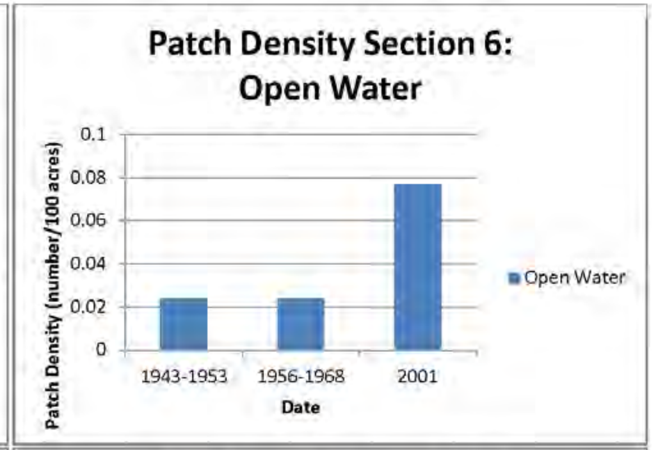

Patch Density Section 6:
Deciduous Forest
Patch Density (number/100 acres)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

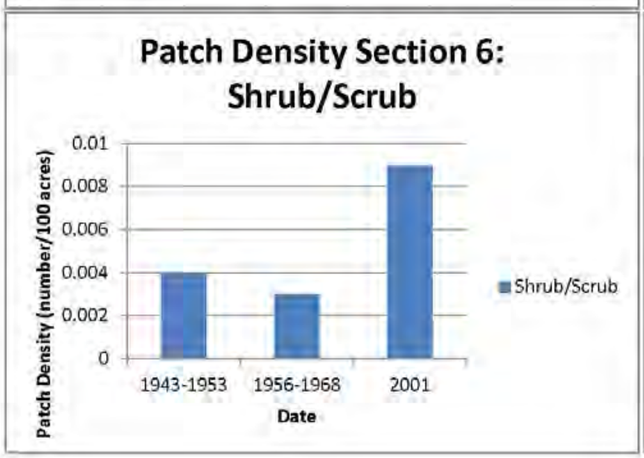

Patch Density Section 6:
Developed High Intensity
Patch Density (number/100 acres)
0.03
0.025
0.02
0.015
0.01
0.005
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

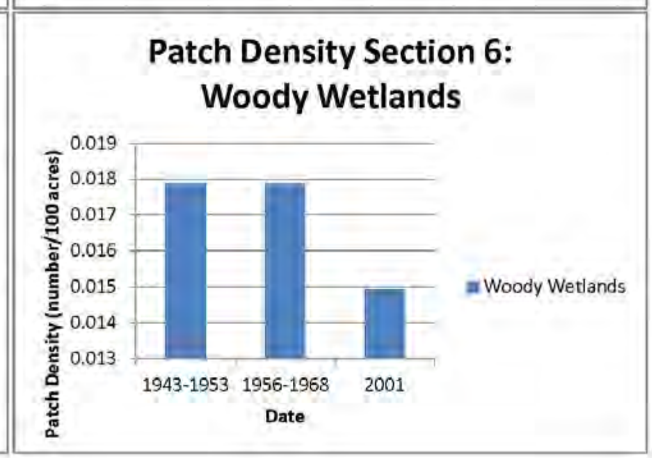

Patch Density Section 6:
Developed Low Intensity
Patch Density (number/100 acres)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

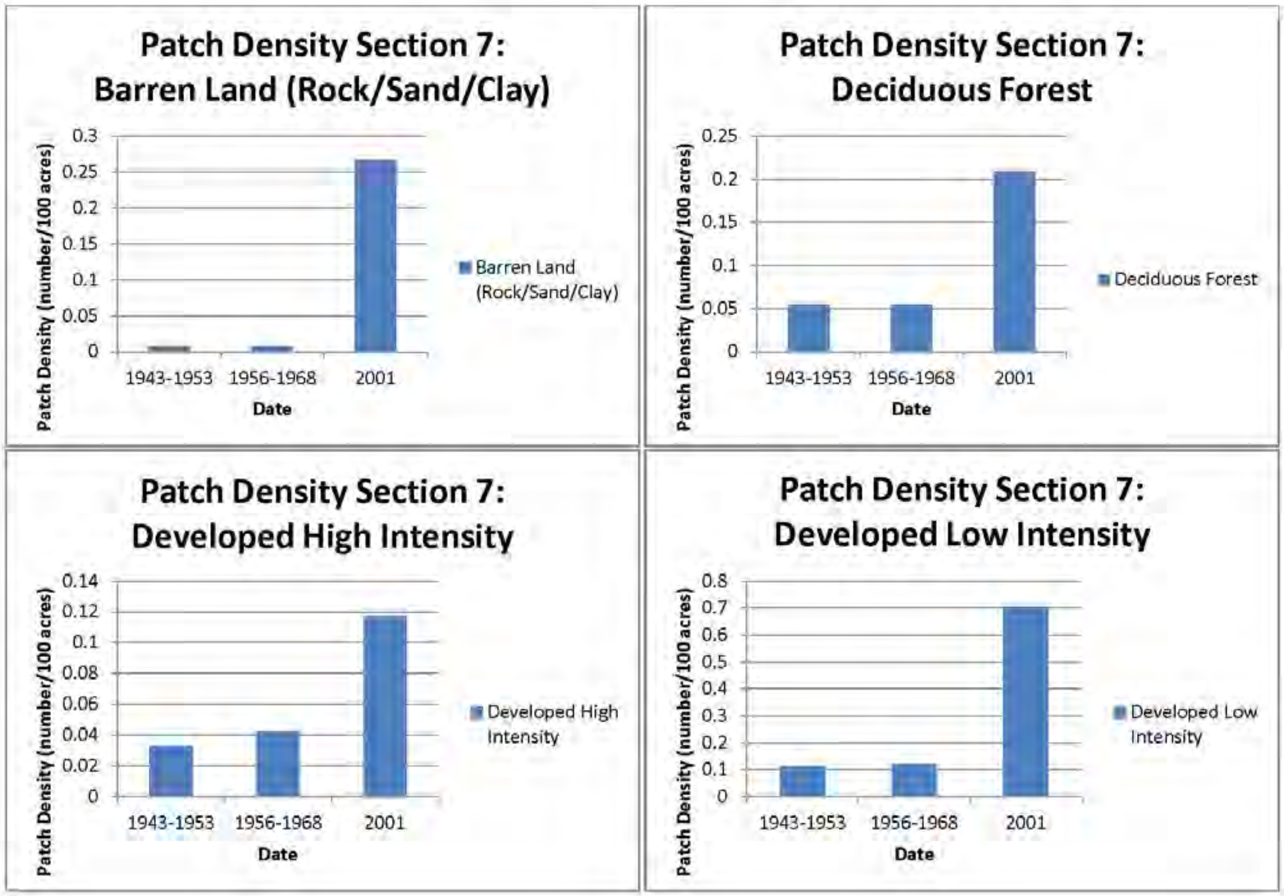

Patch Density Section 6: Developed Medium Intensity
Patch Density (number/100 acres)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Patch Density Section 6: Developed Open Space
Patch Density (number/100 acres)
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Patch Density Section 6: Emergent Herbaceous Wetlands
Patch Density (number/100 acres)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Patch Density Section 6: Evergreen Forest
Patch Density (number/100 acres)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

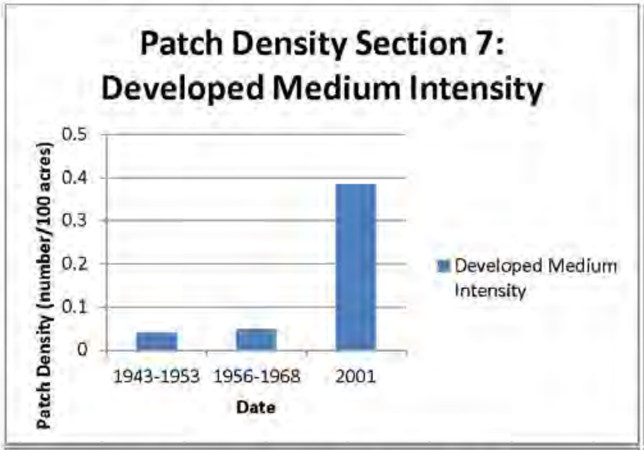

Patch Density Section 6: Mixed Forest
Patch Density (number/100 acres)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1943-1953
1956-1968
2001
Date
Mixed Forest

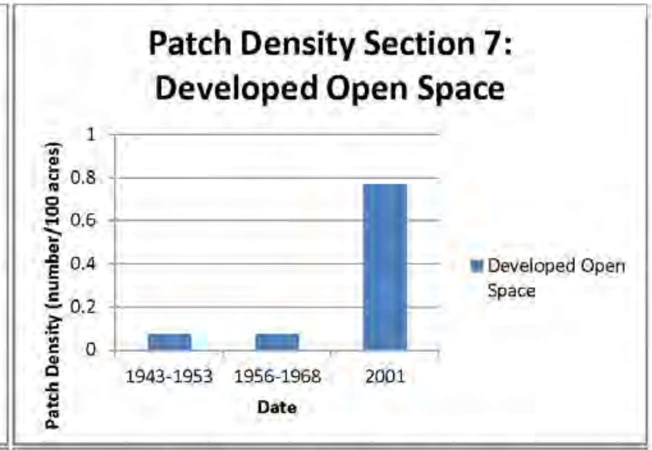

Patch Density Section 6: Open Water
Patch Density (number/100 acres)
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Open Water

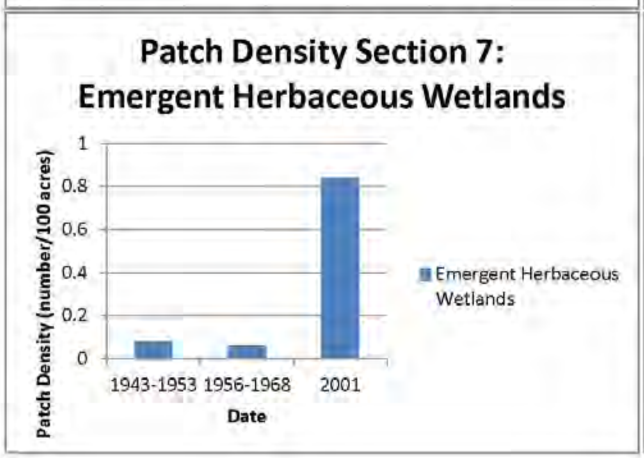

Patch Density Section 6: Shrub/Scrub
Patch Density (number/100 acres)
0.01
0.008
0.006
0.004
0.002
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

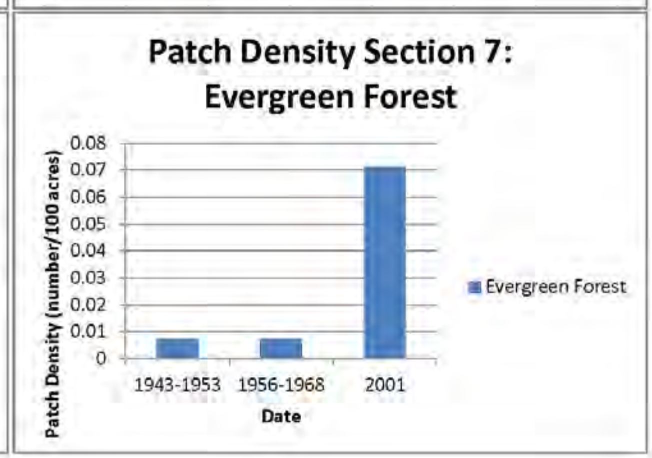

Patch Density Section 6: Woody Wetlands
Patch Density (number/100 acres)
0.019
0.018
0.017
0.016
0.015
0.014
0.013
1943-1953
1956-1968
2001
Date
Woody Wetlands

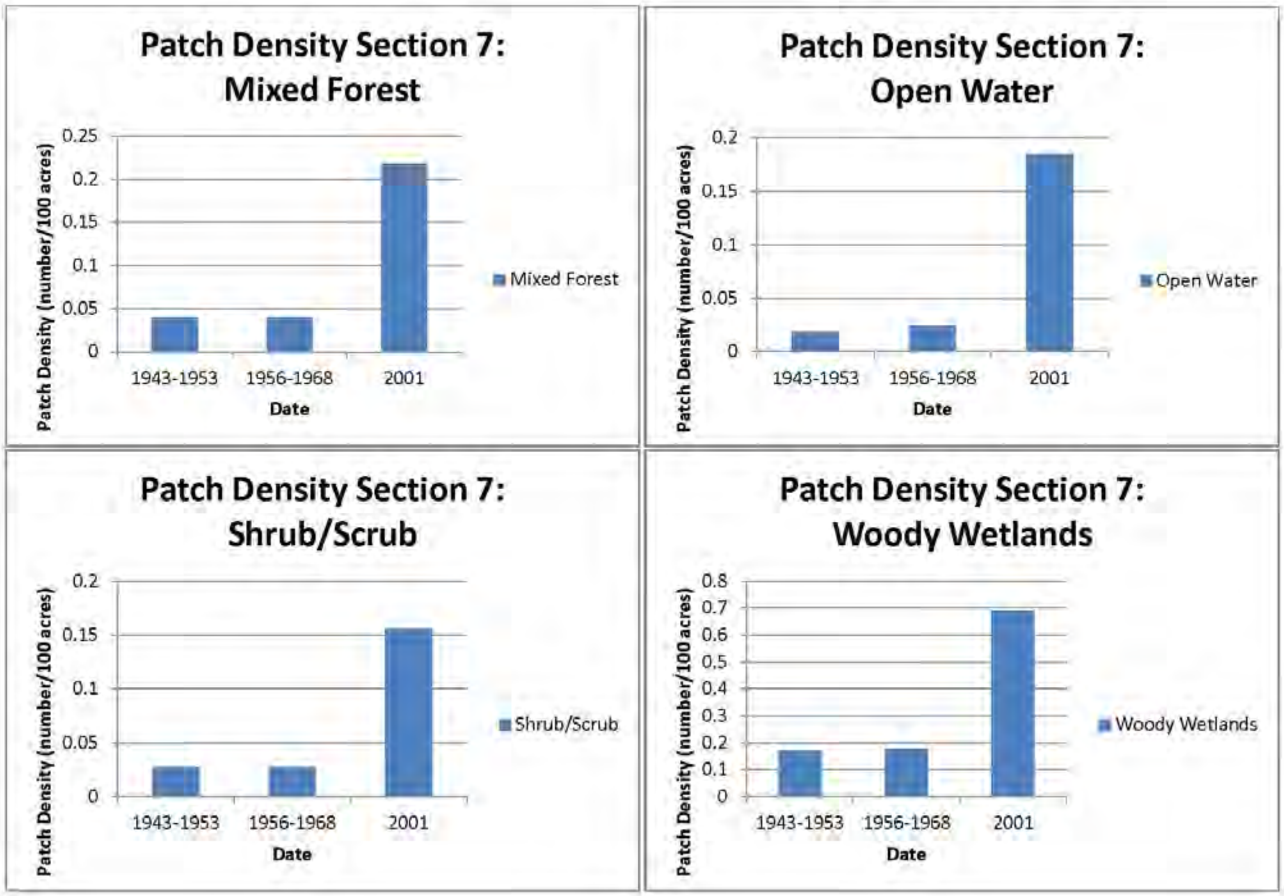

Patch Density Section 7:
Barren Land (Rock/Sand/Clay)
Patch Density (number/100 acres)
0.3
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)
Patch Density Section 7:
Deciduous Forest
Patch Density (number/100 acres)
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Deciduous Forest
Patch Density Section 7:
Developed High Intensity
Patch Density (number/100 acres)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Developed High Intensity
Patch Density Section 7:
Developed Low Intensity
Patch Density (number/100 acres)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

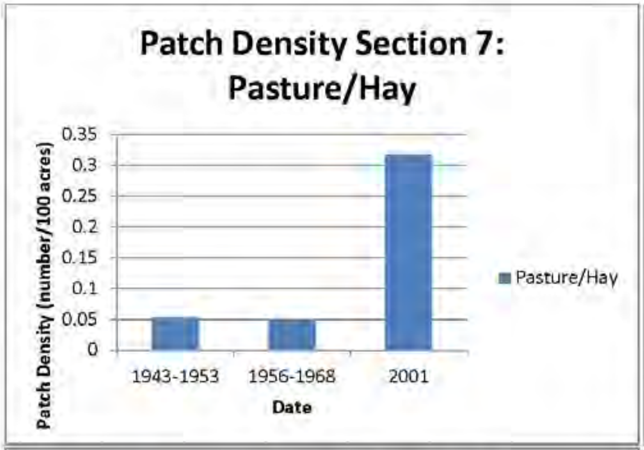

Patch Density Section 7:
Developed Medium Intensity
Patch Density (number/100 acres)
0.5
0.4
0.3
0.2
0.1
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

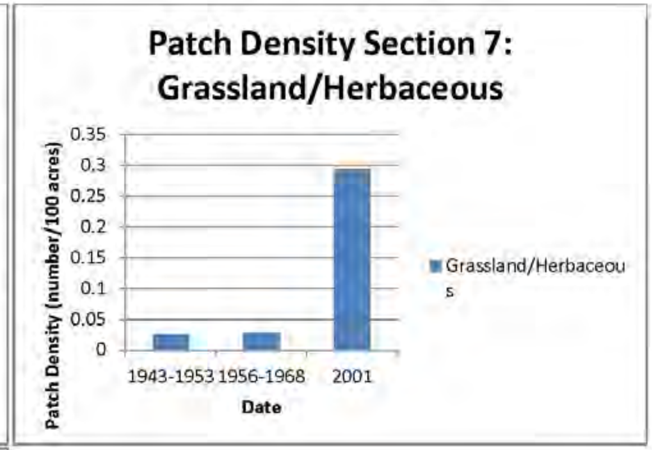

Patch Density Section 7:
Developed Open Space
Patch Density (number/100 acres)
1
0.8
0.6
0.4
0.2
0
1943-1953
1956-1968
2001
Date
Developed Open Space

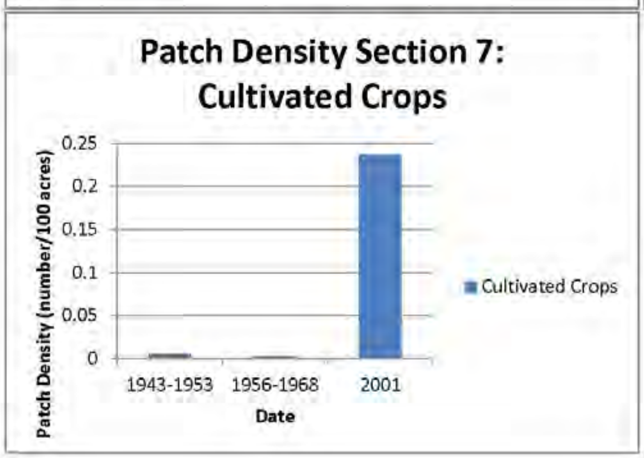

Patch Density Section 7:
Emergent Herbaceous Wetlands
Patch Density (number/100 acres)
1
0.8
0.6
0.4
0.2
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

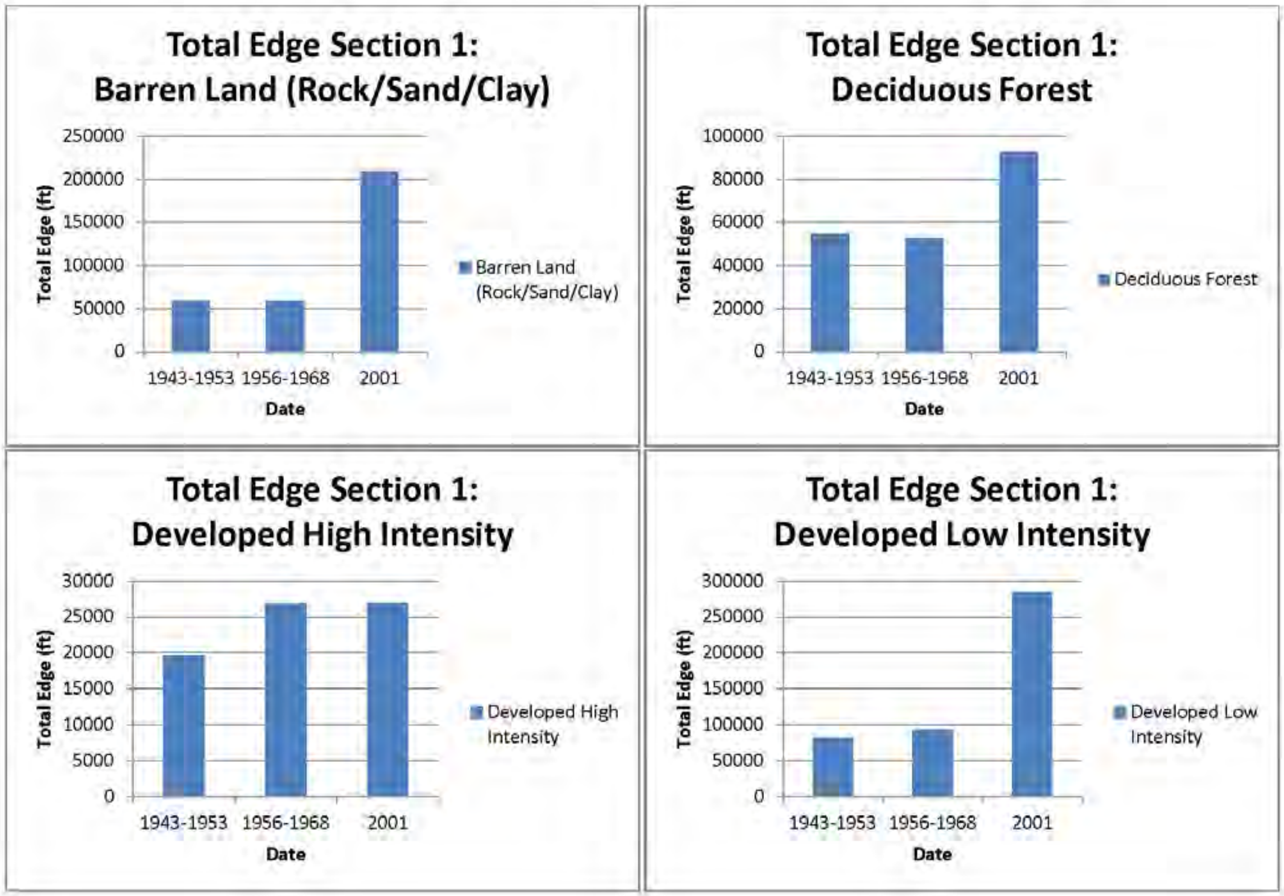

Patch Density Section 7:
Evergreen Forest
Patch Density (number/100 acres)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

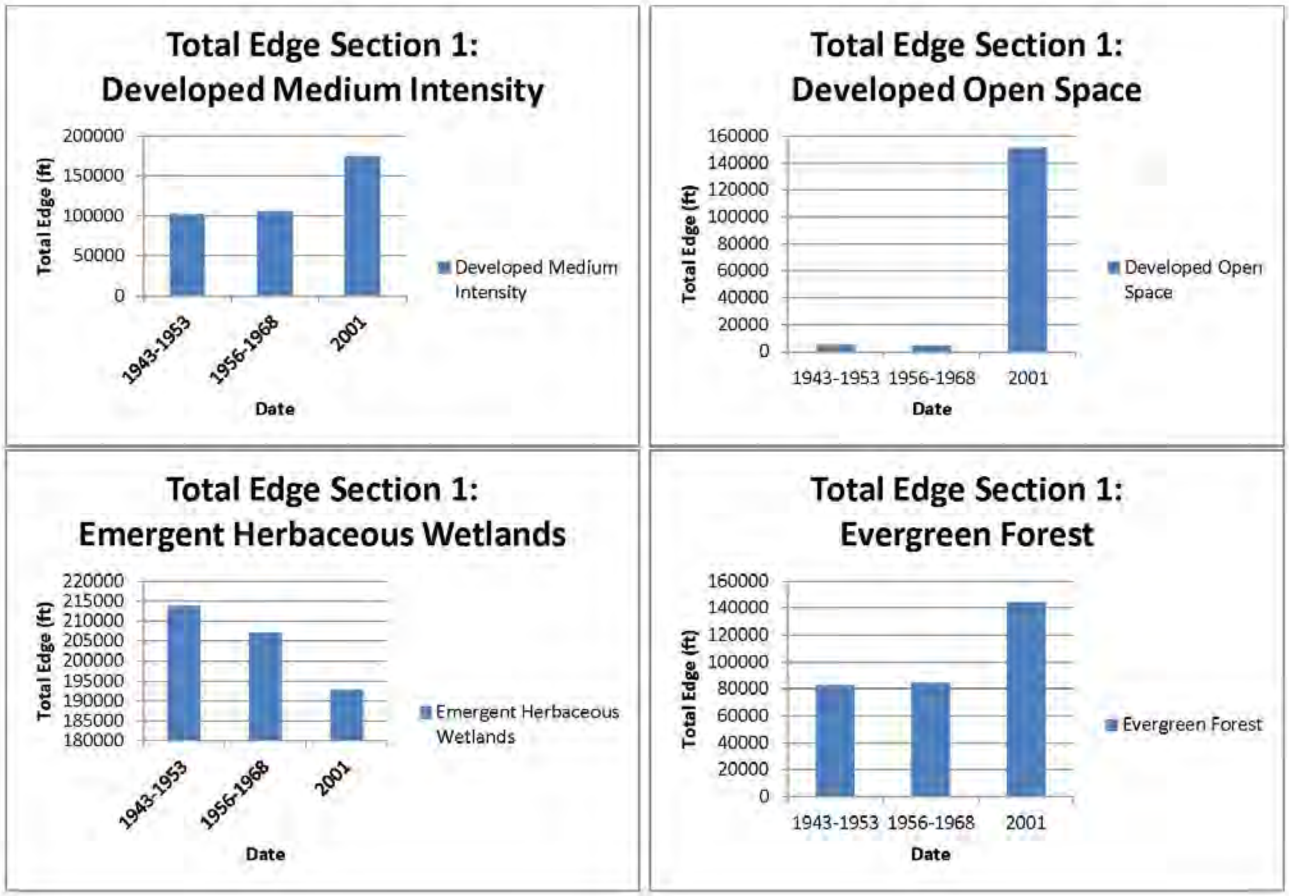

Patch Density Section 7: Mixed Forest
Patch Density (number/100 acres)
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Mixed Forest
Patch Density Section 7: Open Water
Patch Density (number/100 acres)
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Open Water
Patch Density Section 7: Shrub/Scrub
Patch Density (number/100 acres)
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub
Patch Density Section 7: Woody Wetlands
Patch Density (number/100 acres)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

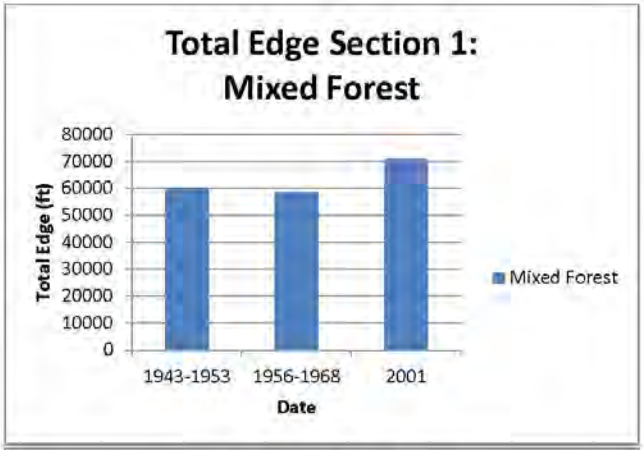

Patch Density Section 7: Pasture/Hay
Patch Density (number/100 acres)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Pasture/Hay

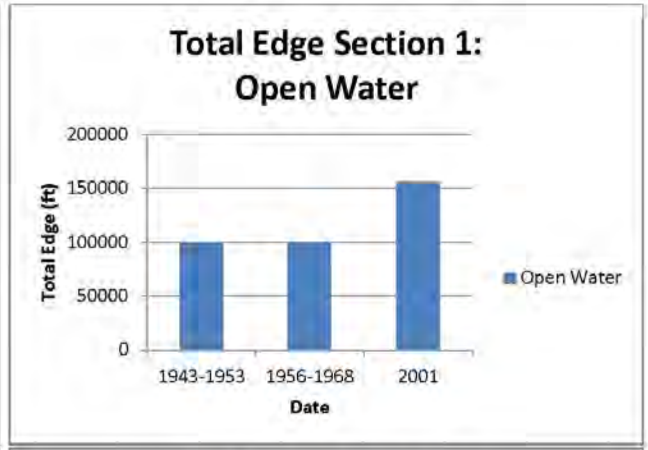

Patch Density Section 7: Grassland/Herbaceous
Patch Density (number/100 acres)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Grassland/Herbaceous

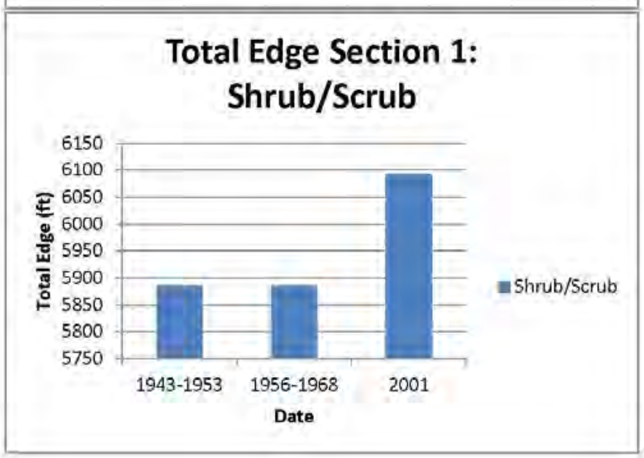

Patch Density Section 7: Cultivated Crops
Patch Density (number/100 acres)
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Cultivated Crops

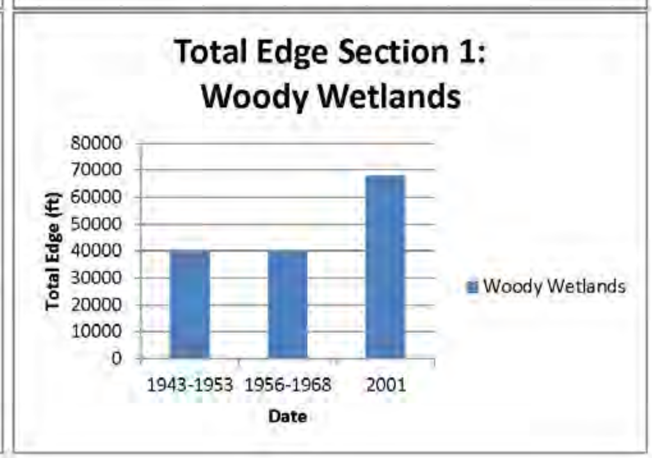

Total Edge Section 1:
Barren Land (Rock/Sand/Clay)
250000
200000
150000
100000
50000
0
Total Edge (ft)
1943-1953 1956-1968 2001
Date
Barren Land (Rock/Sand/Clay)
Total Edge Section 1:
Deciduous Forest
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953 1956-1968 2001
Date
Deciduous Forest
Total Edge Section 1:
Developed High Intensity
30000
25000
20000
15000
10000
5000
0
Total Edge (ft)
1943-1953 1956-1968 2001
Date
Developed High Intensity
Total Edge Section 1:
Developed Low Intensity
300000
250000
200000
150000
100000
50000
0
Total Edge (ft)
1943-1953 1956-1968 2001
Date
Developed Low Intensity

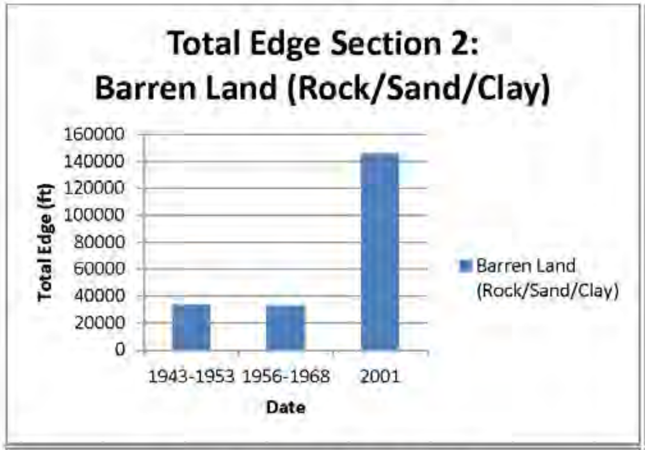

Total Edge Section 1:
Developed Medium Intensity
200000
150000
100000
50000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Total Edge Section 1:
Developed Open Space
160000
140000
120000
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed Open Space
Total Edge Section 1:
Emergent Herbaceous Wetlands
220000
215000
210000
205000
200000
195000
190000
185000
180000
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Total Edge Section 1:
Evergreen Forest
160000
140000
120000
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Evergreen Forest

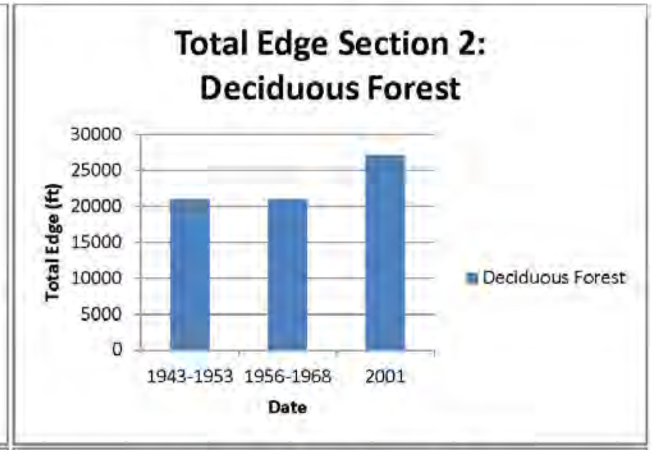

Total Edge Section 1:
Mixed Forest
80000
70000
60000
50000
40000
30000
20000
10000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Mixed Forest

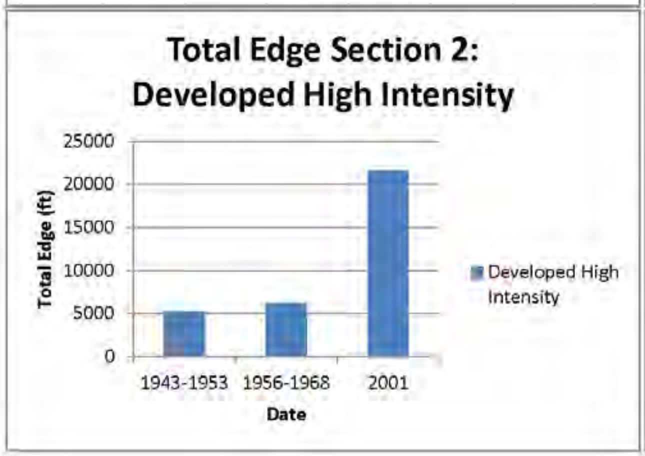

Total Edge Section 1:
Open Water
200000
150000
100000
50000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Open Water

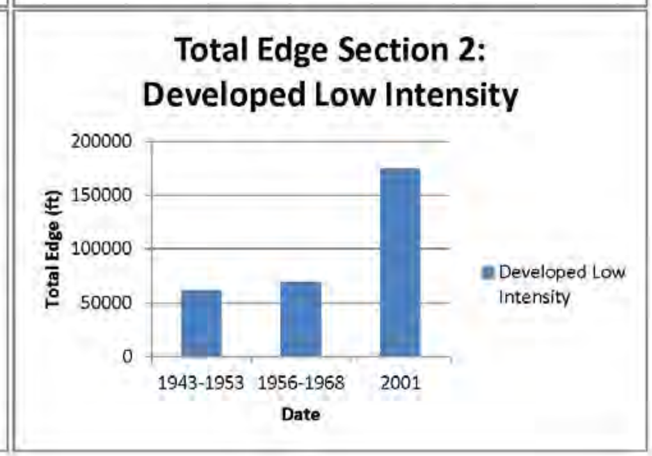

Total Edge Section 1:
Shrub/Scrub
6150
6100
6050
6000
5950
5900
5850
5800
5750
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Shrub/Scrub

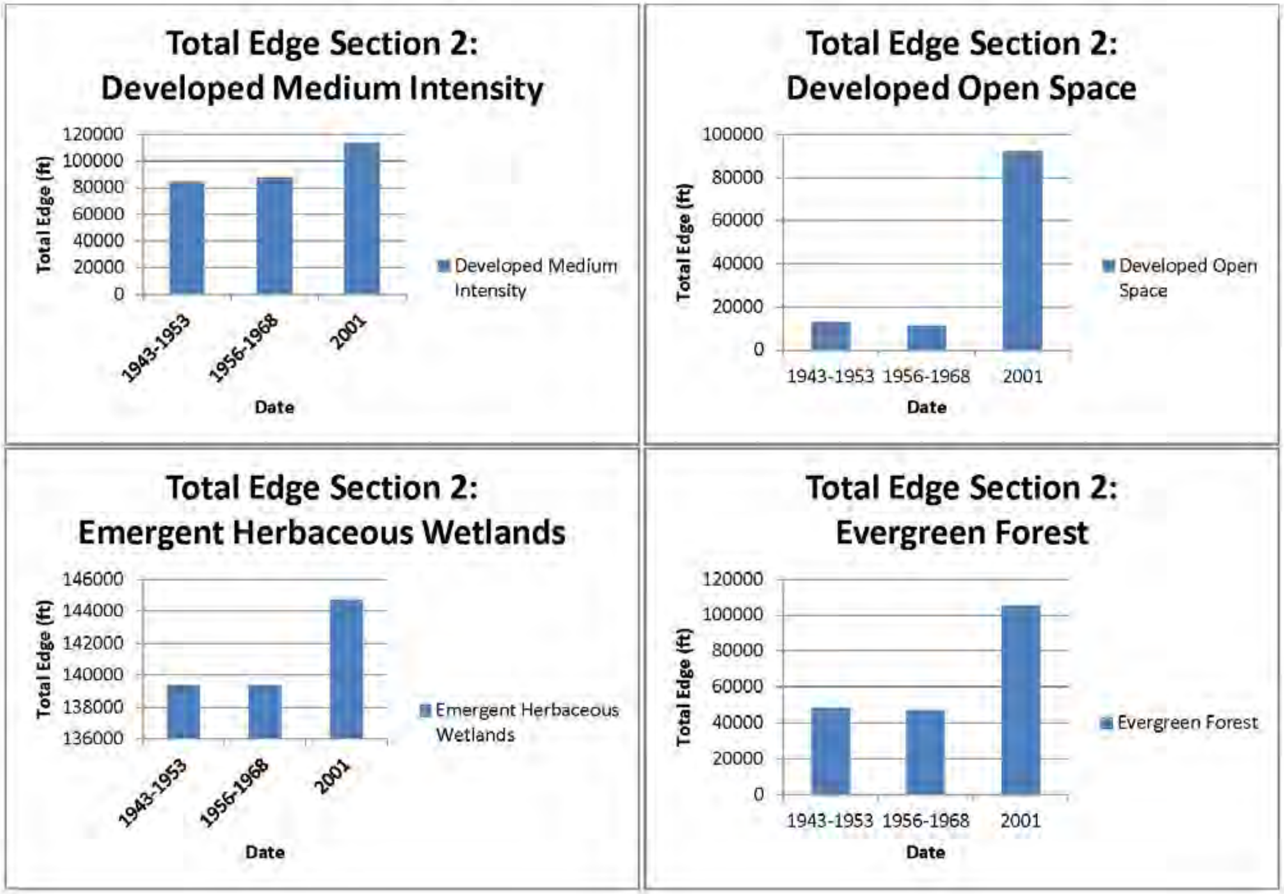

Total Edge Section 1:
Woody Wetlands
80000
70000
60000
50000
40000
30000
20000
10000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Woody Wetlands

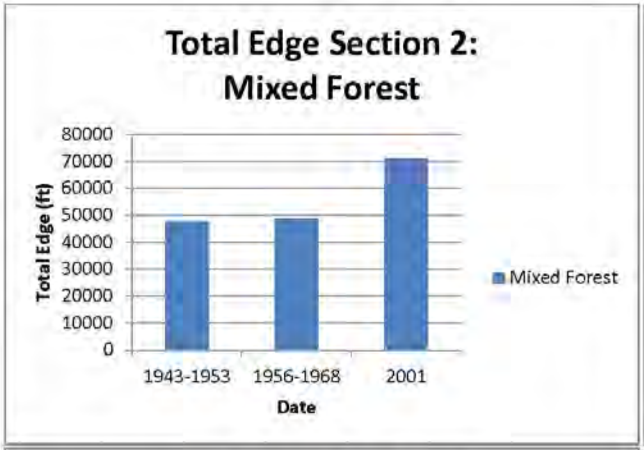

Total Edge Section 2:
Barren Land (Rock/Sand/Clay)
160000
140000
120000
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

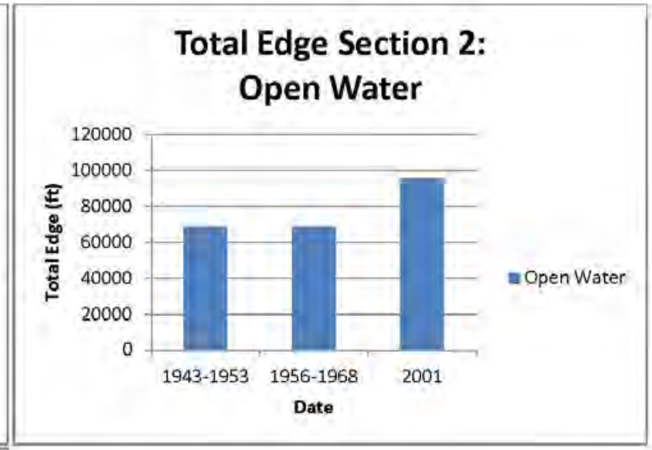

Total Edge Section 2:
Deciduous Forest
30000
25000
20000
15000
10000
5000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Deciduous Forest

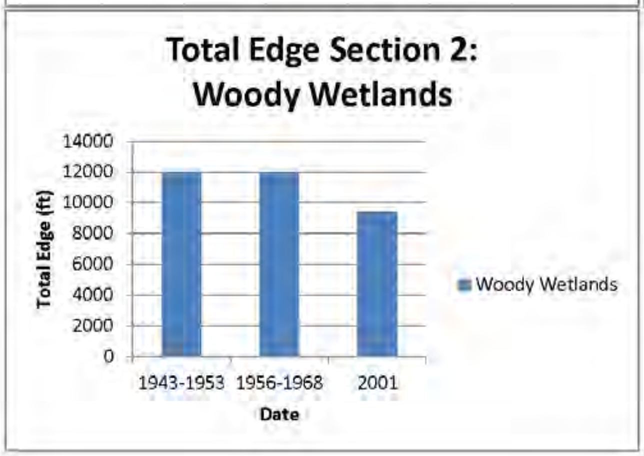

Total Edge Section 2:
Developed High Intensity
25000
20000
15000
10000
5000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed High Intensity

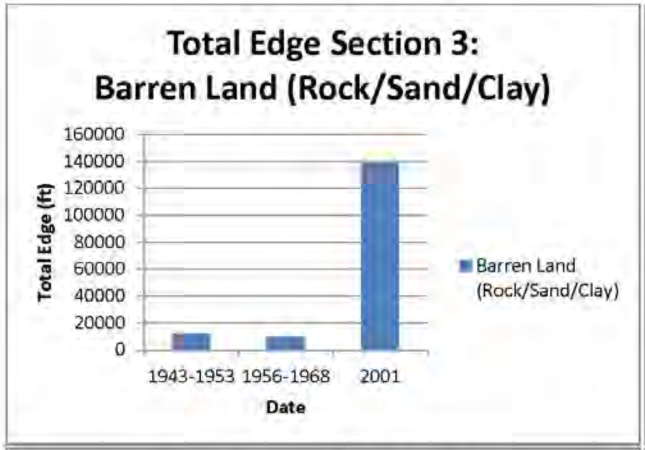

Total Edge Section 2:
Developed Low Intensity
200000
150000
100000
50000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed Low Intensity

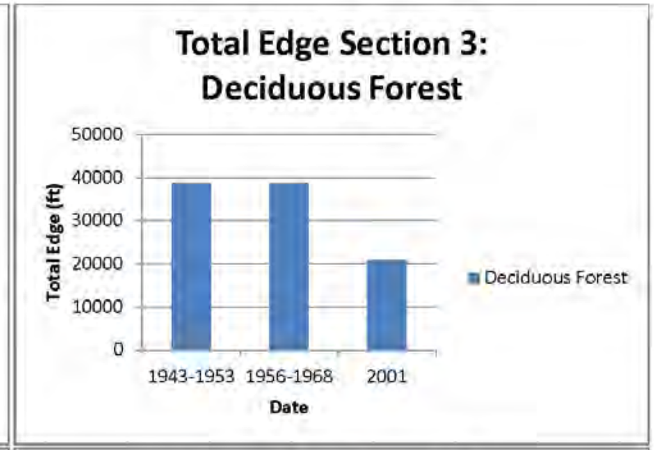

Total Edge Section 2: Developed Medium Intensity
120000
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Total Edge Section 2: Developed Open Space
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed Open Space
Total Edge Section 2: Emergent Herbaceous Wetlands
146000
144000
142000
140000
138000
136000
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Total Edge Section 2: Evergreen Forest
120000
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Evergreen Forest

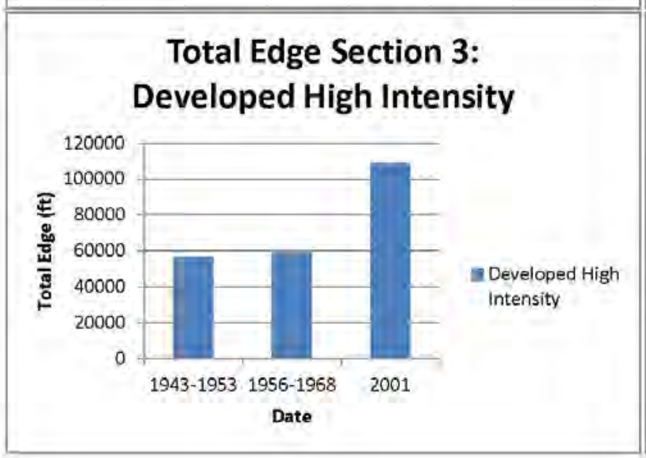

Total Edge Section 2:
Mixed Forest
80000
70000
60000
50000
40000
30000
20000
10000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Mixed Forest

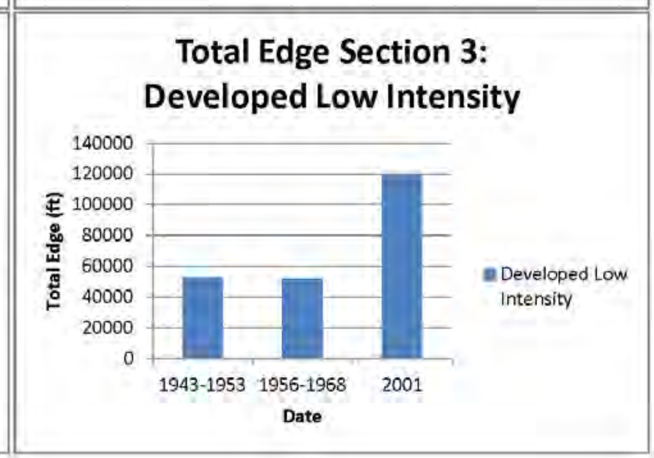

Total Edge Section 2:
Open Water
120000
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Open Water

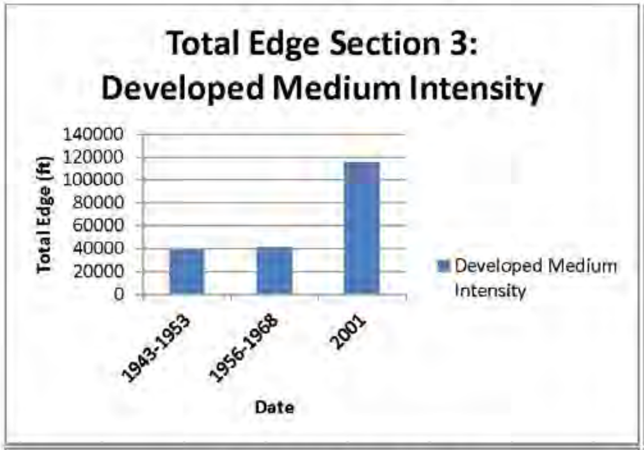

Total Edge Section 2:
Woody Wetlands
14000
12000
10000
8000
6000
4000
2000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Woody Wetlands

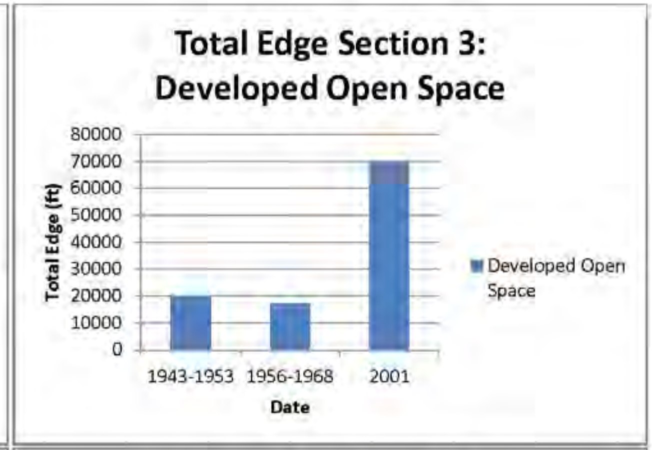

Total Edge Section 3:
Barren Land (Rock/Sand/Clay)
160000
140000
120000
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

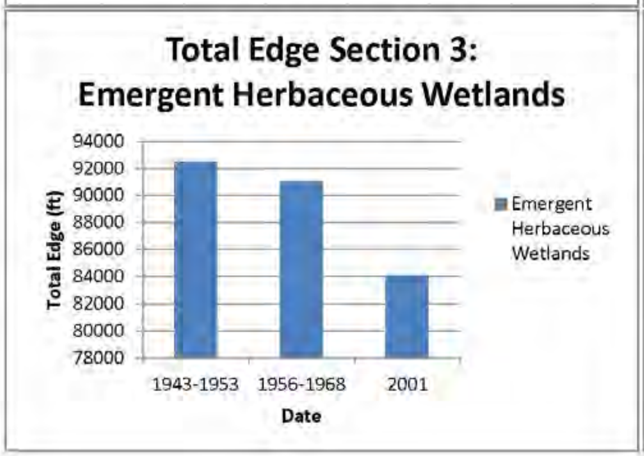

Total Edge Section 3:
Deciduous Forest
50000
40000
30000
20000
10000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Deciduous Forest

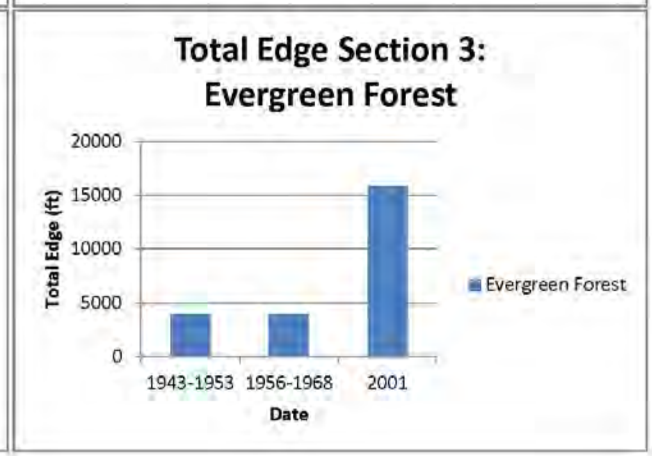

Total Edge Section 3:
Developed High Intensity
120000
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed High Intensity

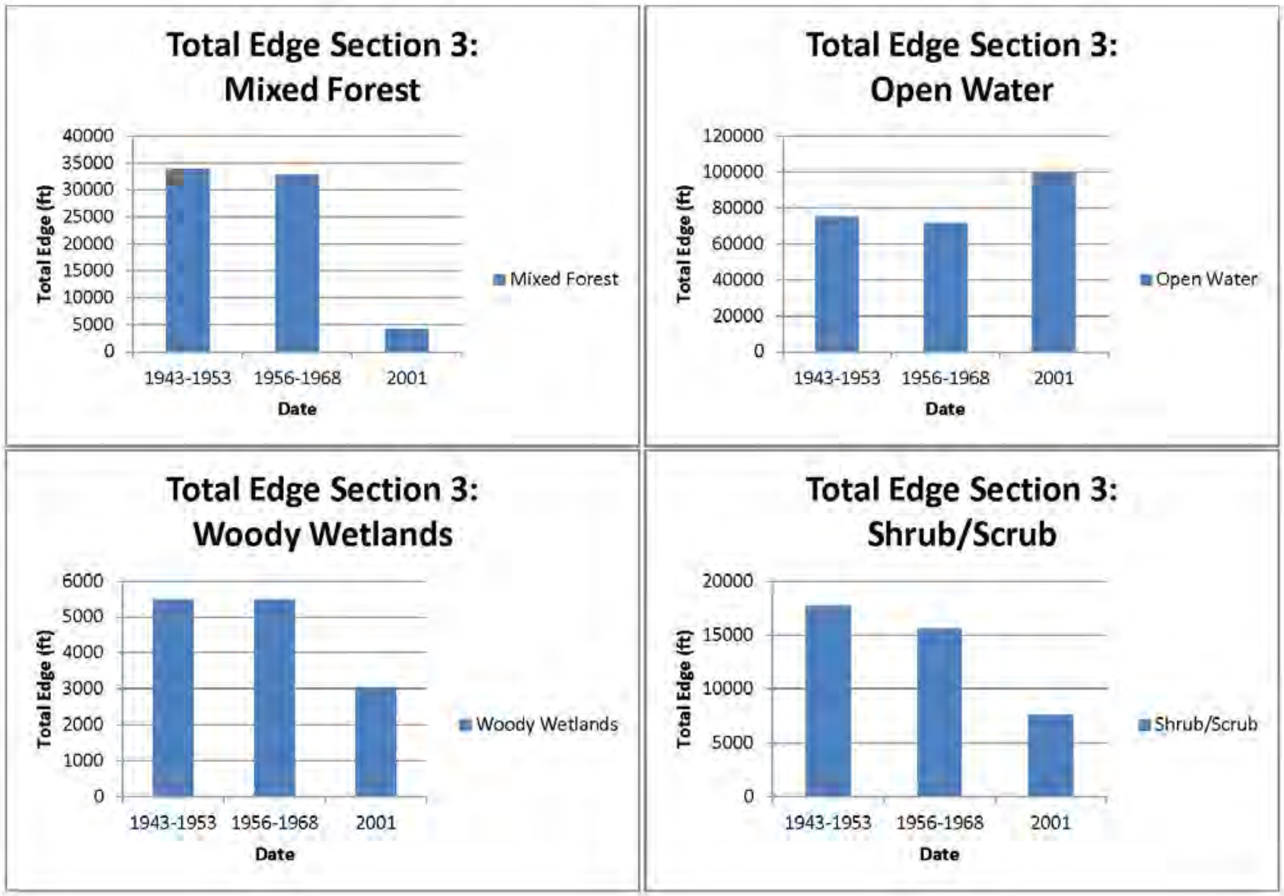

Total Edge Section 3:
Developed Low Intensity
140000
120000
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed Low Intensity

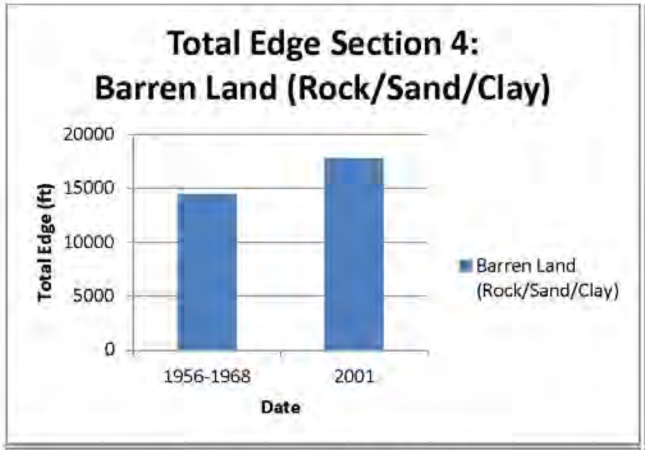

Total Edge Section 3:
Developed Medium Intensity
Total Edge (ft)
140000
120000
100000
80000
60000
40000
20000
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

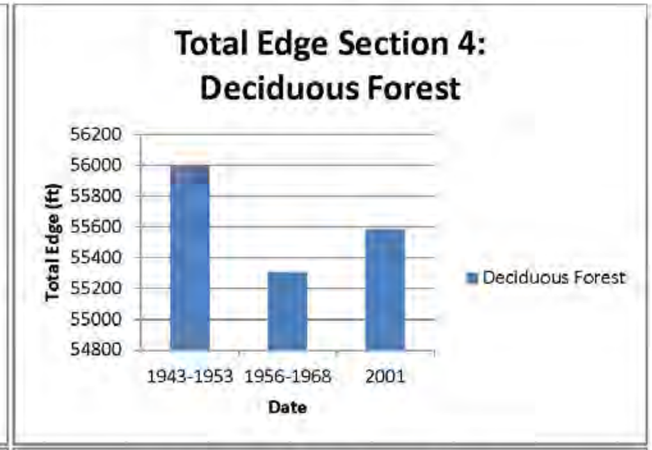

Total Edge Section 3:
Developed Open Space
Total Edge (ft)
80000
70000
60000
50000
40000
30000
20000
10000
0
1943-1953
1956-1968
2001
Date
Developed Open Space

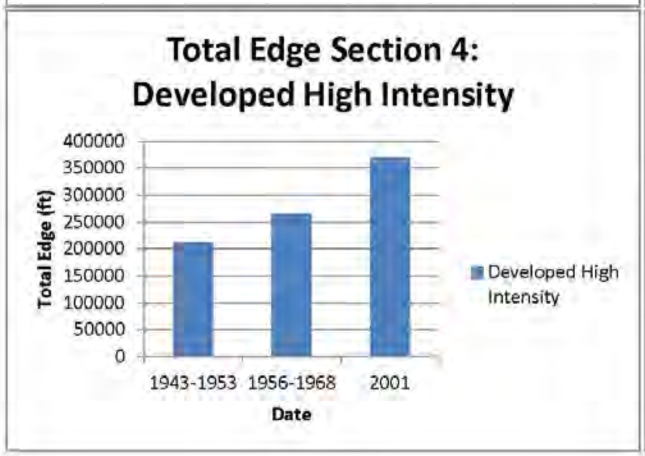

Total Edge Section 3:
Emergent Herbaceous Wetlands
Total Edge (ft)
94000
92000
90000
88000
86000
84000
82000
80000
78000
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

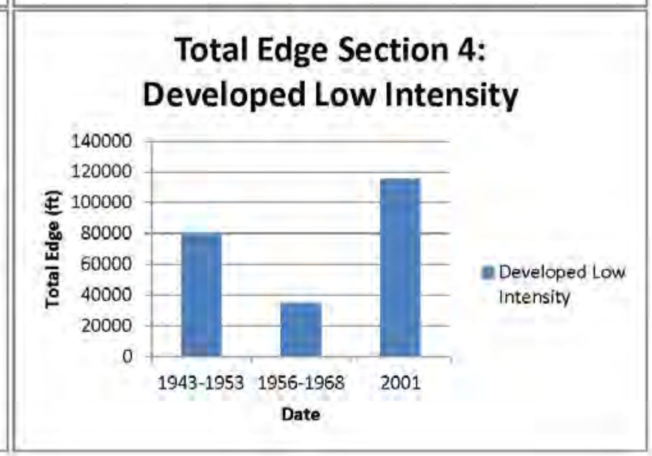

Total Edge Section 3:
Evergreen Forest
Total Edge (ft)
20000
15000
10000
5000
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

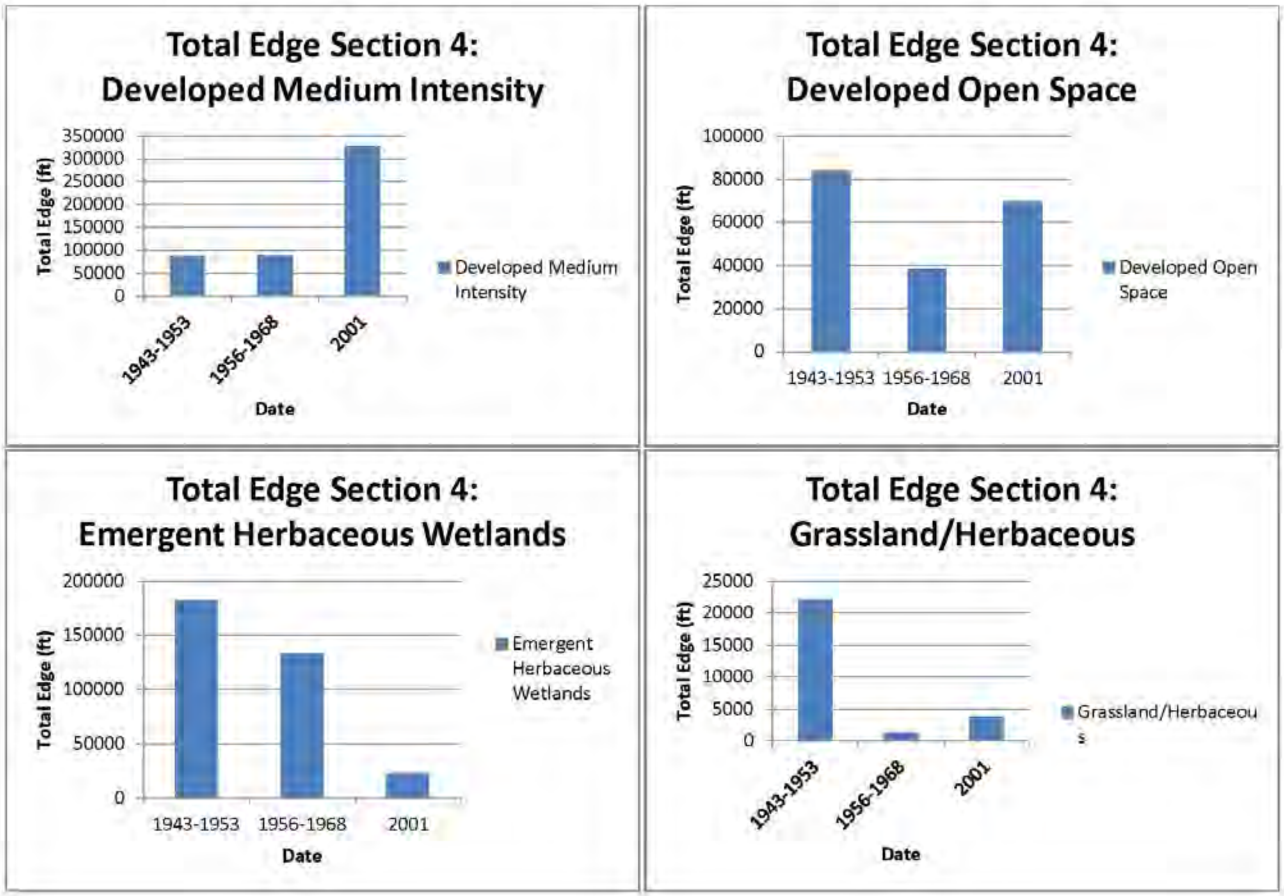

Total Edge Section 3: Mixed Forest
Total Edge (ft)
40000
35000
30000
25000
20000
15000
10000
5000
0
1943-1953
1956-1968
2001
Date
Mixed Forest
Total Edge Section 3: Open Water
Total Edge (ft)
120000
100000
80000
60000
40000
20000
0
1943-1953
1956-1968
2001
Date
Open Water
Total Edge Section 3: Woody Wetlands
Total Edge (ft)
6000
5000
4000
3000
2000
1000
0
1943-1953
1956-1968
2001
Date
Woody Wetlands
Total Edge Section 3: Shrub/Scrub
Total Edge (ft)
20000
15000
10000
5000
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

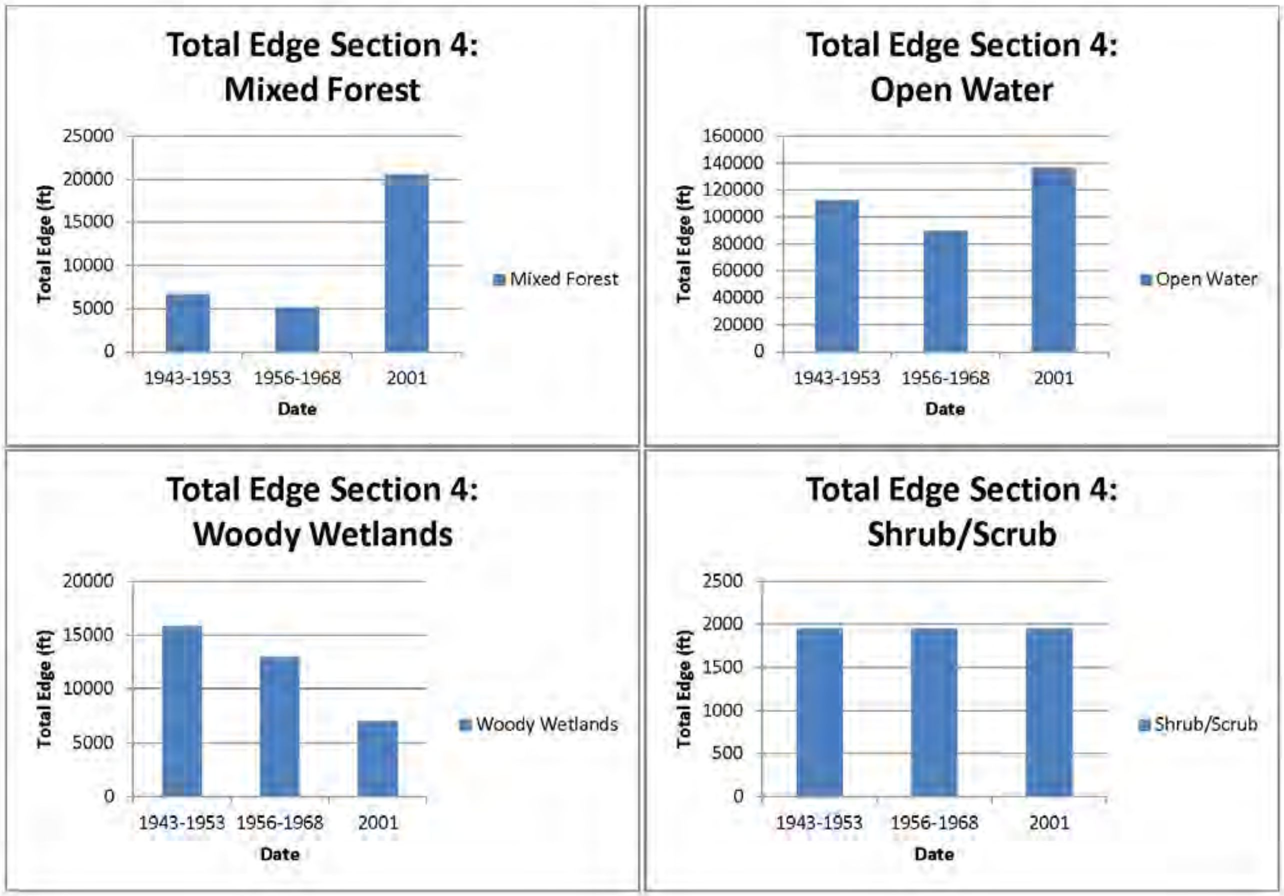

Total Edge Section 4:
Barren Land (Rock/Sand/Clay)
20000
15000
10000
5000
0
Total Edge (ft)
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

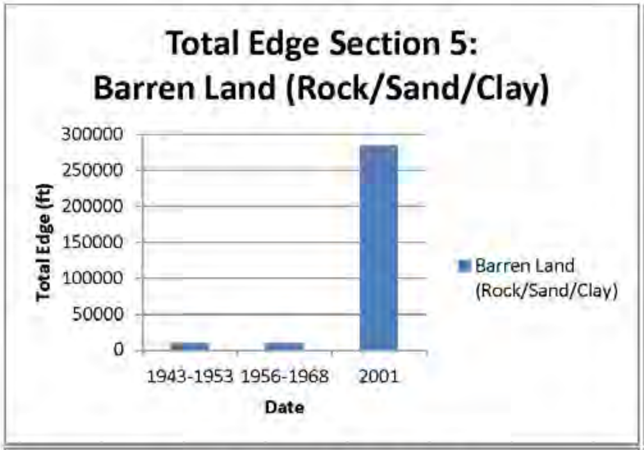

Total Edge Section 4:
Deciduous Forest
56200
56000
55800
55600
55400
55200
55000
54800
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Deciduous Forest

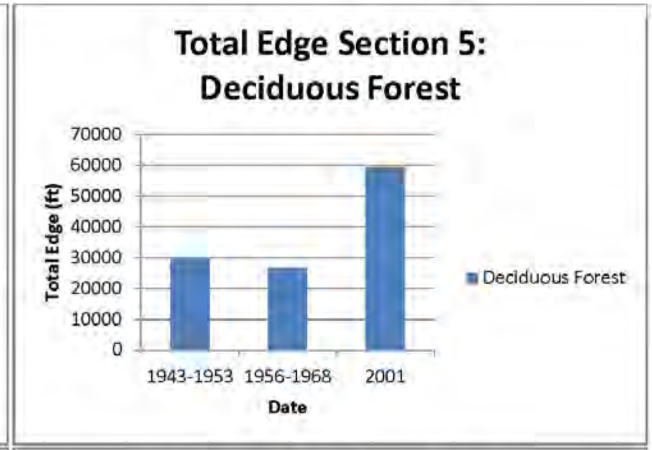

Total Edge Section 4:
Developed High Intensity
400000
350000
300000
250000
200000
150000
100000
50000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed High Intensity

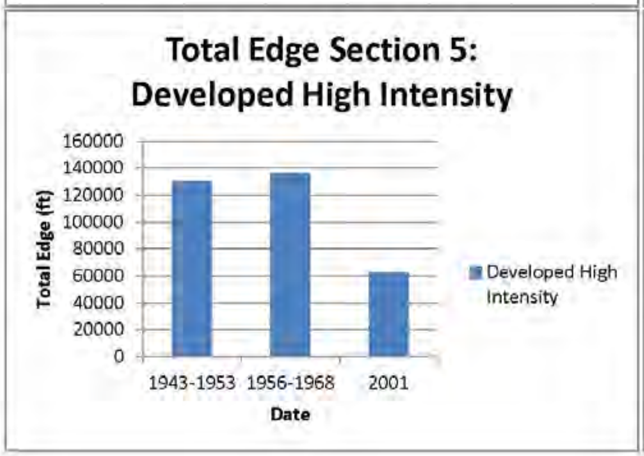

Total Edge Section 4:
Developed Low Intensity
140000
120000
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed Low Intensity

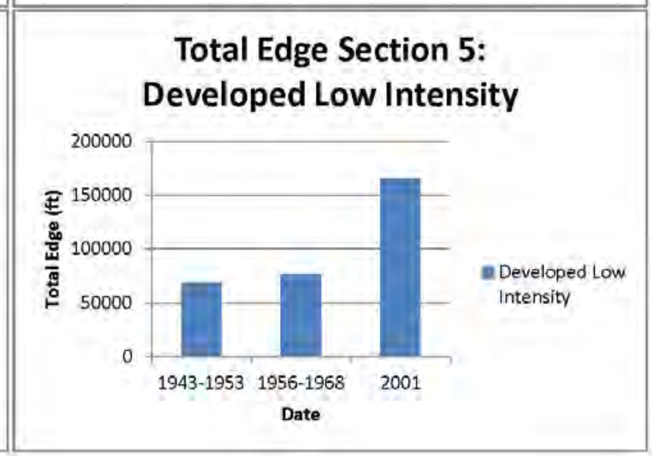

Total Edge Section 4:
Developed Medium Intensity
Total Edge (ft)
350000
300000
250000
200000
150000
100000
50000
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Total Edge Section 4:
Developed Open Space
Total Edge (ft)
100000
80000
60000
40000
20000
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Total Edge Section 4:
Emergent Herbaceous Wetlands
Total Edge (ft)
200000
150000
100000
50000
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Total Edge Section 4:
Grassland/Herbaceous
Total Edge (ft)
25000
20000
15000
10000
5000
0
1943-1953
1956-1968
2001
Date
Grassland/Herbaceous

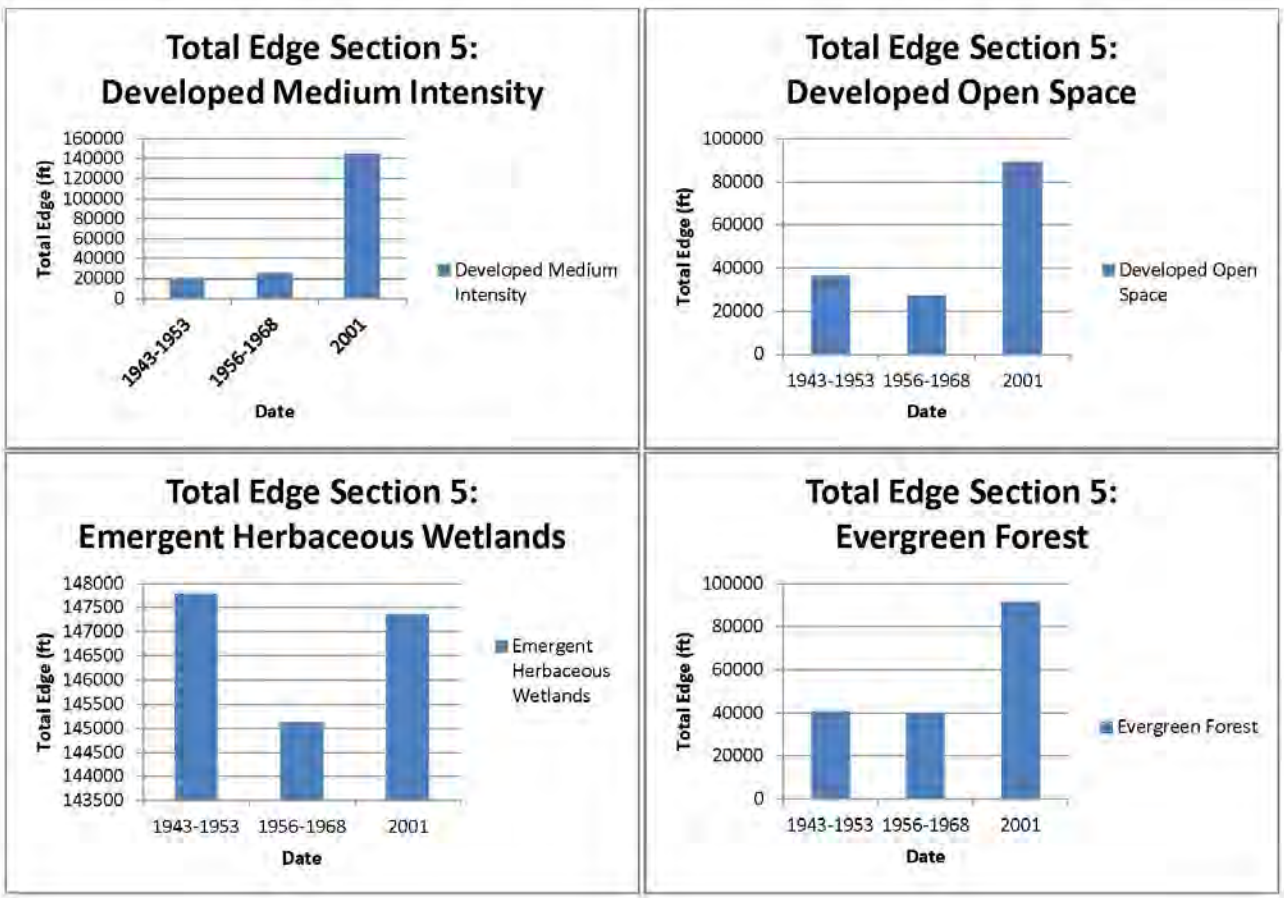

Total Edge Section 4:
Mixed Forest
Total Edge (ft)
25000
20000
15000
10000
5000
0
1943-1953
1956-1968
2001
Date
Mixed Forest
Total Edge Section 4:
Open Water
Total Edge (ft)
160000
140000
120000
100000
80000
60000
40000
20000
0
1943-1953
1956-1968
2001
Date
Open Water
Total Edge Section 4:
Woody Wetlands
Total Edge (ft)
20000
15000
10000
5000
0
1943-1953
1956-1968
2001
Date
Woody Wetlands
Total Edge Section 4:
Shrub/Scrub
Total Edge (ft)
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

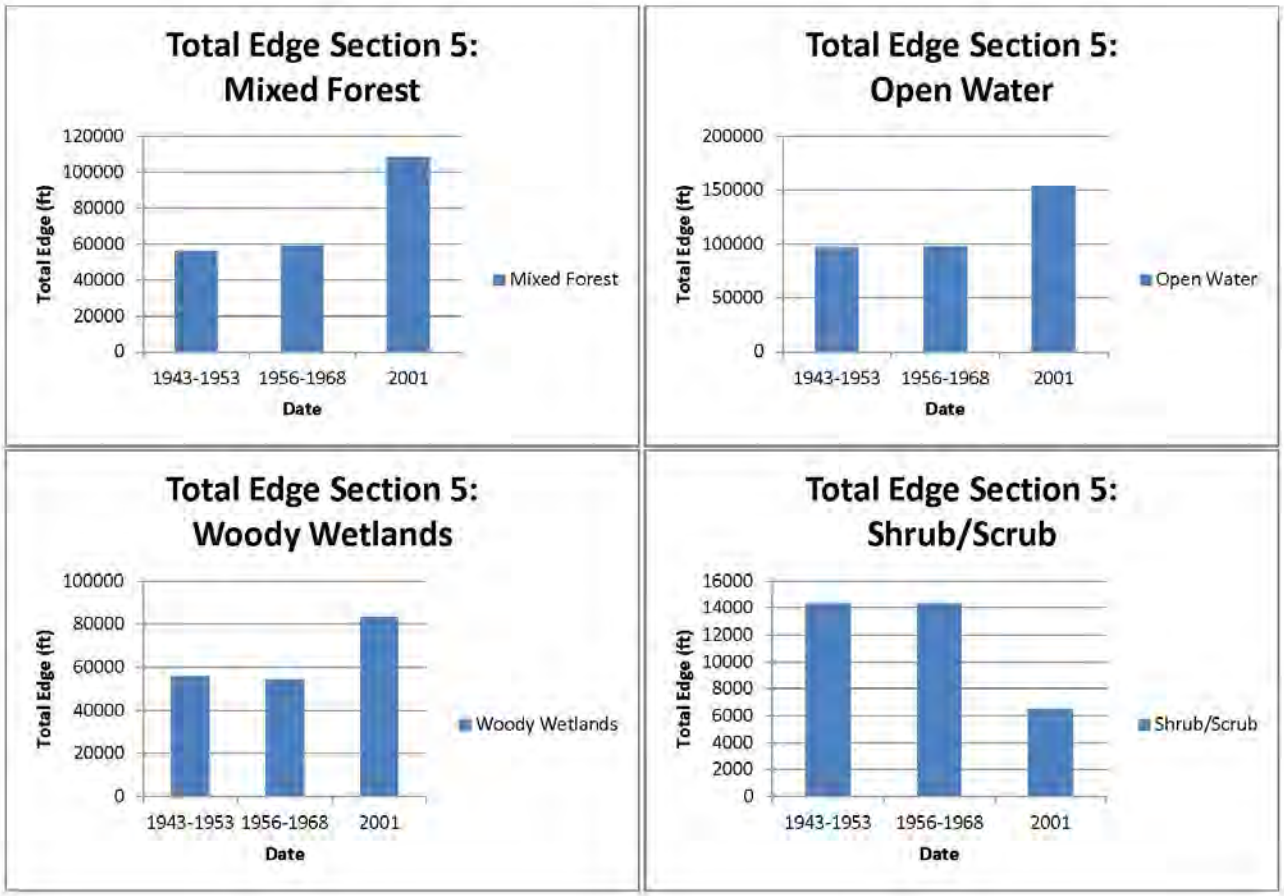

Total Edge Section 5:
Barren Land (Rock/Sand/Clay)
300000
250000
200000
150000
100000
50000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

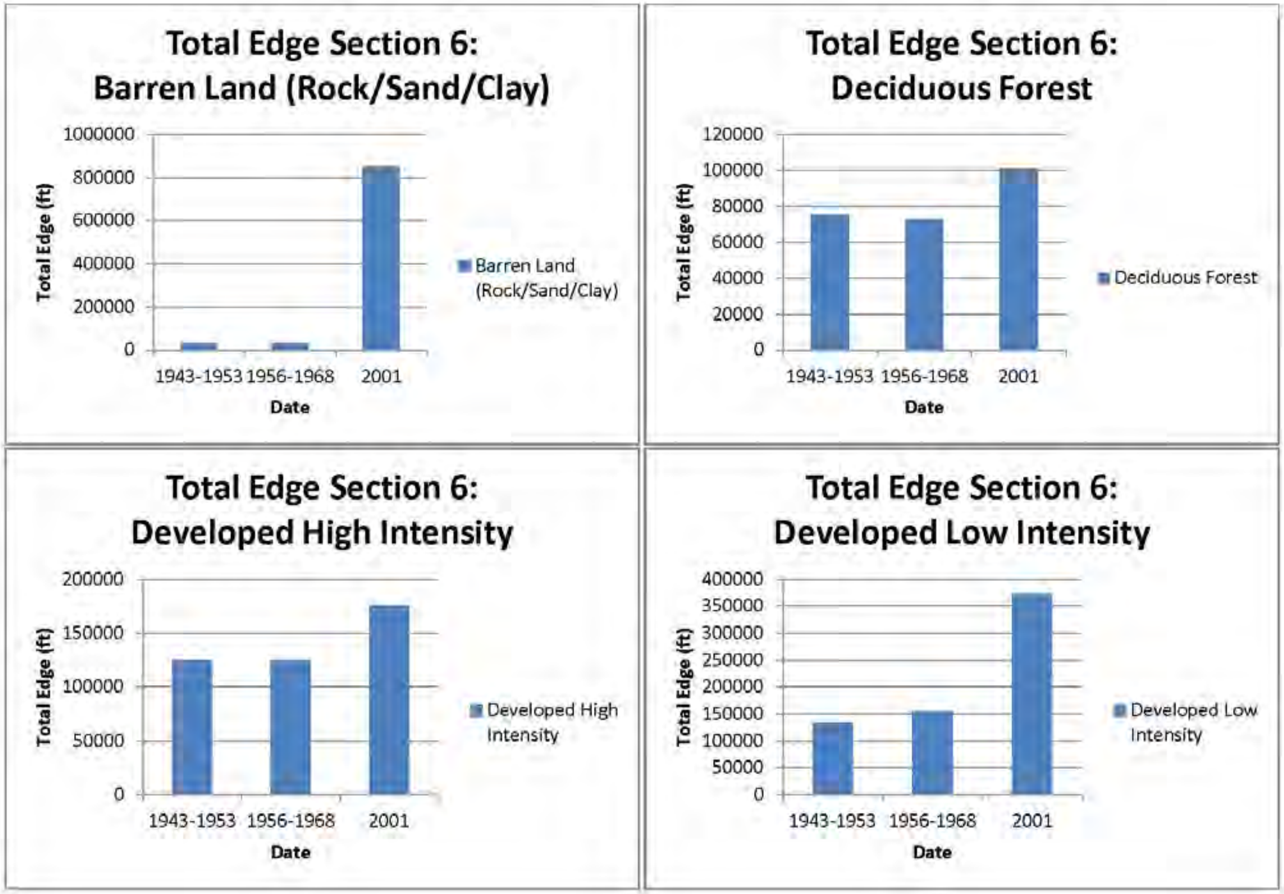

Total Edge Section 5:
Deciduous Forest
70000
60000
50000
40000
30000
20000
10000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Deciduous Forest

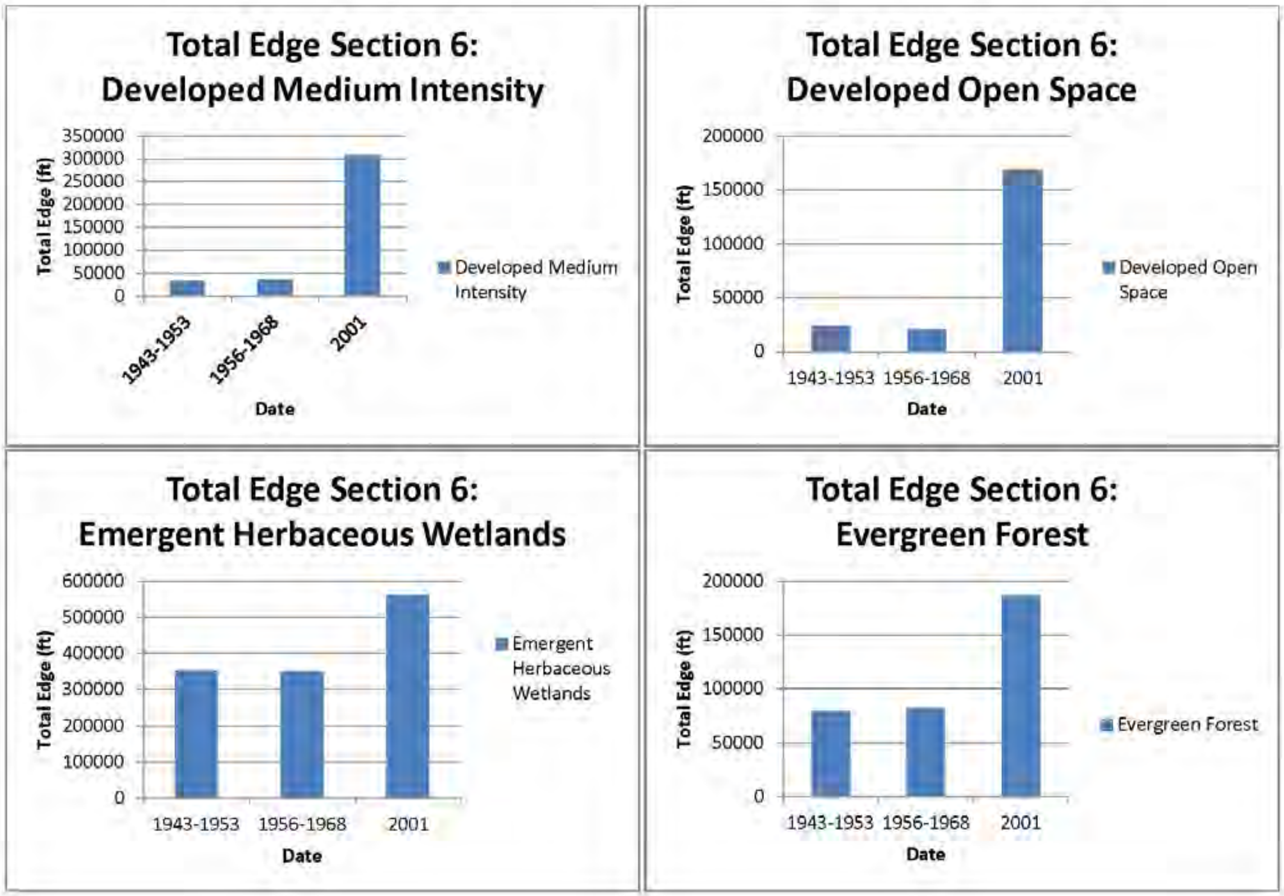

Total Edge Section 5:
Developed High Intensity
160000
140000
120000
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed High Intensity

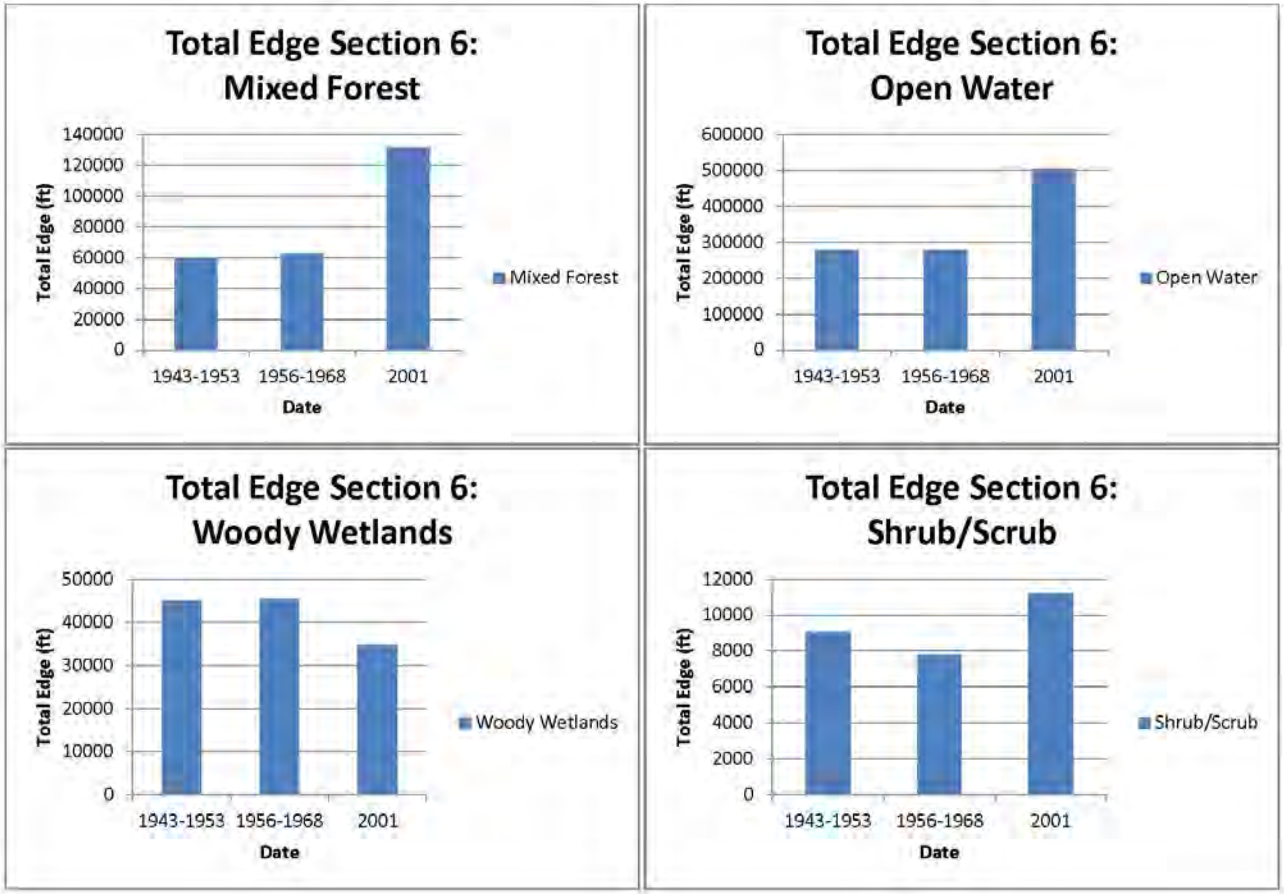

Total Edge Section 5:
Developed Low Intensity
200000
150000
100000
50000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed Low Intensity

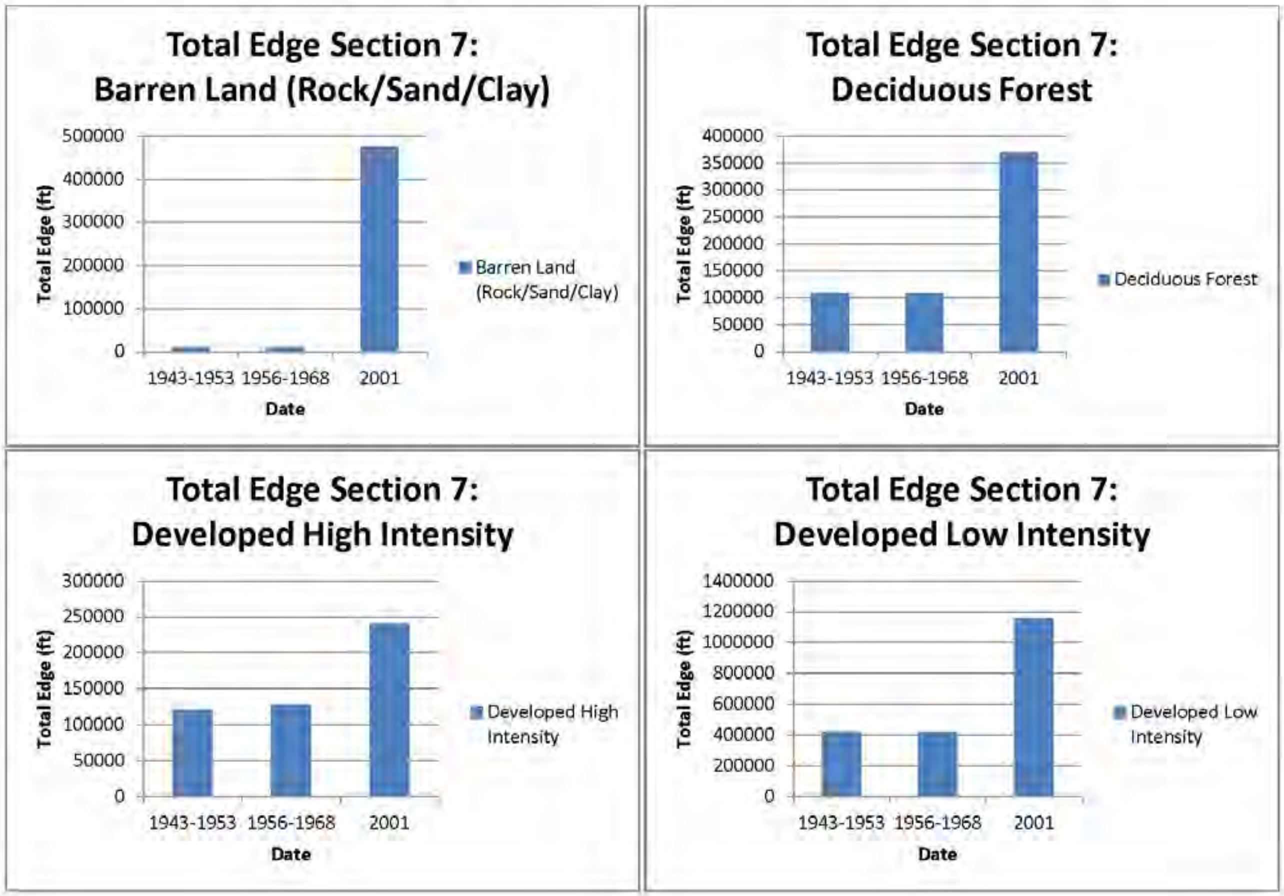

Total Edge Section 5:
Developed Medium Intensity
Total Edge (ft)
160000
140000
120000
100000
80000
60000
40000
20000
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Total Edge Section 5:
Developed Open Space
Total Edge (ft)
100000
80000
60000
40000
20000
0
1943-1953 1956-1968 2001
Date
Developed Open Space
Total Edge Section 5:
Emergent Herbaceous Wetlands
Total Edge (ft)
148000
147500
147000
146500
146000
145500
145000
144500
144000
143500
1943-1953 1956-1968 2001
Date
Emergent Herbaceous Wetlands
Total Edge Section 5:
Evergreen Forest
Total Edge (ft)
100000
80000
60000
40000
20000
0
1943-1953 1956-1968 2001
Date
Evergreen Forest

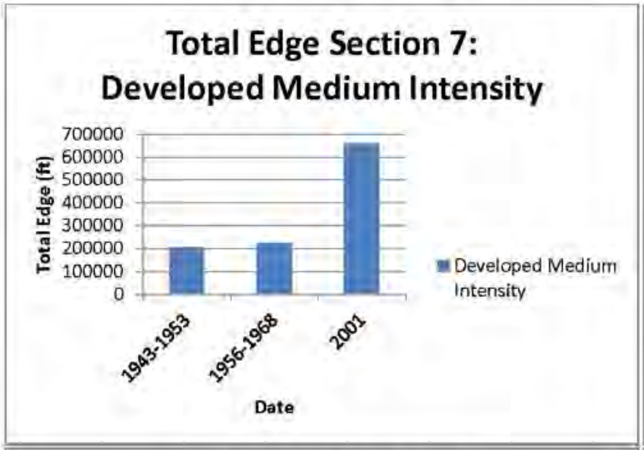

Total Edge Section 5: Mixed Forest
120000
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Mixed Forest
Total Edge Section 5: Open Water
200000
150000
100000
50000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Open Water
Total Edge Section 5: Woody Wetlands
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Woody Wetlands
Total Edge Section 5: Shrub/Scrub
16000
14000
12000
10000
8000
6000
4000
2000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Shrub/Scrub

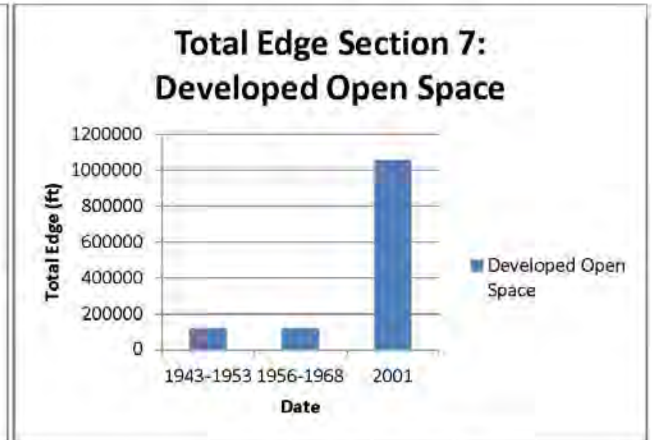

Total Edge Section 6:
Barren Land (Rock/Sand/Clay)
1000000
800000
600000
400000
200000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)
Total Edge Section 6:
Deciduous Forest
120000
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Deciduous Forest
Total Edge Section 6:
Developed High Intensity
200000
150000
100000
50000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed High Intensity
Total Edge Section 6:
Developed Low Intensity
400000
350000
300000
250000
200000
150000
100000
50000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed Low Intensity

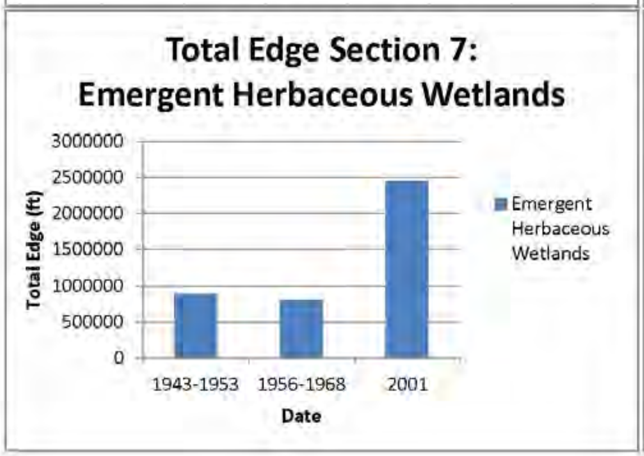

Total Edge Section 6: Developed Medium Intensity
350000
300000
250000
200000
150000
100000
50000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Total Edge Section 6: Developed Open Space
200000
150000
100000
50000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Developed Open Space
Total Edge Section 6: Emergent Herbaceous Wetlands
600000
500000
400000
300000
200000
100000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Total Edge Section 6: Evergreen Forest
200000
150000
100000
50000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Evergreen Forest

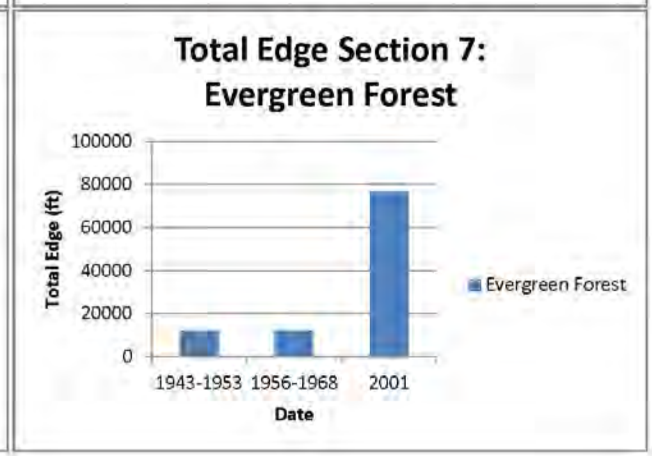

Total Edge Section 6: Mixed Forest
140000
120000
100000
80000
60000
40000
20000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Mixed Forest
Total Edge Section 6: Open Water
600000
500000
400000
300000
200000
100000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Open Water
Total Edge Section 6: Woody Wetlands
50000
40000
30000
20000
10000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Woody Wetlands
Total Edge Section 6: Shrub/Scrub
12000
10000
8000
6000
4000
2000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Shrub/Scrub

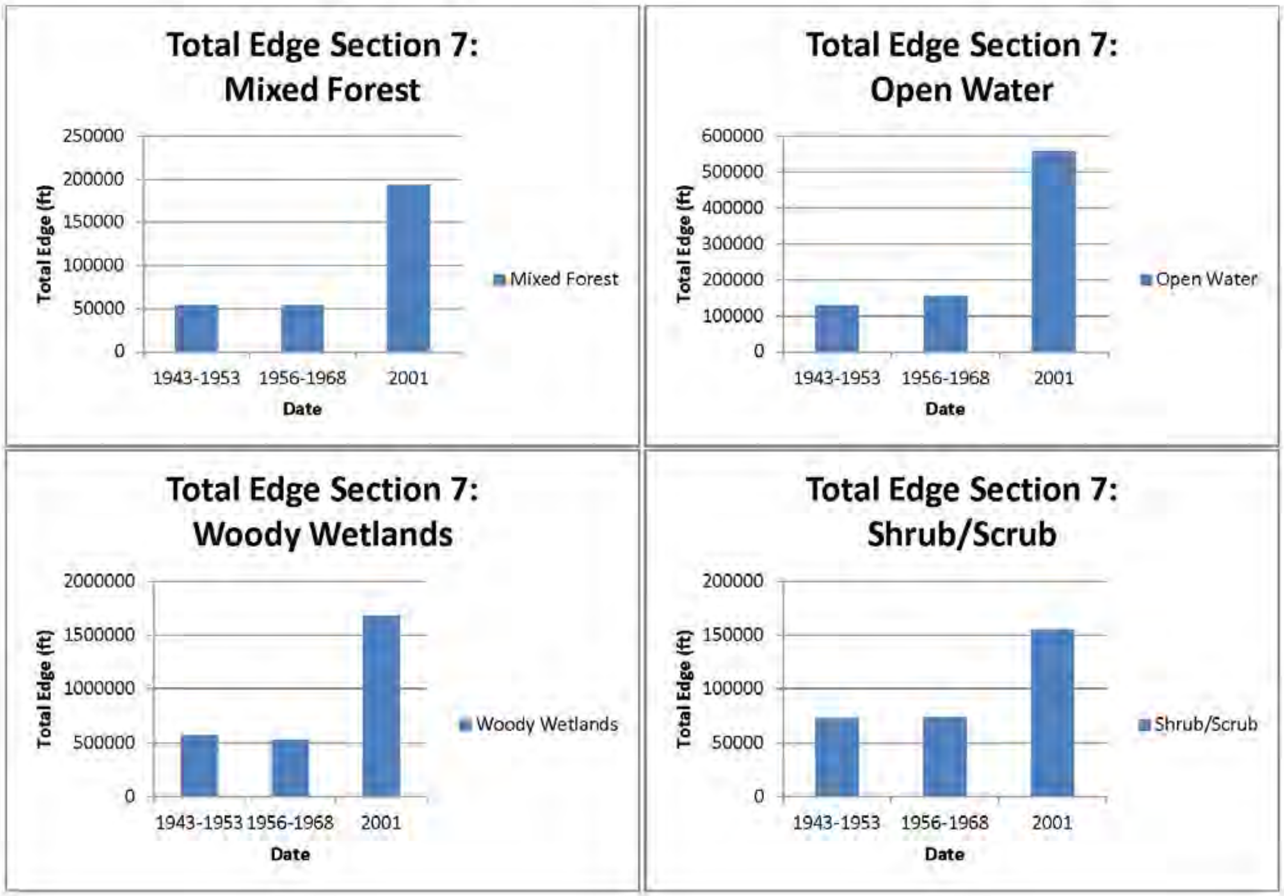

Total Edge Section 7:
Barren Land (Rock/Sand/Clay)
Total Edge (ft)
500000
400000
300000
200000
100000
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)
Total Edge Section 7:
Deciduous Forest
Total Edge (ft)
400000
350000
300000
250000
200000
150000
100000
50000
0
1943-1953
1956-1968
2001
Date
Deciduous Forest
Total Edge Section 7:
Developed High Intensity
Total Edge (ft)
300000
250000
200000
150000
100000
50000
0
1943-1953
1956-1968
2001
Date
Developed High Intensity
Total Edge Section 7:
Developed Low Intensity
Total Edge (ft)
1400000
1200000
1000000
800000
600000
400000
200000
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

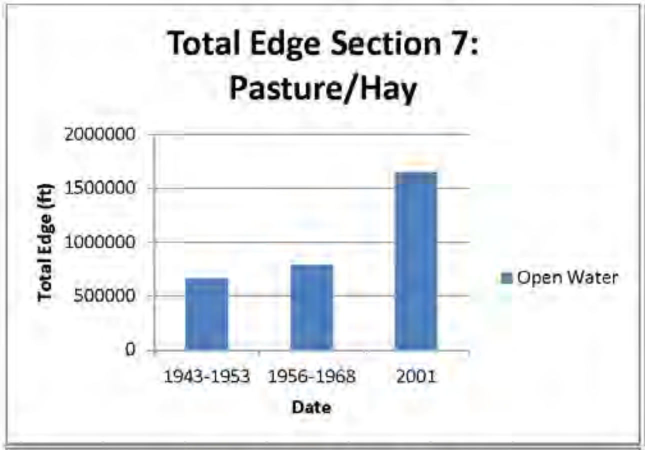

Total Edge Section 7:
Developed Medium Intensity
Total Edge (ft)
700000
600000
500000
400000
300000
200000
100000
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

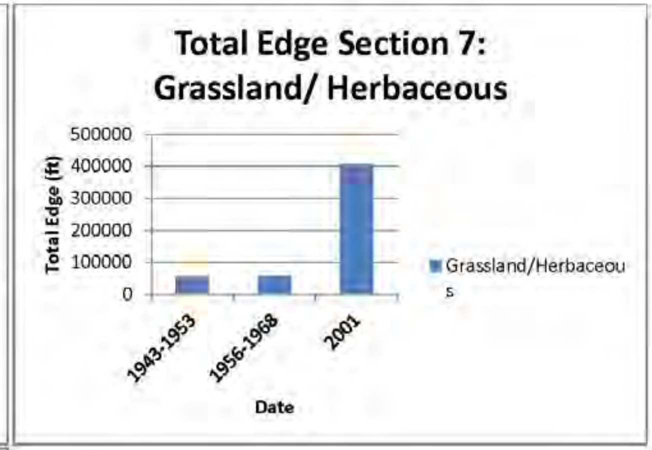

Total Edge Section 7:
Developed Open Space
Total Edge (ft)
1200000
1000000
800000
600000
400000
200000
0
1943-1953
1956-1968
2001
Date
Developed Open Space

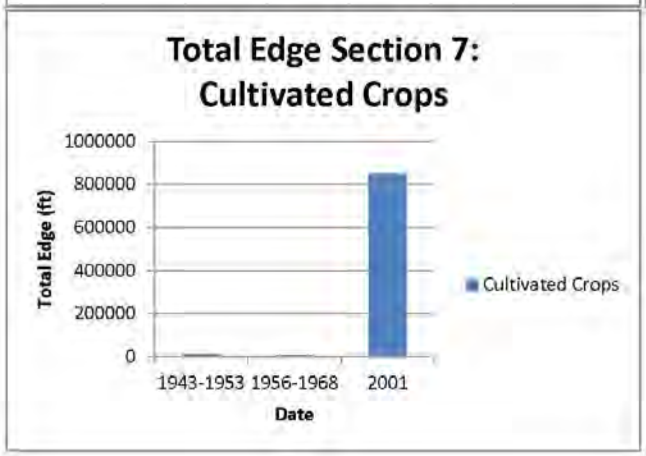

Total Edge Section 7:
Emergent Herbaceous Wetlands
Total Edge (ft)
3000000
2500000
2000000
1500000
1000000
500000
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

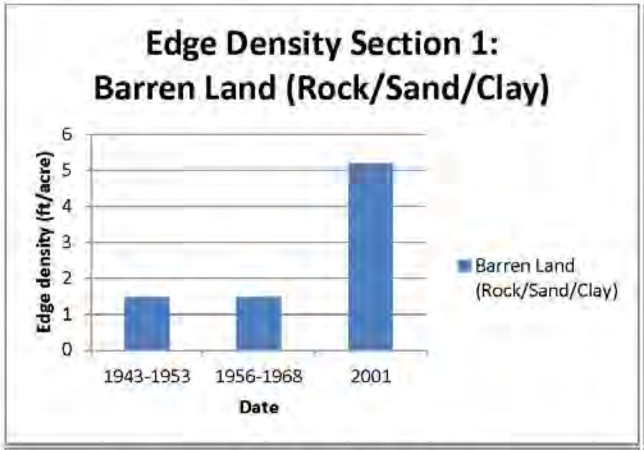

Total Edge Section 7:
Evergreen Forest
Total Edge (ft)
100000
80000
60000
40000
20000
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

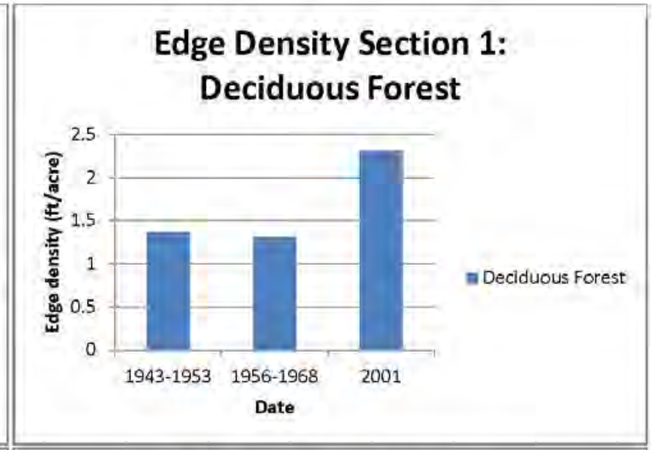

Total Edge Section 7:
Mixed Forest
Total Edge (ft)
250000
200000
150000
100000
50000
0
1943-1953
1956-1968
2001
Date
Mixed Forest
Total Edge Section 7:
Open Water
Total Edge (ft)
600000
500000
400000
300000
200000
100000
0
1943-1953
1956-1968
2001
Date
Open Water
Total Edge Section 7:
Woody Wetlands
Total Edge (ft)
2000000
1500000
1000000
500000
0
1943-1953
1956-1968
2001
Date
Woody Wetlands
Total Edge Section 7:
Shrub/Scrub
Total Edge (ft)
200000
150000
100000
50000
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

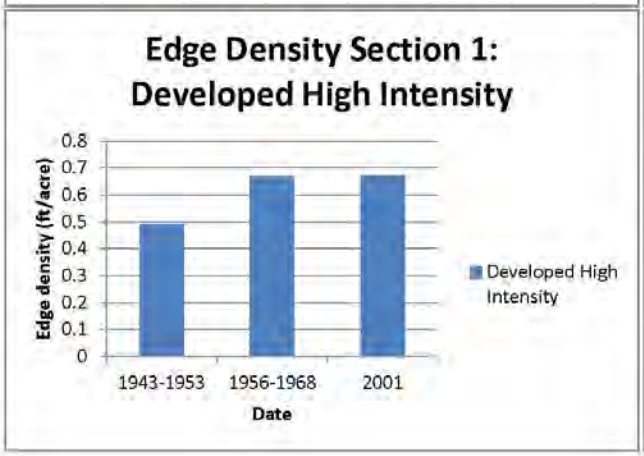

Total Edge Section 7:
Pasture/Hay
2000000
1500000
1000000
500000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Open Water

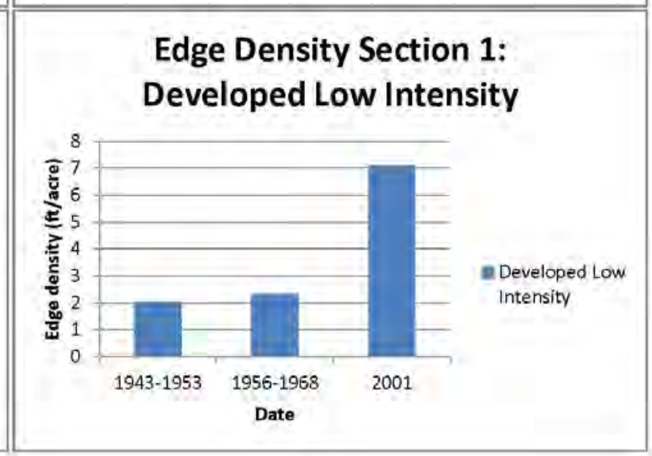

Total Edge Section 7:
Grassland/ Herbaceous
500000
400000
300000
200000
100000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Grassland/Herbaceou
s

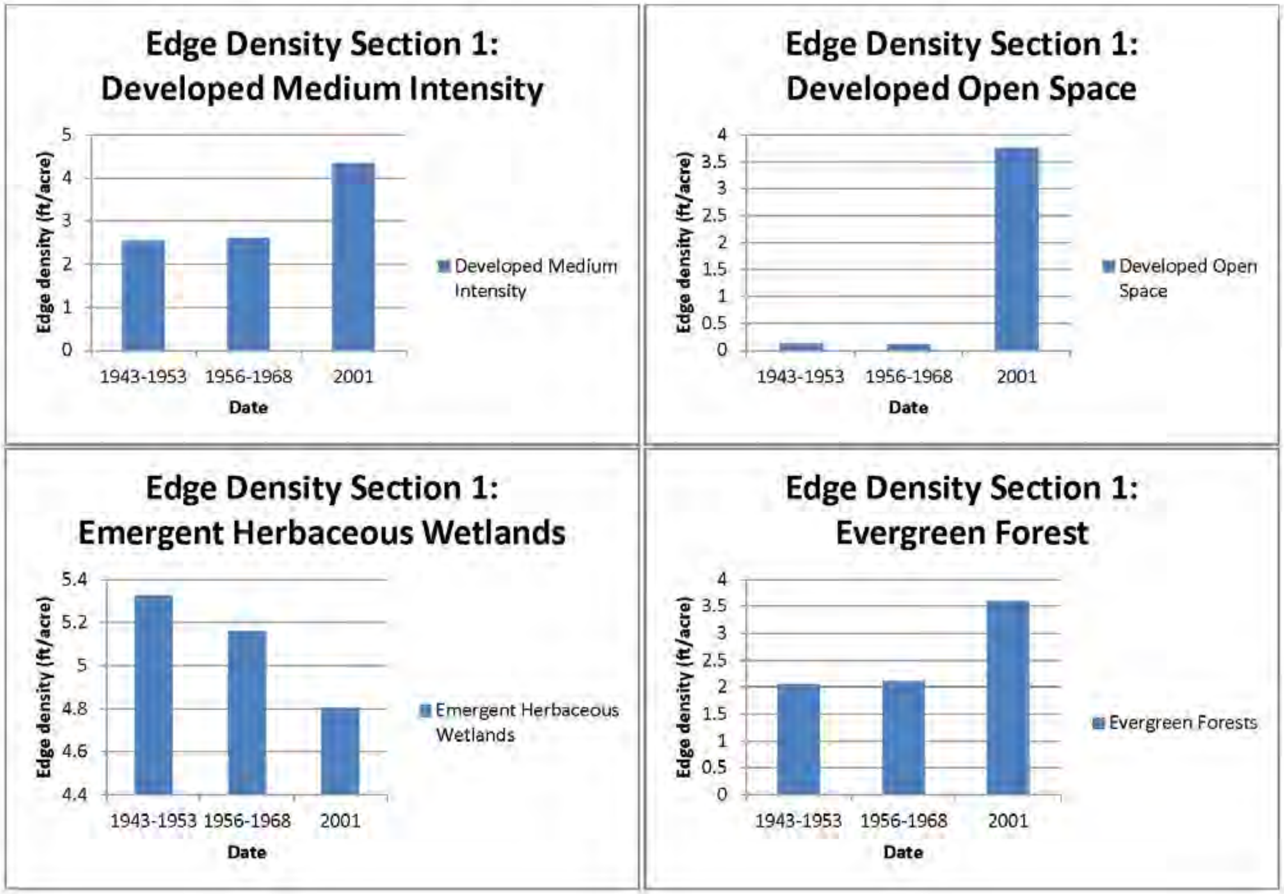

Total Edge Section 7:
Cultivated Crops
1000000
800000
600000
400000
200000
0
Total Edge (ft)
1943-1953
1956-1968
2001
Date
Cultivated Crops

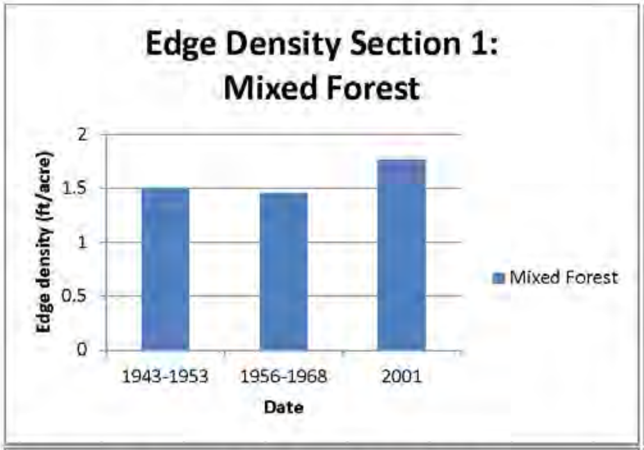

Edge Density Section 1:
Barren Land (Rock/Sand/Clay)
Edge density (ft/acre)
6
5
4
3
2
1
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

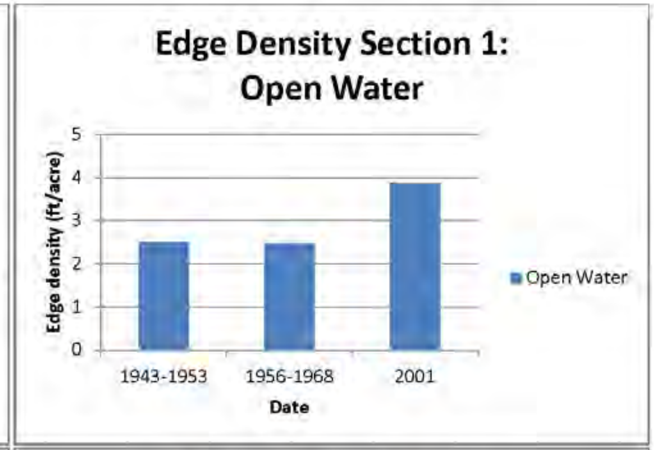

Edge Density Section 1:
Deciduous Forest
Edge density (ft/acre)
2.5
2
1.5
1
0.5
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

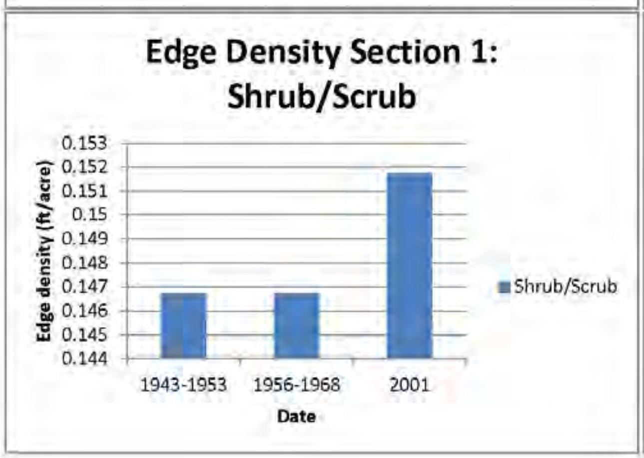

Edge Density Section 1:
Developed High Intensity
Edge density (ft/acre)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

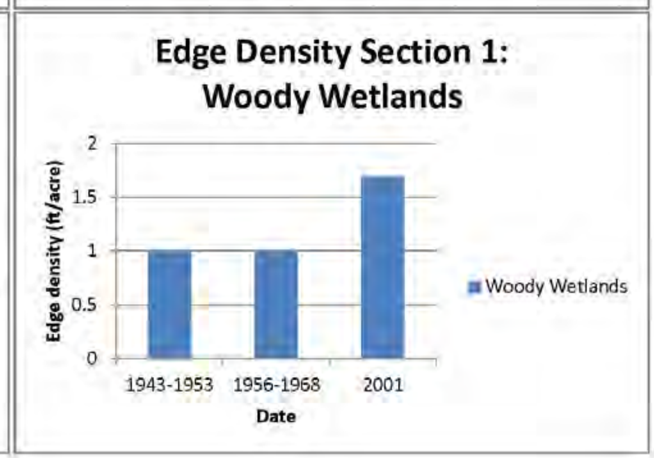

Edge Density Section 1:
Developed Low Intensity
Edge density (ft/acre)
8
7
6
5
4
3
2
1
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

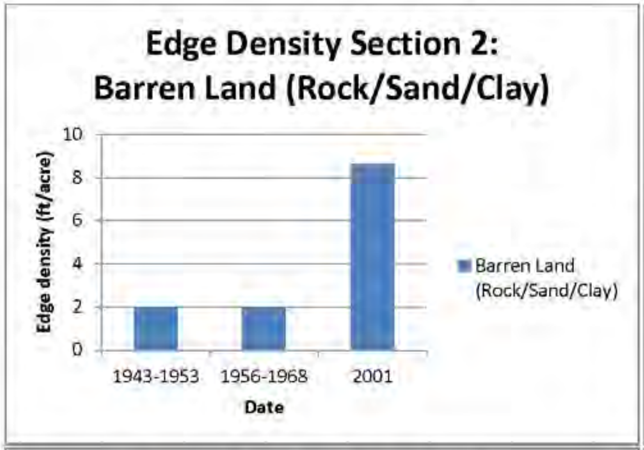

Edge Density Section 1:
Developed Medium Intensity
Edge density (ft/acre)
5
4
3
2
1
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Edge Density Section 1:
Developed Open Space
Edge density (ft/acre)
4
3.5
3
2.5
2
1.5
1
0.5
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Edge Density Section 1:
Emergent Herbaceous Wetlands
Edge density (ft/acre)
5.4
5.2
5
4.8
4.6
4.4
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Edge Density Section 1:
Evergreen Forest
Edge density (ft/acre)
4
3.5
3
2.5
2
1.5
1
0.5
0
1943-1953
1956-1968
2001
Date
Evergreen Forests

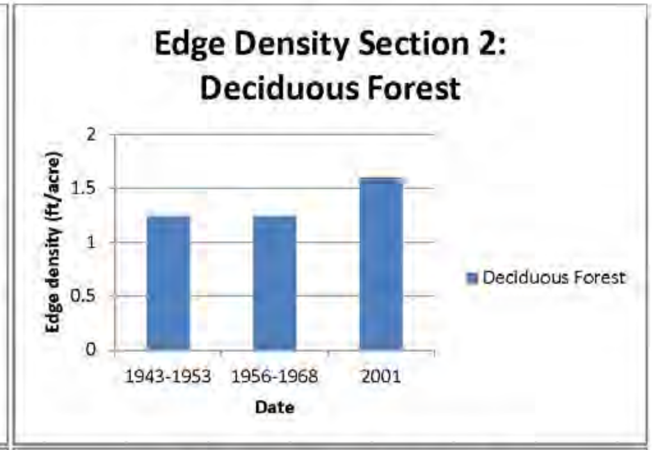

Edge Density Section 1:
Mixed Forest
Edge density (ft/acre)
2
1.5
1
0.5
0
1943-1953
1956-1968
2001
Date
Mixed Forest

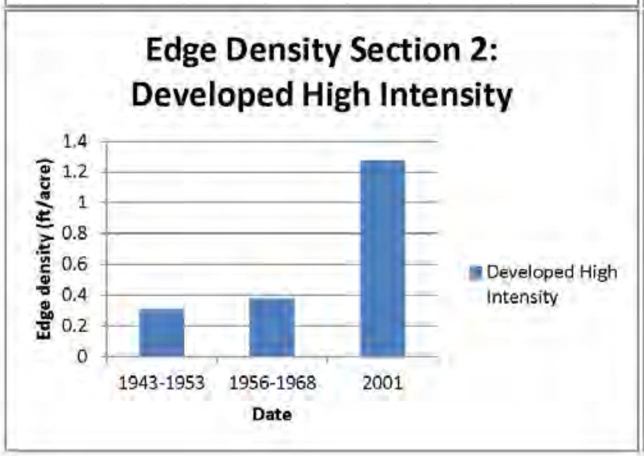

Edge Density Section 1:
Open Water
Edge density (ft/acre)
5
4
3
2
1
0
1943-1953
1956-1968
2001
Date
Open Water

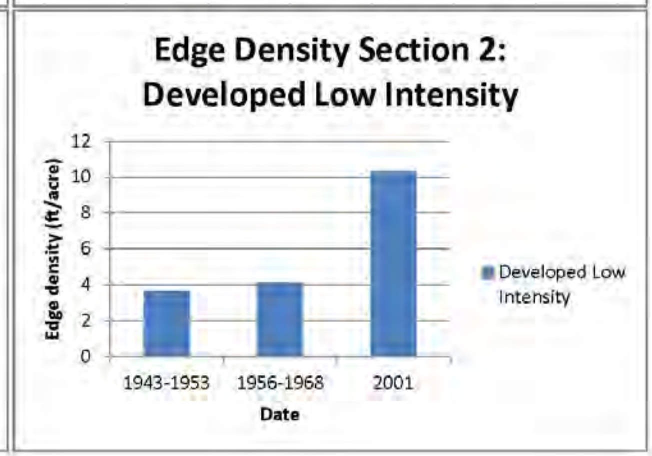

Edge Density Section 1:
Shrub/Scrub
Edge density (ft/acre)
0.153
0.152
0.151
0.15
0.149
0.148
0.147
0.146
0.145
0.144
1943-1953
1956-1968
2001
Date
Shrub/Scrub

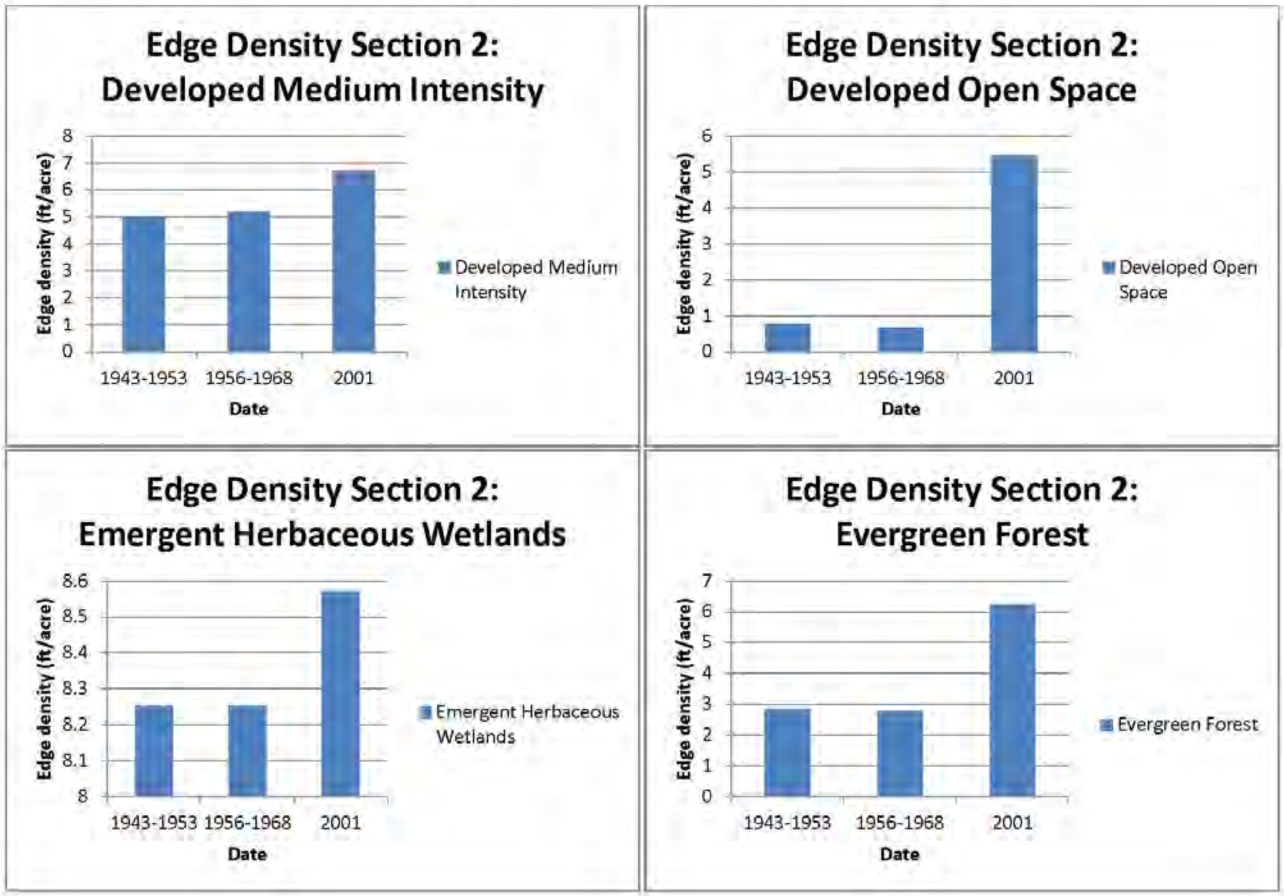

Edge Density Section 1:
Woody Wetlands
Edge density (ft/acre)
2
1.5
1
0.5
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

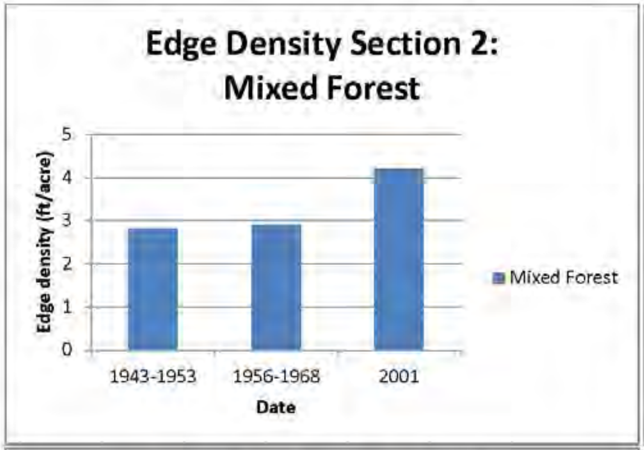

Edge Density Section 2:
Barren Land (Rock/Sand/Clay)
Edge density (ft/acre)
10
8
6
4
2
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

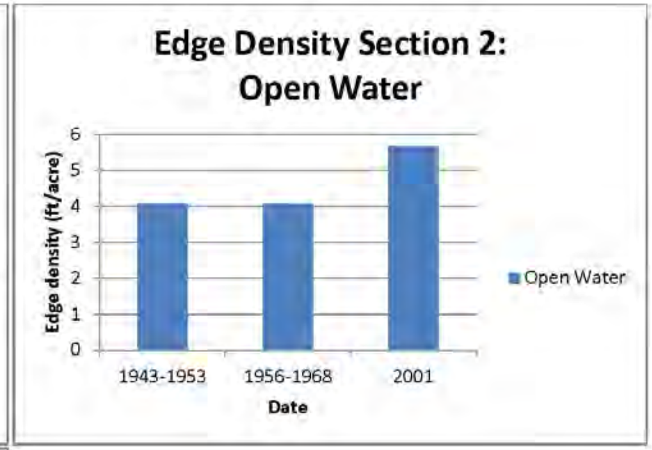

Edge Density Section 2:
Deciduous Forest
Edge density (ft/acre)
2
1.5
1
0.5
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

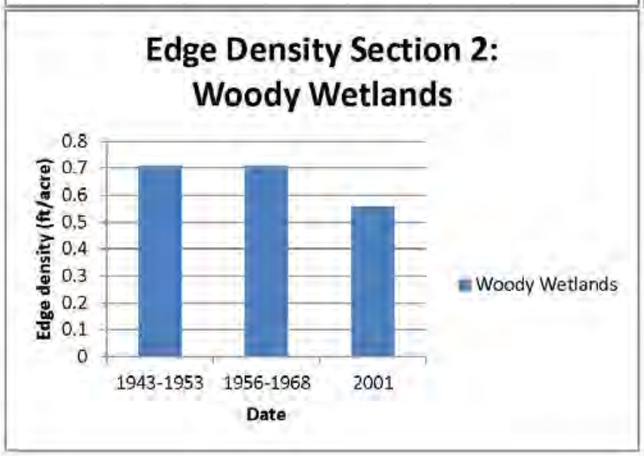

Edge Density Section 2:
Developed High Intensity
Edge density (ft/acre)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

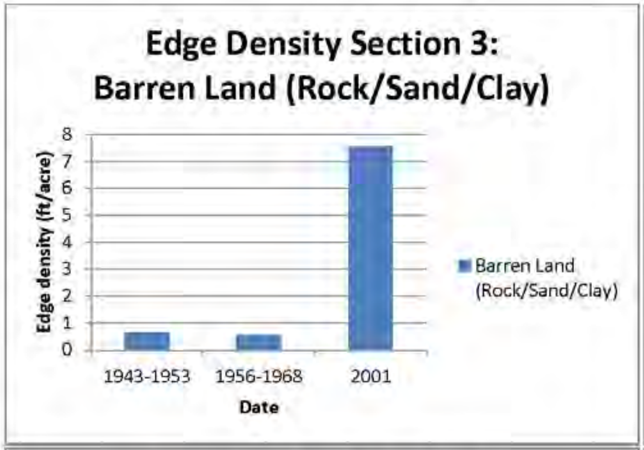

Edge Density Section 2:
Developed Low Intensity
Edge density (ft/acre)
12
10
8
6
4
2
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

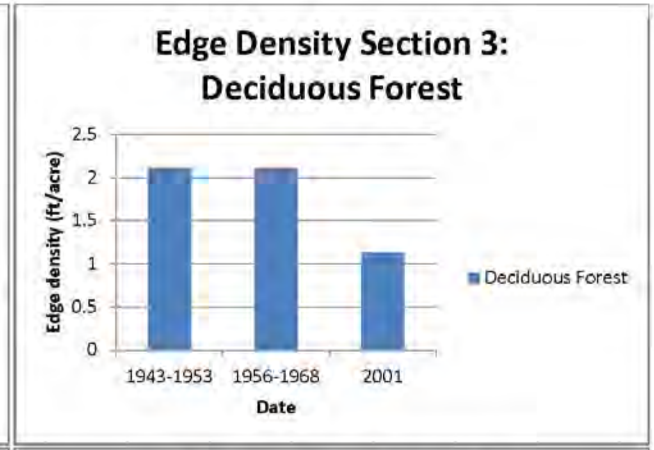

Edge Density Section 2: Developed Medium Intensity
Edge density (ft/acre)
0
1
2
3
4
5
6
7
8
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Edge Density Section 2: Developed Open Space
Edge density (ft/acre)
0
1
2
3
4
5
6
1943-1953
1956-1968
2001
Date
Developed Open Space
Edge Density Section 2: Emergent Herbaceous Wetlands
Edge density (ft/acre)
8
8.1
8.2
8.3
8.4
8.5
8.6
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Edge Density Section 2: Evergreen Forest
Edge density (ft/acre)
0
1
2
3
4
5
6
7
1943-1953
1956-1968
2001
Date
Evergreen Forest

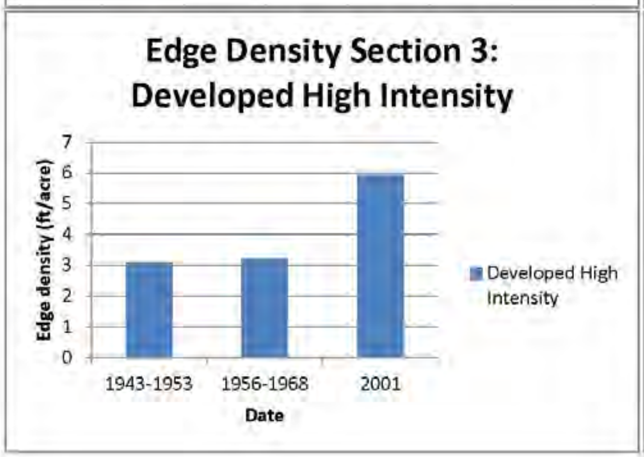

Edge Density Section 2: Mixed Forest
Edge density (ft/acre)
0
1
2
3
4
5
1943-1953
1956-1968
2001
Date
Mixed Forest

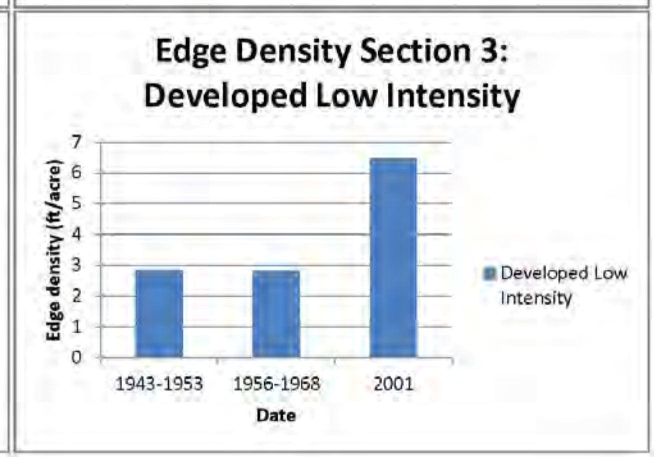

Edge Density Section 2: Open Water
Edge density (ft/acre)
0
1
2
3
4
5
6
1943-1953
1956-1968
2001
Date
Open Water

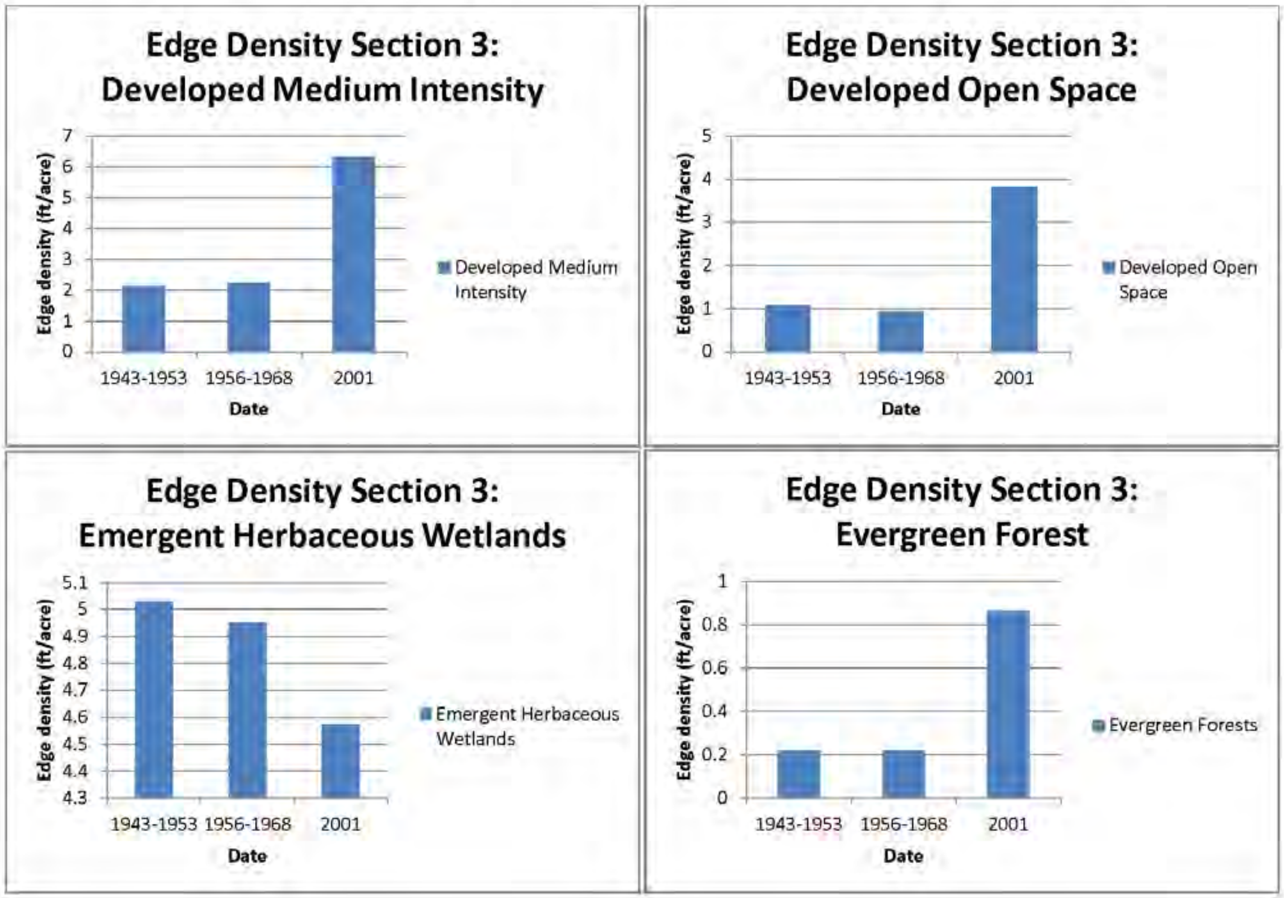

Edge Density Section 2: Woody Wetlands
Edge density (ft/acre)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
1943-1953
1956-1968
2001
Date
Woody Wetlands

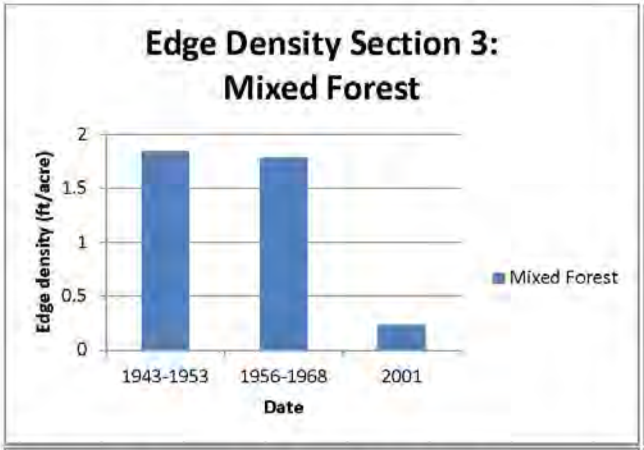

Edge Density Section 3:
Barren Land (Rock/Sand/Clay)
Edge density (ft/acre)
0
1
2
3
4
5
6
7
8
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

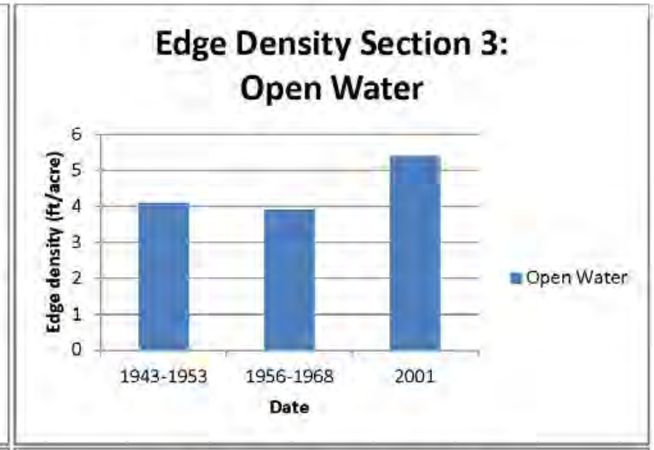

Edge Density Section 3:
Deciduous Forest
Edge density (ft/acre)
0
0.5
1
1.5
2
2.5
1943-1953
1956-1968
2001
Date
Deciduous Forest

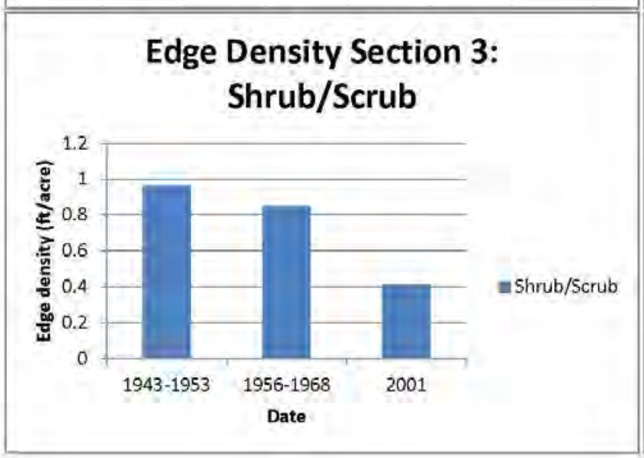

Edge Density Section 3:
Developed High Intensity
Edge density (ft/acre)
0
1
2
3
4
5
6
7
1943-1953
1956-1968
2001
Date
Developed High Intensity

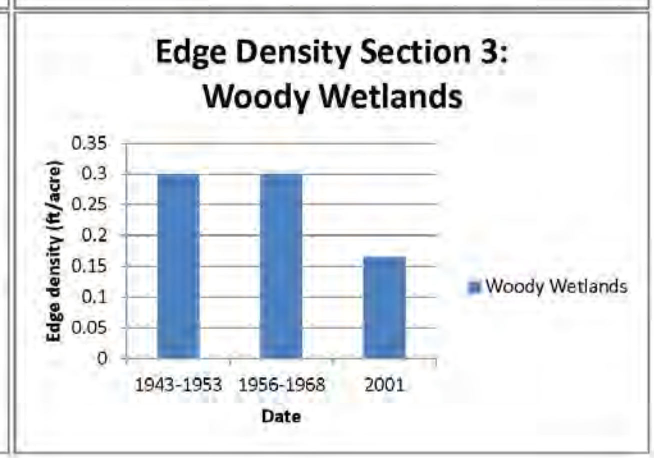

Edge Density Section 3:
Developed Low Intensity
Edge density (ft/acre)
0
1
2
3
4
5
6
7
1943-1953
1956-1968
2001
Date
Developed Low Intensity

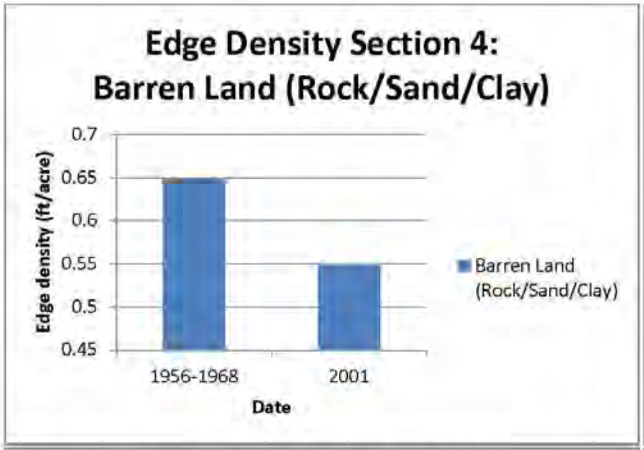

Edge Density Section 3:
Developed Medium Intensity
Edge density (ft/acre)
0
1
2
3
4
5
6
7
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Edge Density Section 3:
Developed Open Space
Edge density (ft/acre)
0
1
2
3
4
5
1943-1953
1956-1968
2001
Date
Developed Open Space
Edge Density Section 3:
Emergent Herbaceous Wetlands
Edge density (ft/acre)
4.3
4.4
4.5
4.6
4.7
4.8
4.9
5
5.1
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Edge Density Section 3:
Evergreen Forest
Edge density (ft/acre)
0
0.2
0.4
0.6
0.8
1
1943-1953
1956-1968
2001
Date
Evergreen Forests

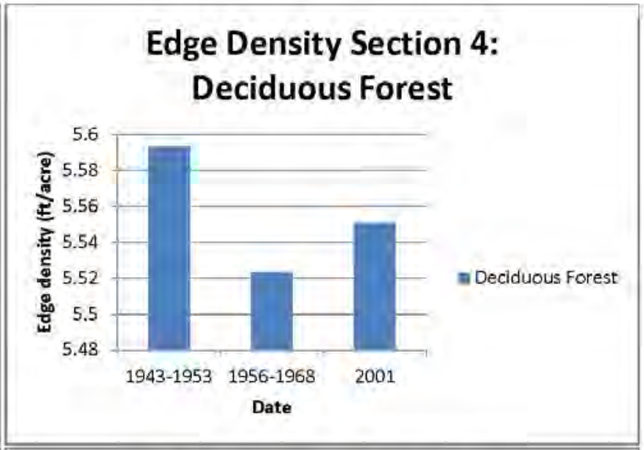

Edge Density Section 3:
Mixed Forest
Edge density (ft/acre)
2
1.5
1
0.5
0
1943-1953
1956-1968
2001
Date
Mixed Forest

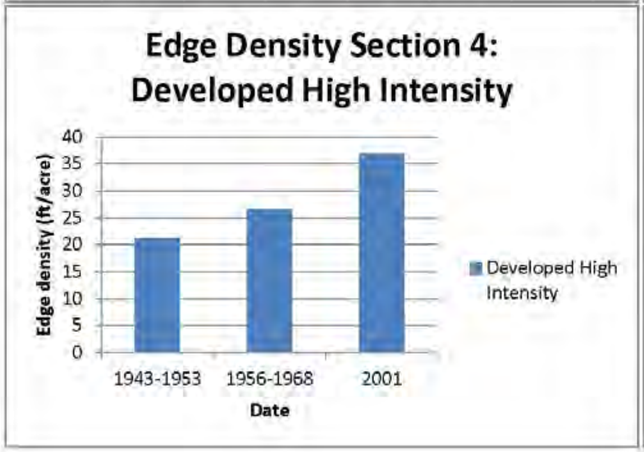

Edge Density Section 3:
Open Water
Edge density (ft/acre)
6
5
4
3
2
1
0
1943-1953
1956-1968
2001
Date
Open Water

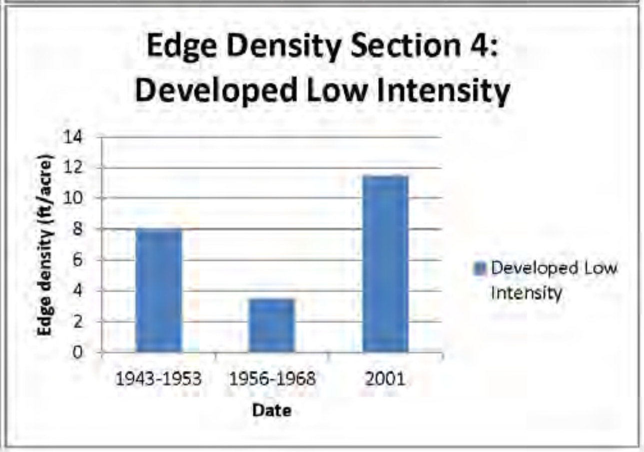

Edge Density Section 3:
Shrub/Scrub
Edge density (ft/acre)
1.2
1
0.8
0.6
0.4
0.2
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

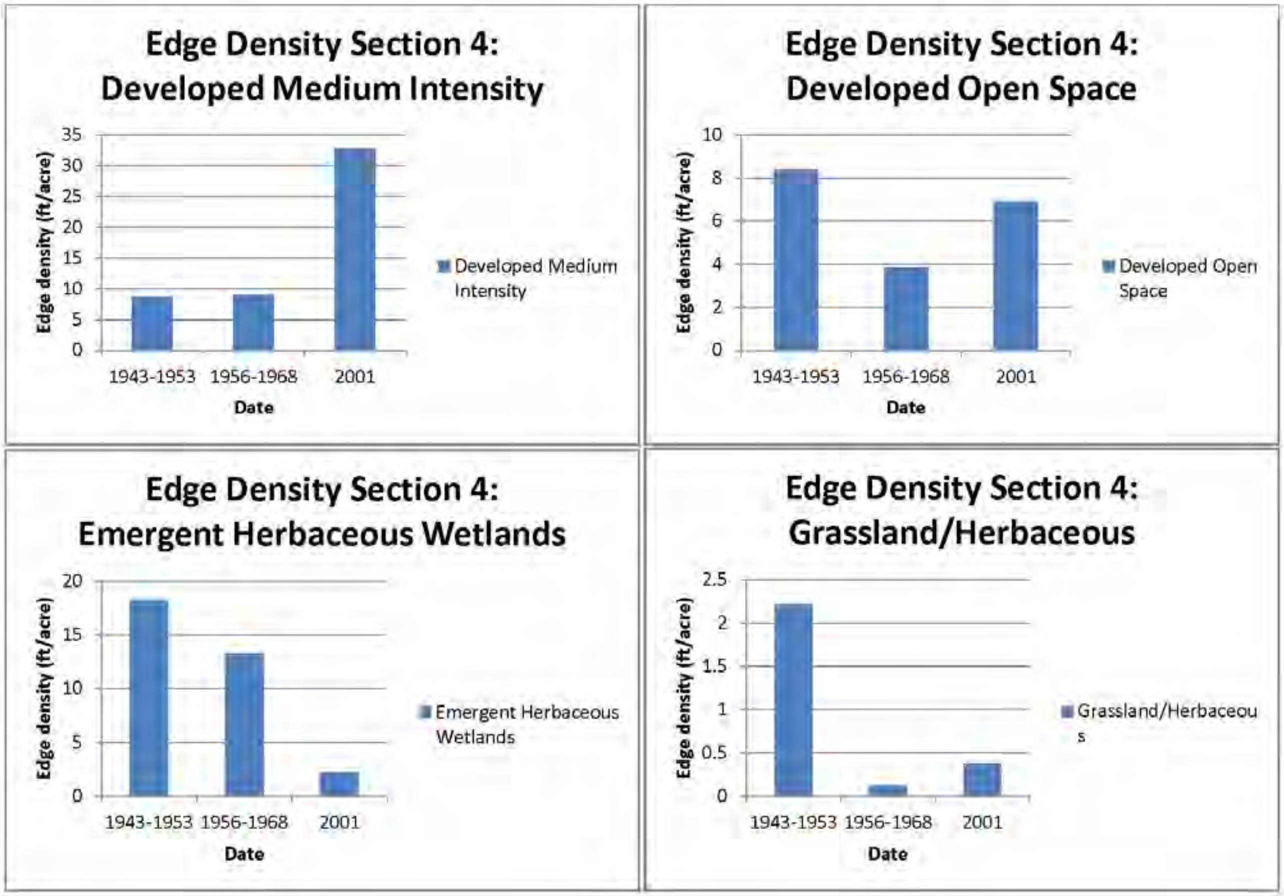

Edge Density Section 3:
Woody Wetlands
Edge density (ft/acre)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

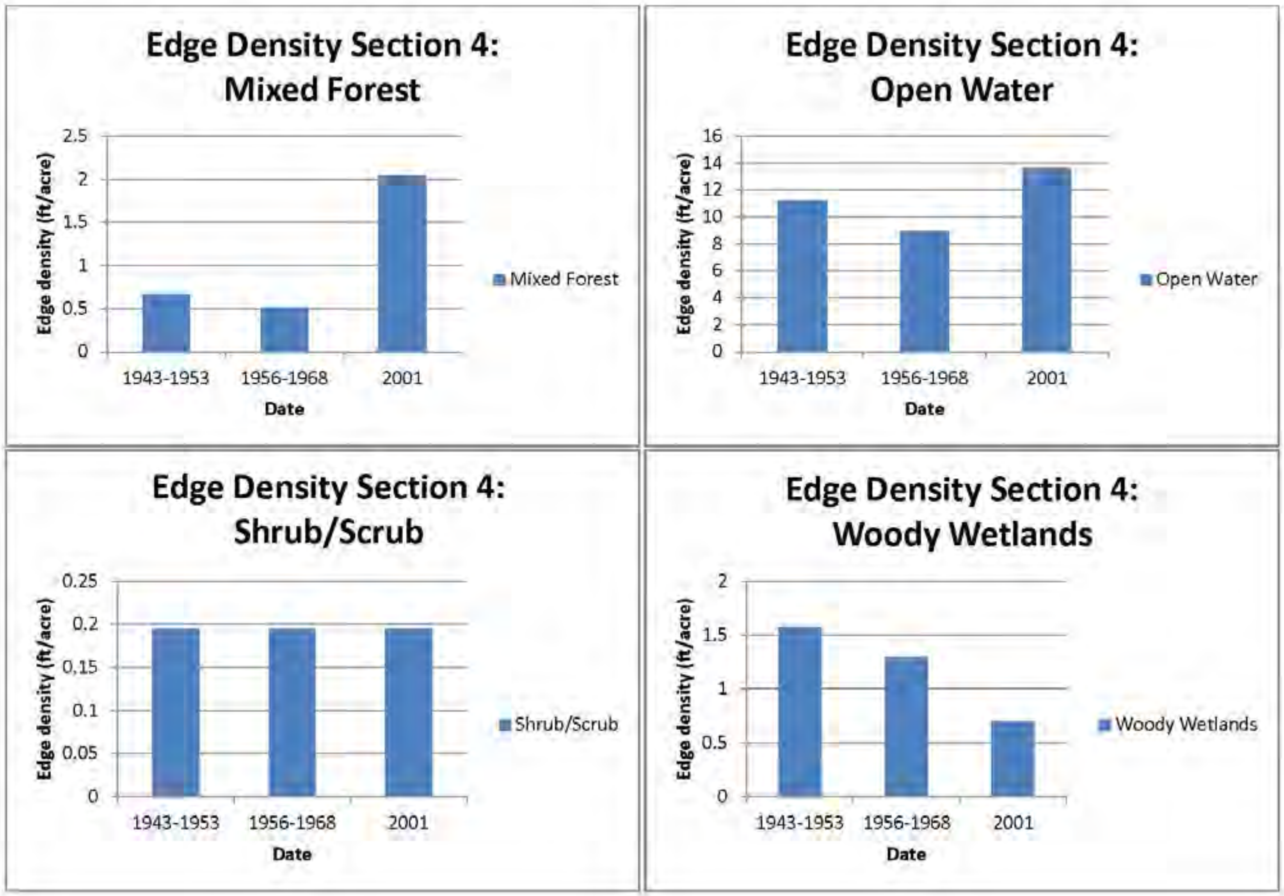

Edge Density Section 4:
Barren Land (Rock/Sand/Clay)
Edge density (ft/acre)
0.7
0.65
0.6
0.55
0.5
0.45
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

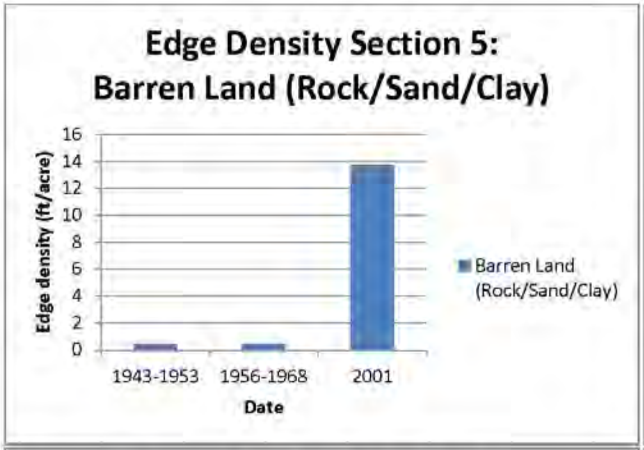

Edge Density Section 4:
Deciduous Forest
Edge density (ft/acre)
5.6
5.58
5.56
5.54
5.52
5.5
5.48
1943-1953
1956-1968
2001
Date
Deciduous Forest

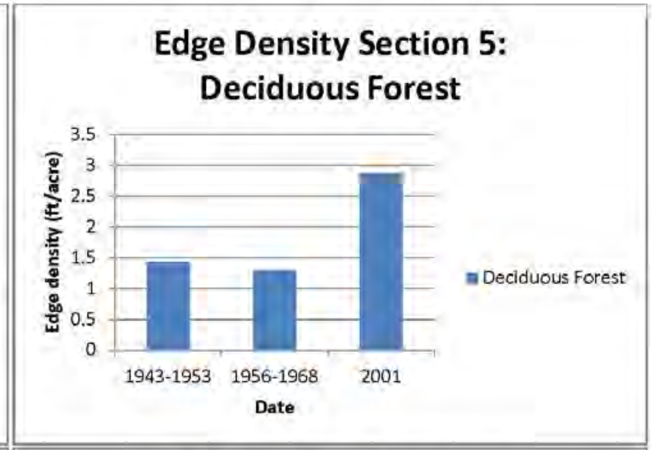

Edge Density Section 4:
Developed High Intensity
Edge density (ft/acre)
40
35
30
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

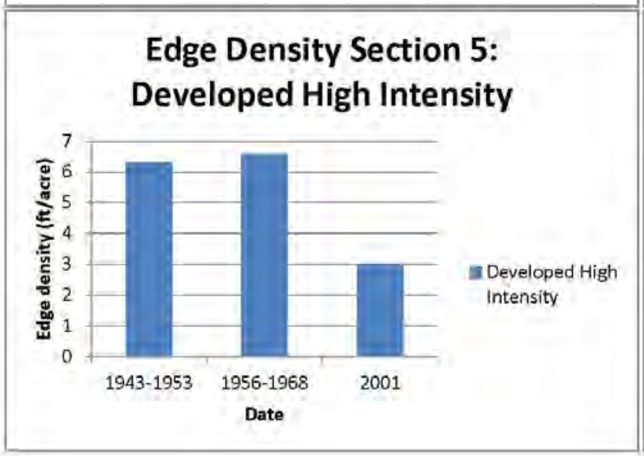

Edge Density Section 4:
Developed Low Intensity
Edge density (ft/acre)
14
12
10
8
6
4
2
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

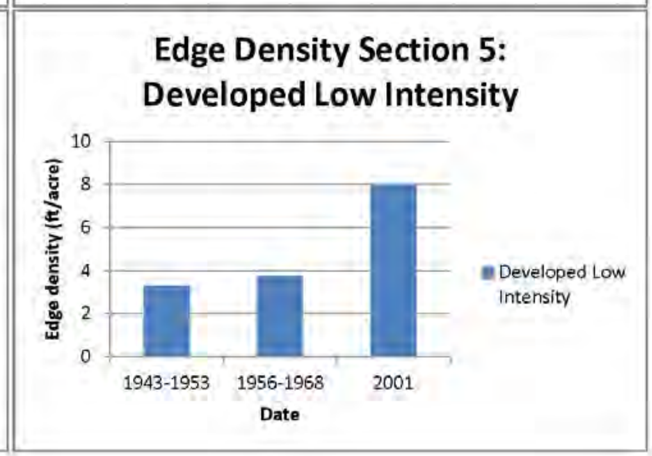

Edge Density Section 4: Developed Medium Intensity
Edge density (ft/acre)
35
30
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Edge Density Section 4: Developed Open Space
Edge density (ft/acre)
10
8
6
4
2
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Edge Density Section 4: Emergent Herbaceous Wetlands
Edge density (ft/acre)
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Edge Density Section 4: Grassland/Herbaceous
Edge density (ft/acre)
2.5
2
1.5
1
0.5
0
1943-1953
1956-1968
2001
Date
Grassland/Herbaceous

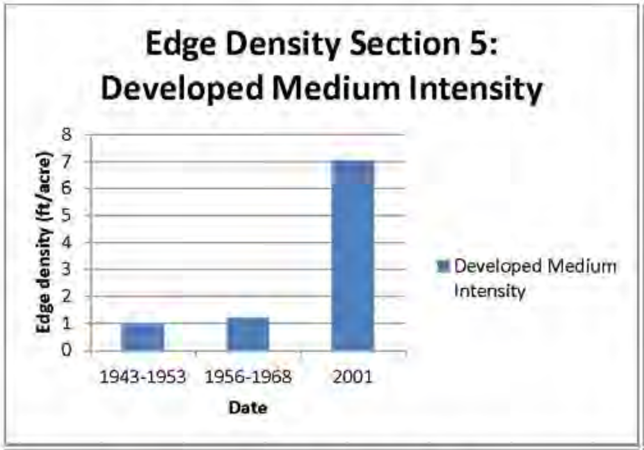

Edge Density Section 4: Mixed Forest
Edge density (ft/acre)
0
0.5
1
1.5
2
2.5
1943-1953
1956-1968
2001
Date
Mixed Forest
Edge Density Section 4: Open Water
Edge density (ft/acre)
0
2
4
6
8
10
12
14
16
1943-1953
1956-1968
2001
Date
Open Water
Edge Density Section 4: Shrub/Scrub
Edge density (ft/acre)
0
0.05
0.1
0.15
0.2
0.25
1943-1953
1956-1968
2001
Date
Shrub/Scrub
Edge Density Section 4: Woody Wetlands
Edge density (ft/acre)
0
0.5
1
1.5
2
1943-1953
1956-1968
2001
Date
Woody Wetlands

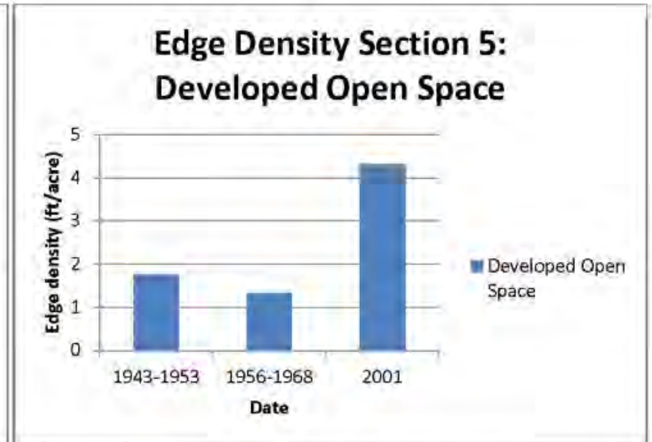

Edge Density Section 5:
Barren Land (Rock/Sand/Clay)
Edge density (ft/acre)
16
14
12
10
8
6
4
2
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

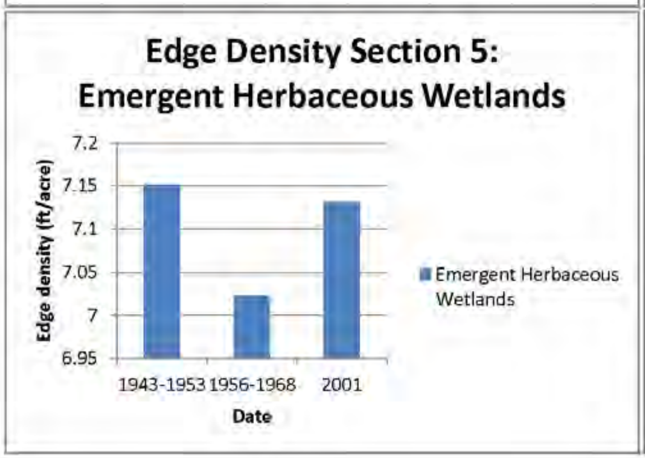

Edge Density Section 5:
Deciduous Forest
Edge density (ft/acre)
3.5
3
2.5
2
1.5
1
0.5
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

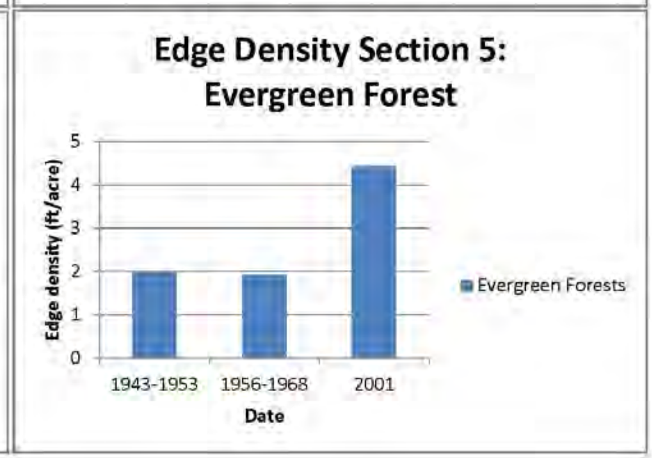

Edge Density Section 5:
Developed High Intensity
Edge density (ft/acre)
7
6
5
4
3
2
1
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

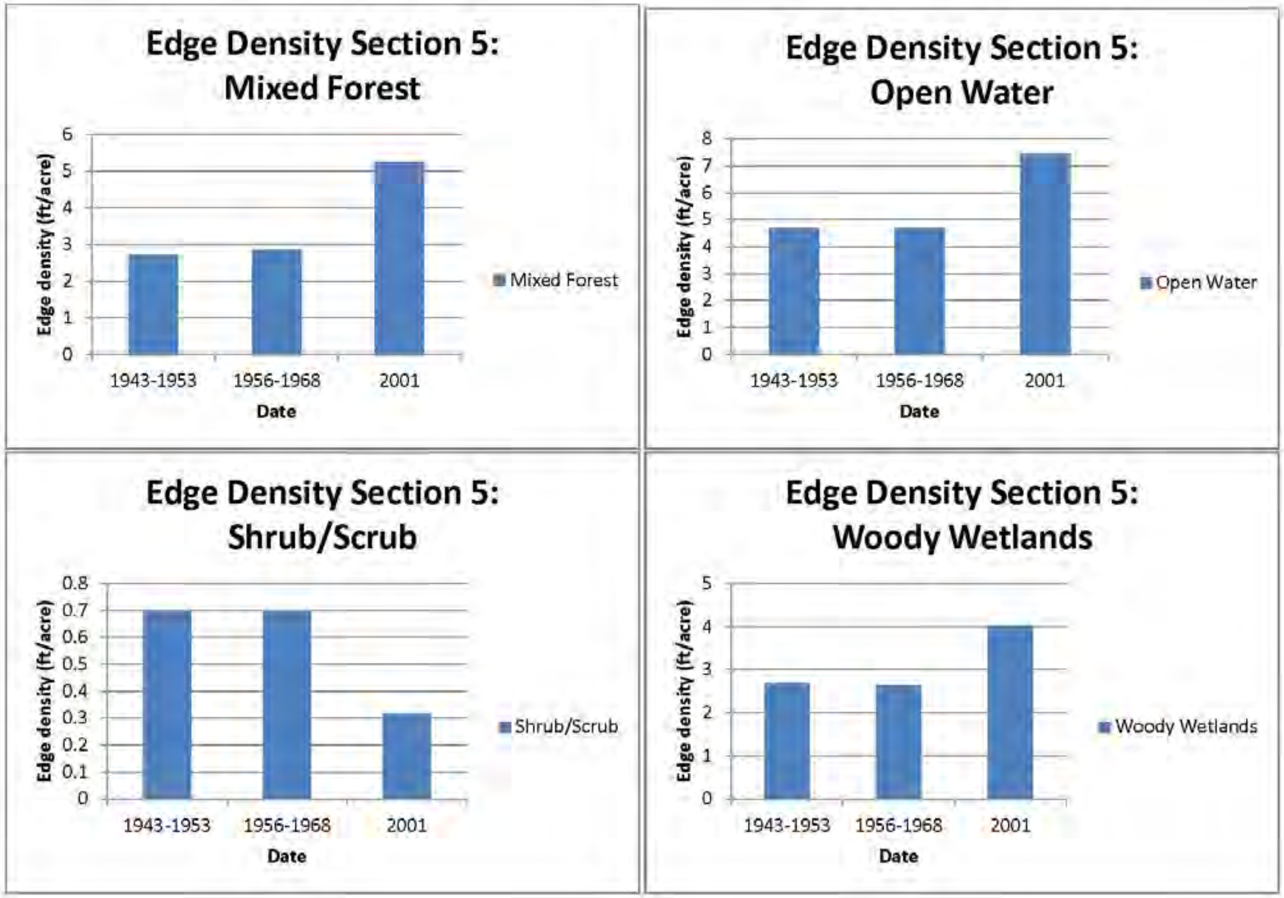

Edge Density Section 5:
Developed Low Intensity
Edge density (ft/acre)
10
8
6
4
2
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

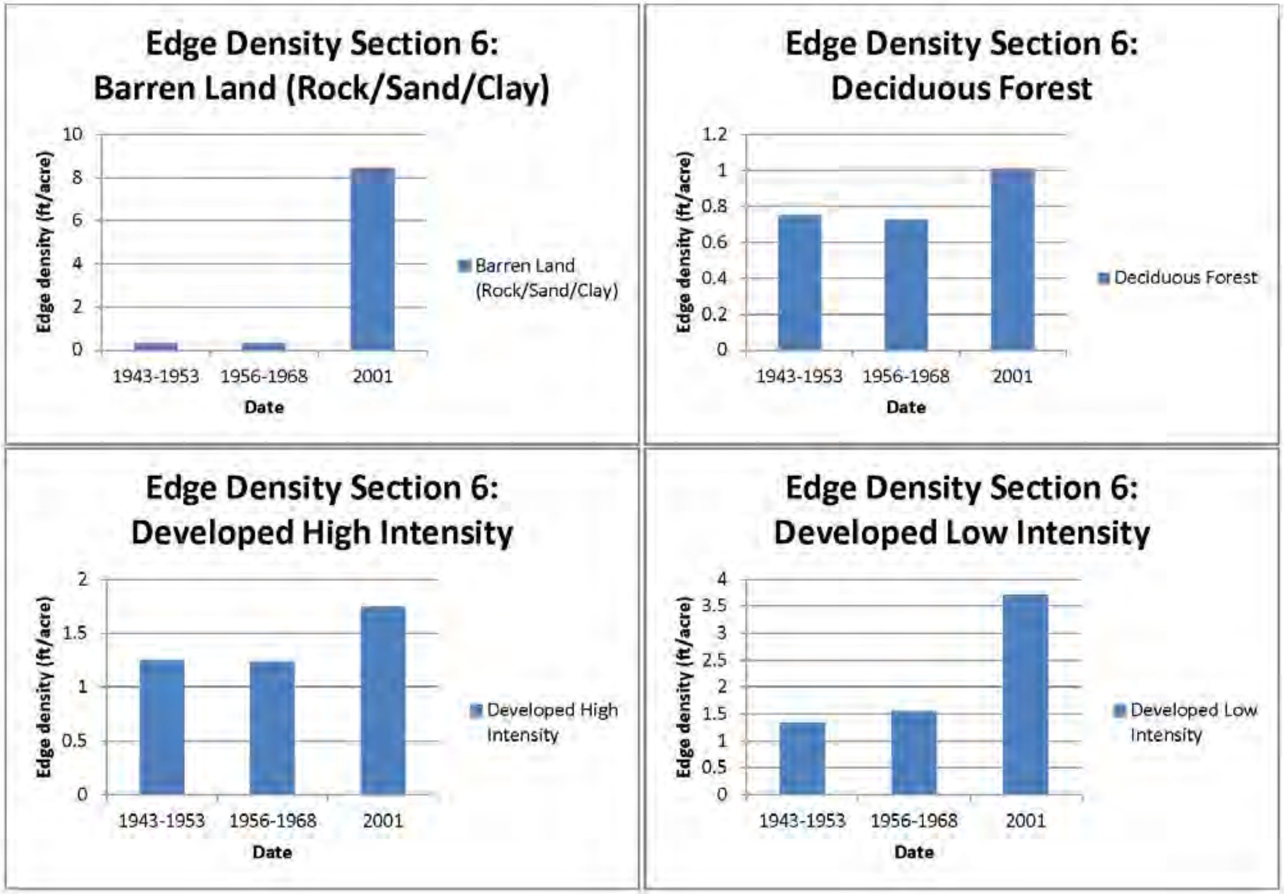

Edge Density Section 5:
Developed Medium Intensity
Edge density (ft/acre)
8
7
6
5
4
3
2
1
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

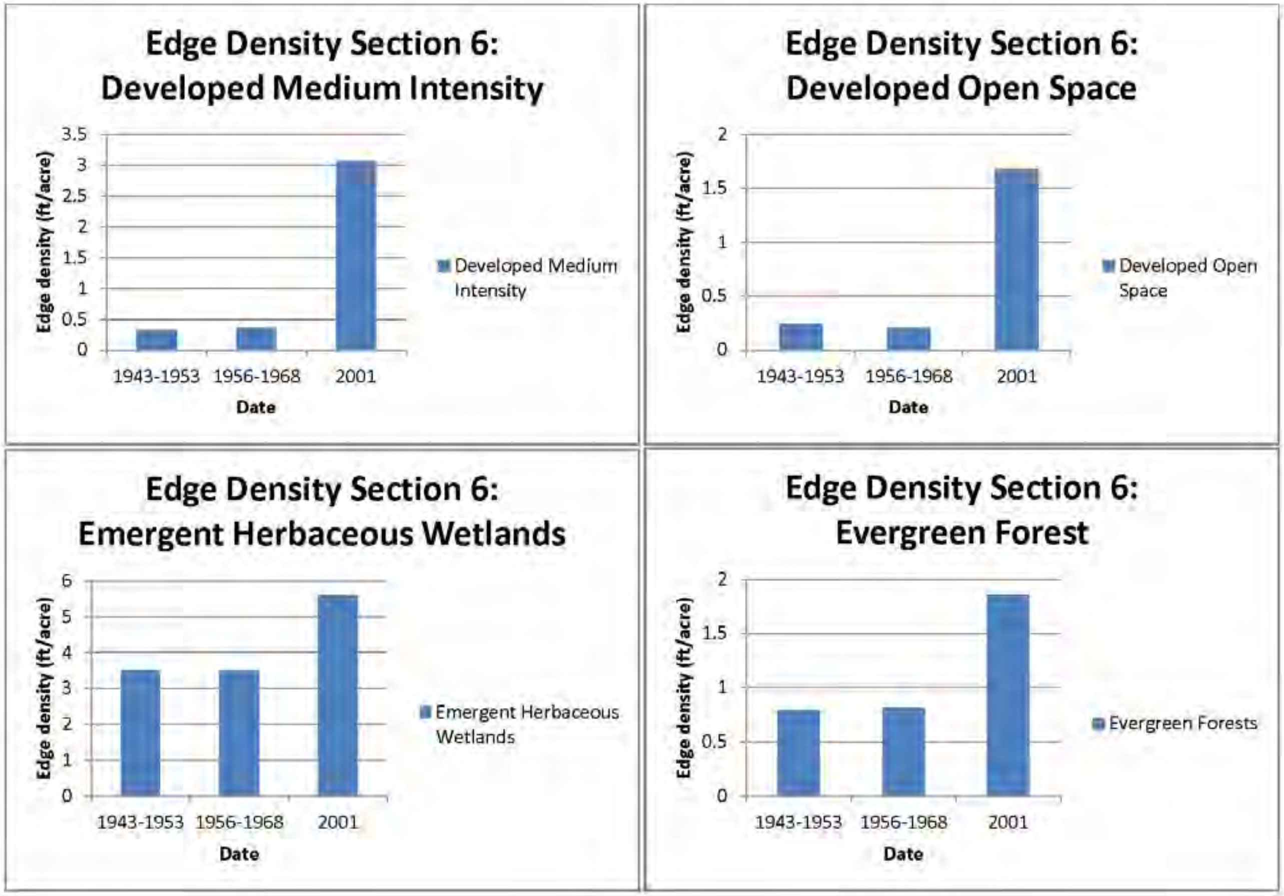

Edge Density Section 5:
Developed Open Space
Edge density (ft/acre)
5
4
3
2
1
0
1943-1953
1956-1968
2001
Date
Developed Open Space

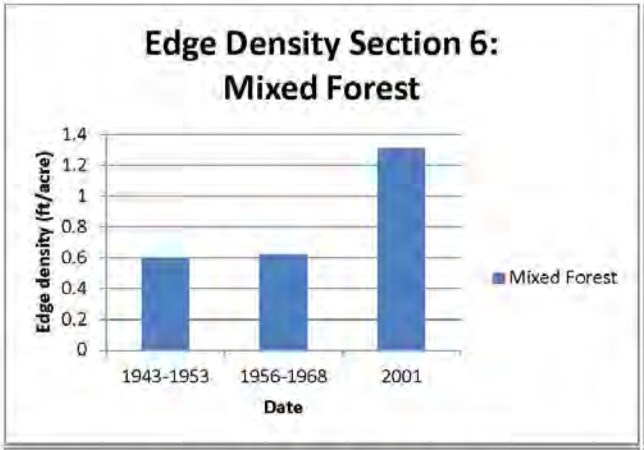

Edge Density Section 5:
Emergent Herbaceous Wetlands
Edge density (ft/acre)
7.2
7.15
7.1
7.05
7
6.95
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

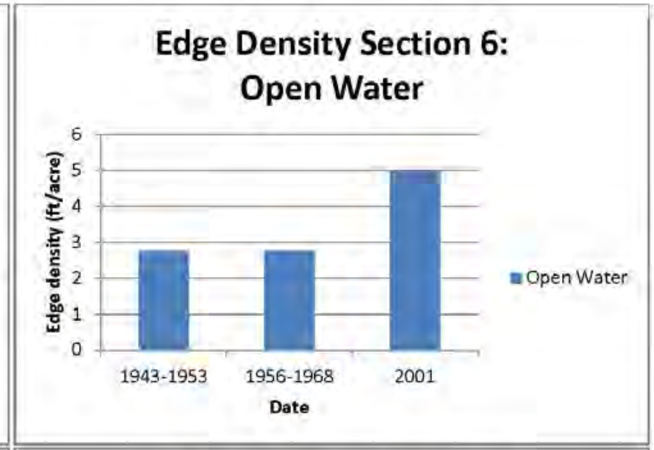

Edge Density Section 5:
Evergreen Forest
Edge density (ft/acre)
5
4
3
2
1
0
1943-1953
1956-1968
2001
Date
Evergreen Forests

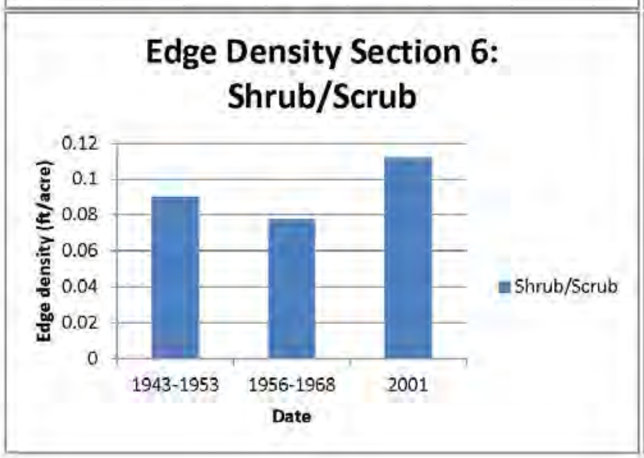

Edge Density Section 5: Mixed Forest
Edge density (ft/acre)
0
1
2
3
4
5
6
1943-1953
1956-1968
2001
Date
Mixed Forest
Edge Density Section 5: Open Water
Edge density (ft/acre)
0
1
2
3
4
5
6
7
8
1943-1953
1956-1968
2001
Date
Open Water
Edge Density Section 5: Shrub/Scrub
Edge density (ft/acre)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
1943-1953
1956-1968
2001
Date
Shrub/Scrub
Edge Density Section 5: Woody Wetlands
Edge density (ft/acre)
0
1
2
3
4
5
1943-1953
1956-1968
2001
Date
Woody Wetlands

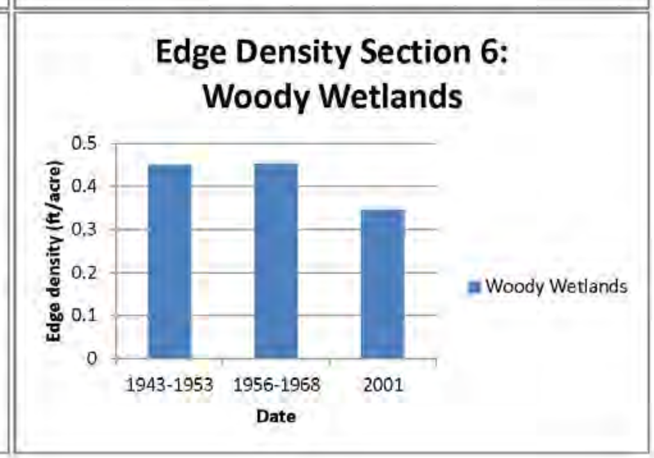

Edge Density Section 6:
Barren Land (Rock/Sand/Clay)
Edge density (ft/acre)
0
2
4
6
8
10
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)
Edge Density Section 6:
Deciduous Forest
Edge density (ft/acre)
0
0.2
0.4
0.6
0.8
1
1.2
1943-1953
1956-1968
2001
Date
Deciduous Forest
Edge Density Section 6:
Developed High Intensity
Edge density (ft/acre)
0
0.5
1
1.5
2
1943-1953
1956-1968
2001
Date
Developed High Intensity
Edge Density Section 6:
Developed Low Intensity
Edge density (ft/acre)
0
0.5
1
1.5
2
2.5
3
3.5
4
1943-1953
1956-1968
2001
Date
Developed Low Intensity

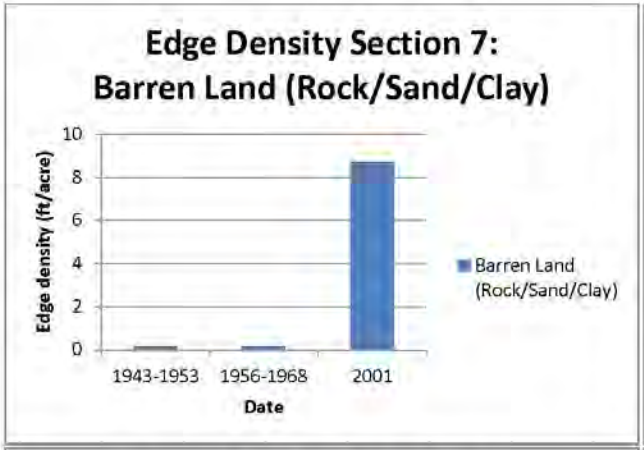

Edge Density Section 6: Developed Medium Intensity
Edge density (ft/acre)
3.5
3
2.5
2
1.5
1
0.5
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Edge Density Section 6: Developed Open Space
Edge density (ft/acre)
2
1.5
1
0.5
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Edge Density Section 6: Emergent Herbaceous Wetlands
Edge density (ft/acre)
6
5
4
3
2
1
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Edge Density Section 6: Evergreen Forest
Edge density (ft/acre)
2
1.5
1
0.5
0
1943-1953
1956-1968
2001
Date
Evergreen Forests

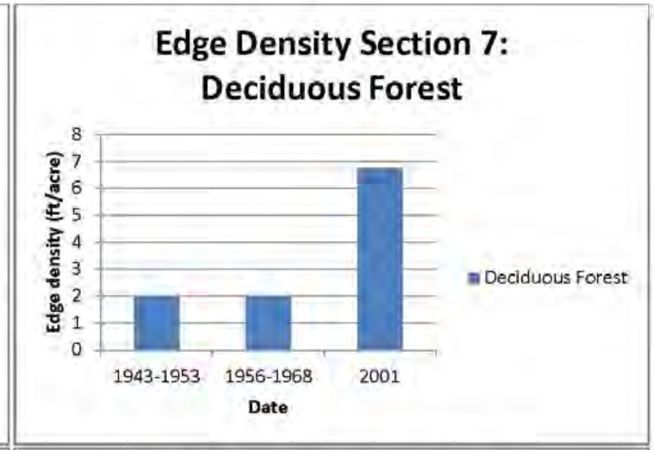

Edge Density Section 6:
Mixed Forest
Edge density (ft/acre)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1943-1953
1956-1968
2001
Date
Mixed Forest

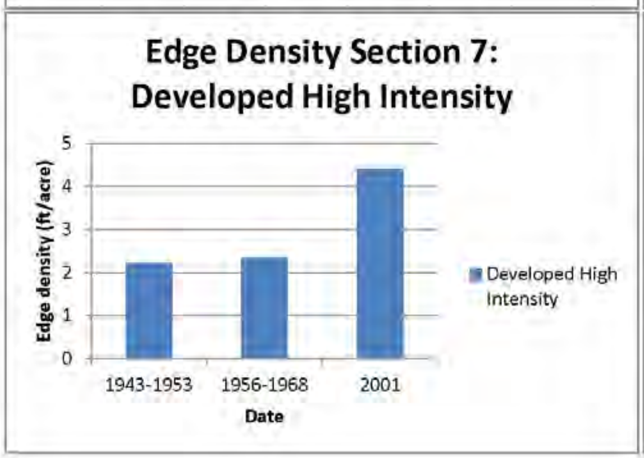

Edge Density Section 6:
Open Water
Edge density (ft/acre)
6
5
4
3
2
1
0
1943-1953
1956-1968
2001
Date
Open Water

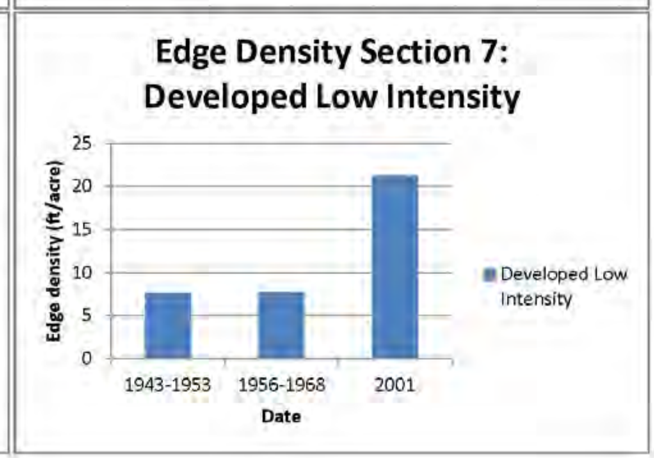

Edge Density Section 6:
Shrub/Scrub
Edge density (ft/acre)
0.12
0.1
0.08
0.06
0.04
0.02
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

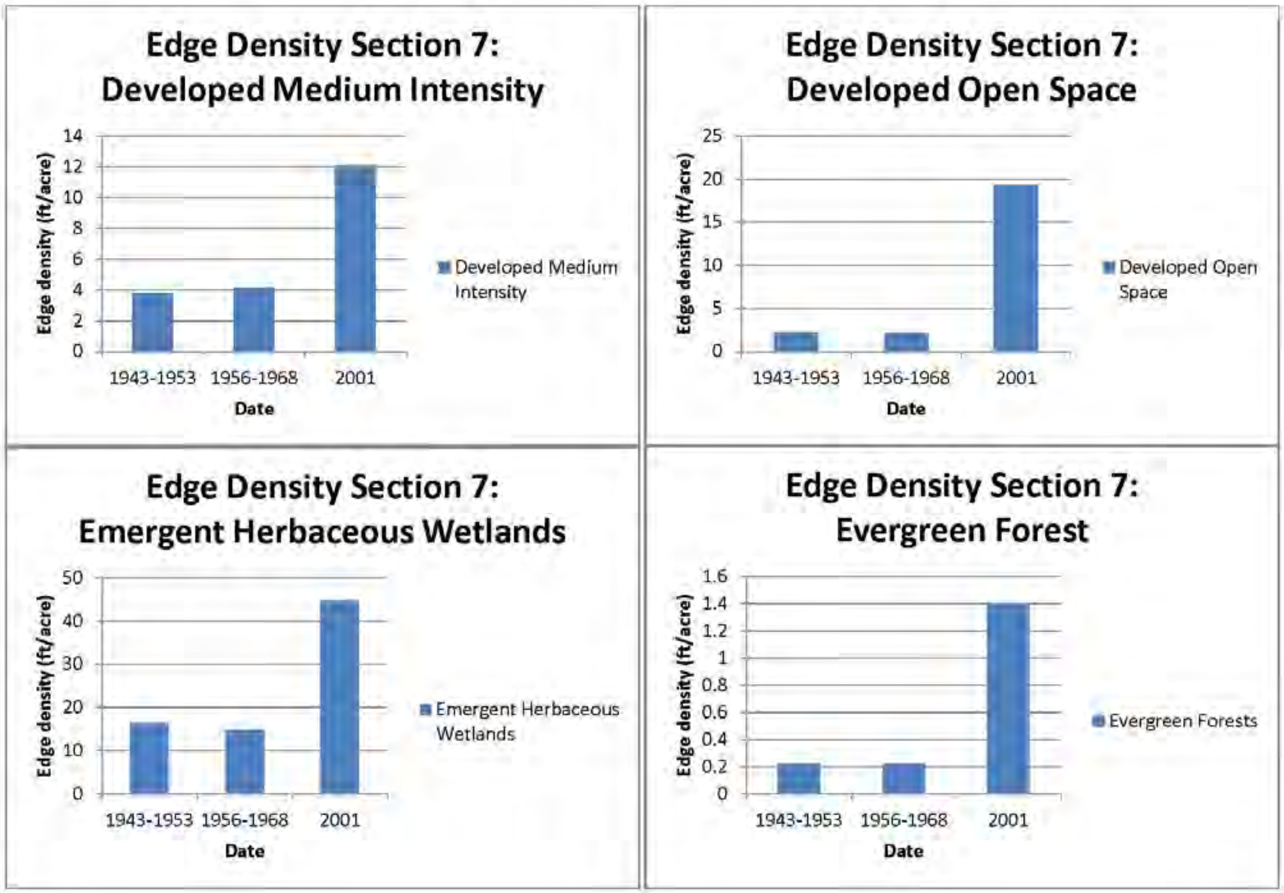

Edge Density Section 6:
Woody Wetlands
Edge density (ft/acre)
0.5
0.4
0.3
0.2
0.1
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

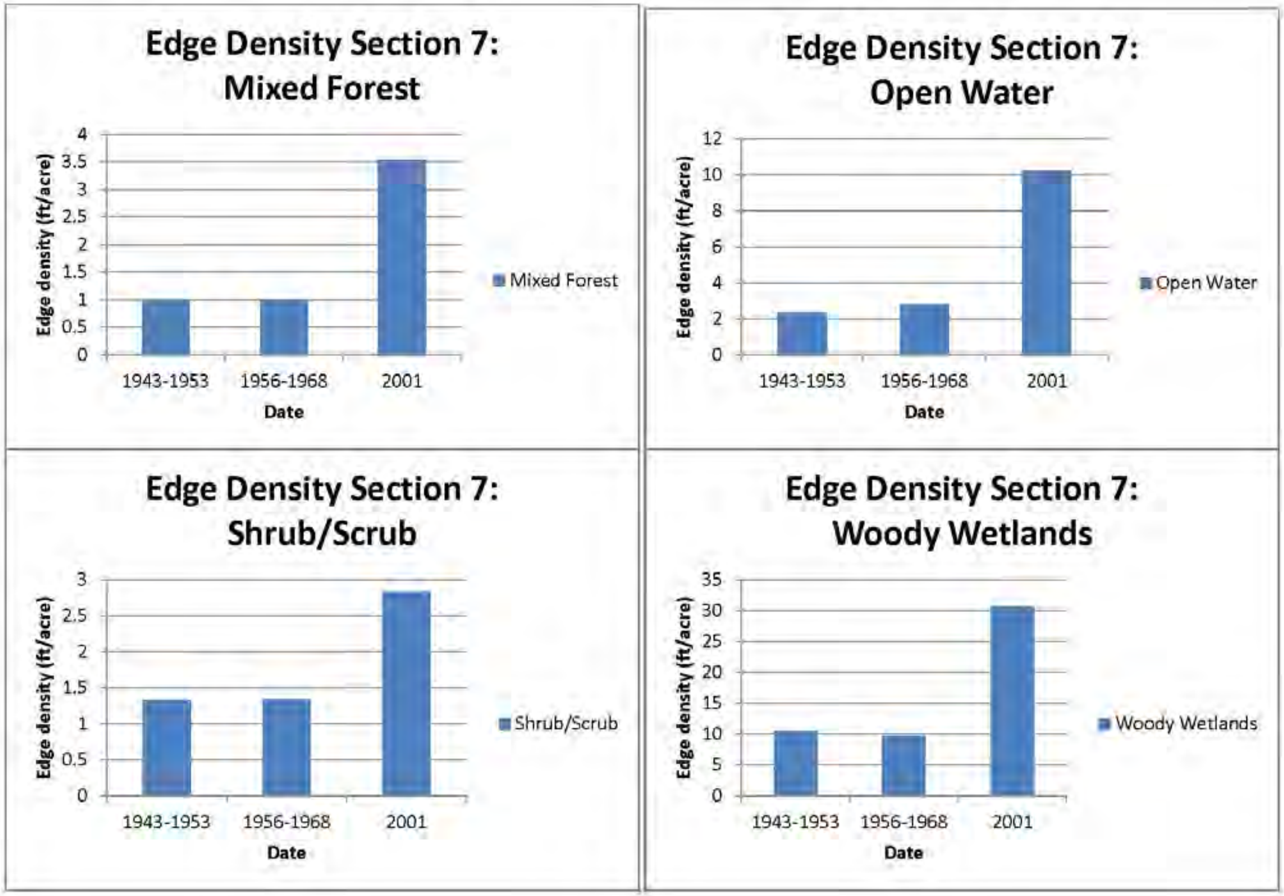

Edge Density Section 7:
Barren Land (Rock/Sand/Clay)
Edge density (ft/acre)
0
2
4
6
8
10
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

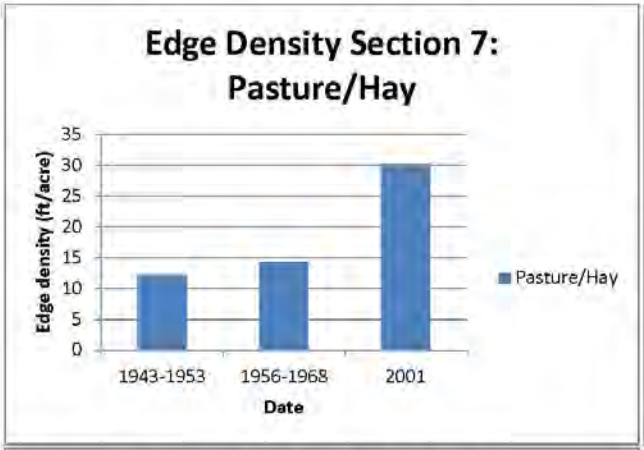

Edge Density Section 7:
Deciduous Forest
Edge density (ft/acre)
0
1
2
3
4
5
6
7
8
1943-1953
1956-1968
2001
Date
Deciduous Forest

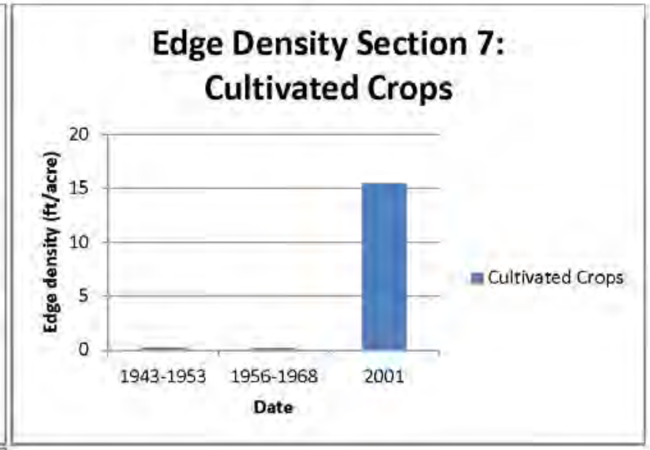

Edge Density Section 7:
Developed High Intensity
Edge density (ft/acre)
0
1
2
3
4
5
1943-1953
1956-1968
2001
Date
Developed High Intensity

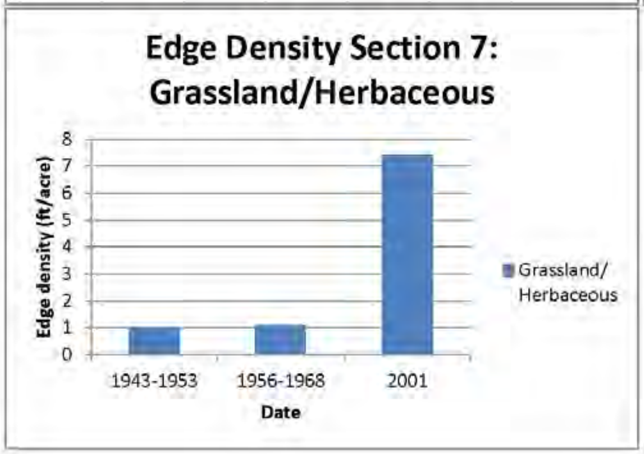

Edge Density Section 7:
Developed Low Intensity
Edge density (ft/acre)
0
5
10
15
20
25
1943-1953
1956-1968
2001
Date
Developed Low Intensity

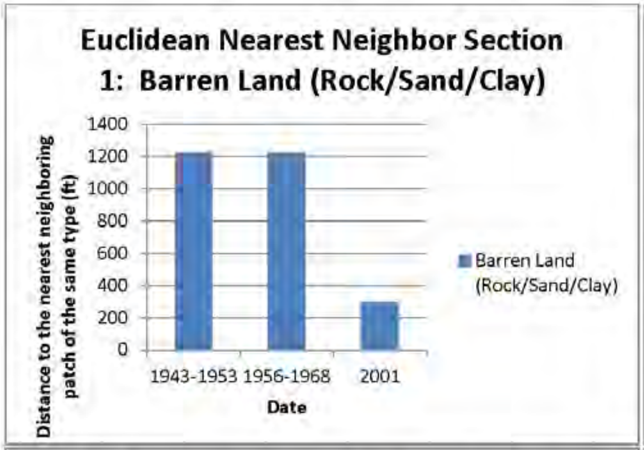

Edge Density Section 7: Developed Medium Intensity
Edge density (ft/acre)
14
12
10
8
6
4
2
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Edge Density Section 7: Developed Open Space
Edge density (ft/acre)
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Edge Density Section 7: Emergent Herbaceous Wetlands
Edge density (ft/acre)
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Edge Density Section 7: Evergreen Forest
Edge density (ft/acre)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1943-1953
1956-1968
2001
Date
Evergreen Forests

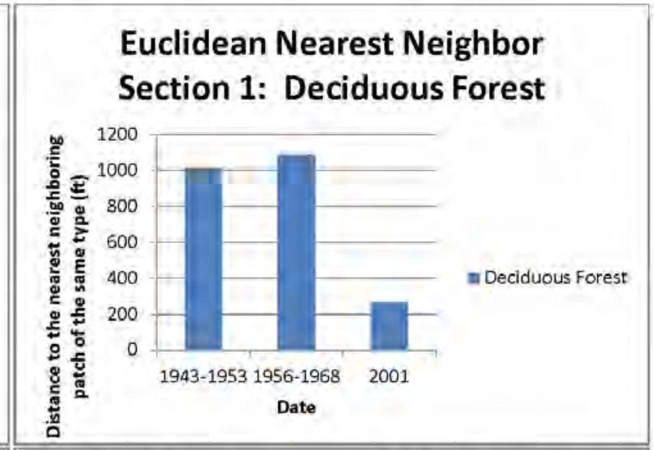

Edge Density Section 7: Mixed Forest
Edge density (ft/acre)
0
0.5
1
1.5
2
2.5
3
3.5
4
1943-1953
1956-1968
2001
Date
Mixed Forest
Edge Density Section 7: Open Water
Edge density (ft/acre)
0
2
4
6
8
10
12
1943-1953
1956-1968
2001
Date
Open Water
Edge Density Section 7: Shrub/Scrub
Edge density (ft/acre)
0
0.5
1
1.5
2
2.5
3
1943-1953
1956-1968
2001
Date
Shrub/Scrub
Edge Density Section 7: Woody Wetlands
Edge density (ft/acre)
0
5
10
15
20
25
30
35
1943-1953
1956-1968
2001
Date
Woody Wetlands

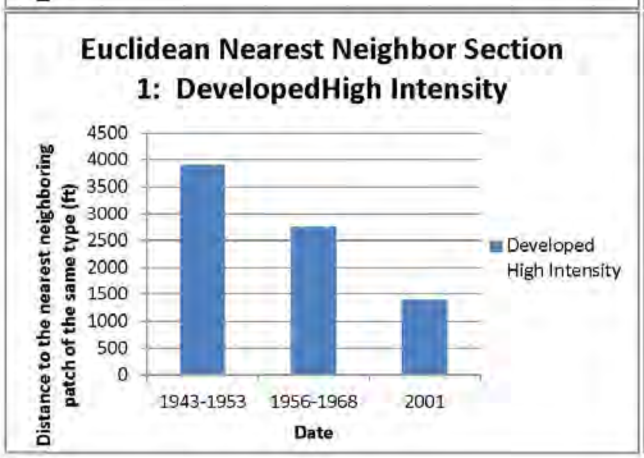

Edge Density Section 7: Pasture/Hay
Edge density (ft/acre)
35
30
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Pasture/Hay

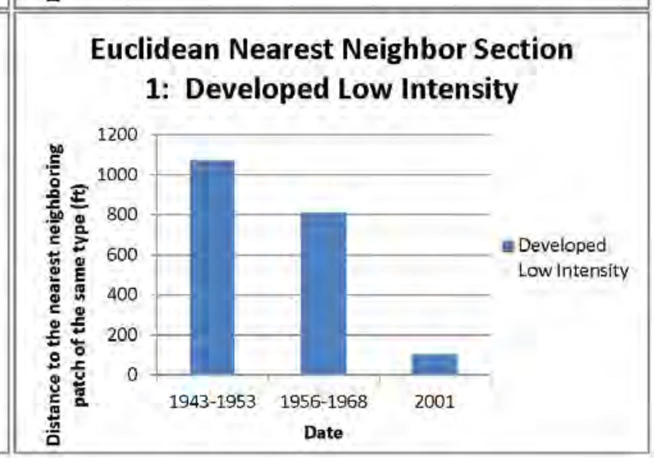

Edge Density Section 7: Cultivated Crops
Edge density (ft/acre)
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Cultivated Crops

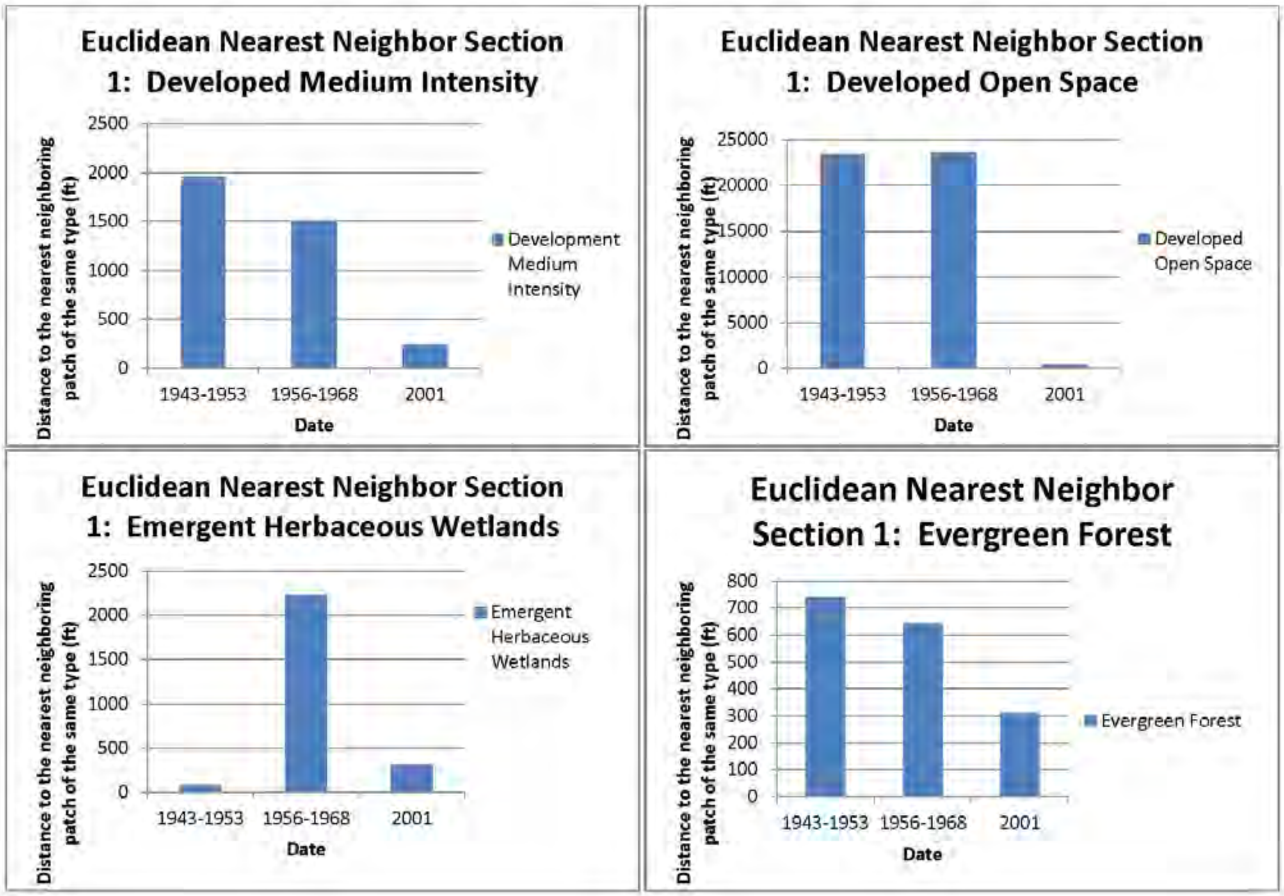

Edge Density Section 7: Grassland/Herbaceous
Edge density (ft/acre)
8
7
6
5
4
3
2
1
0
1943-1953
1956-1968
2001
Date
Grassland/ Herbaceous

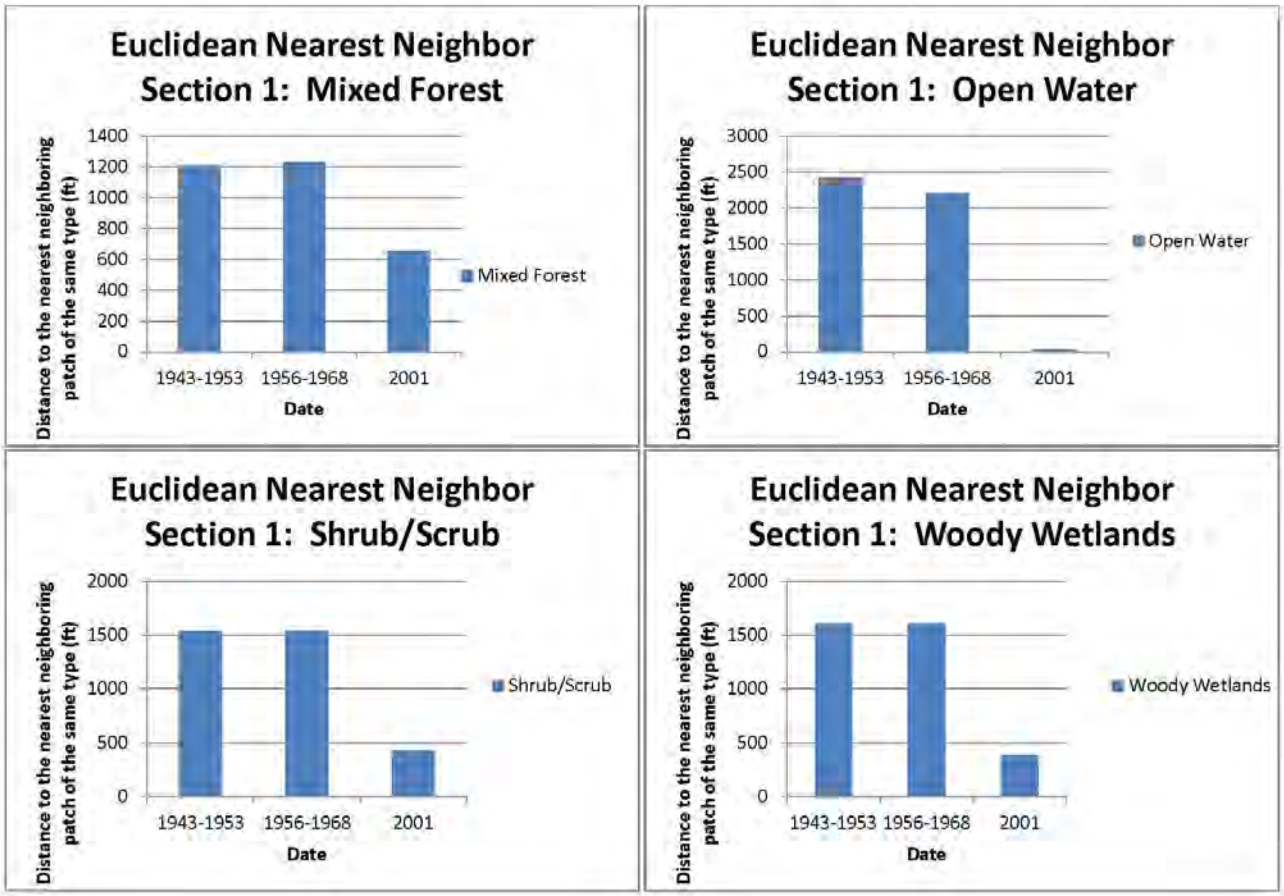

Euclidean Nearest Neighbor Section 1: Barren Land (Rock/Sand/Clay)
Distance to the nearest neighboring patch of the same type (ft)
1400
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

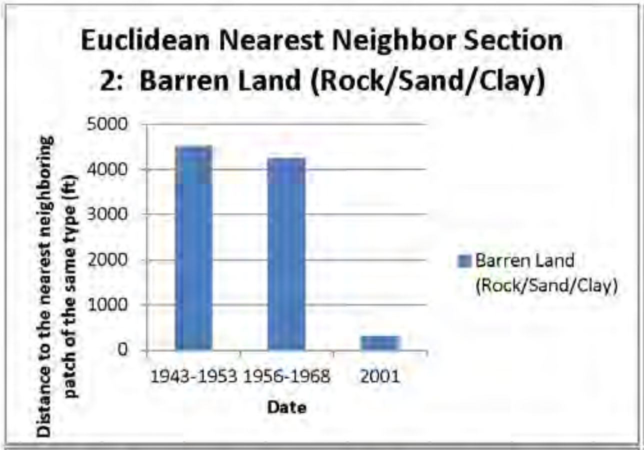

Euclidean Nearest Neighbor Section 1: Deciduous Forest
Distance to the nearest neighboring patch of the same type (ft)
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

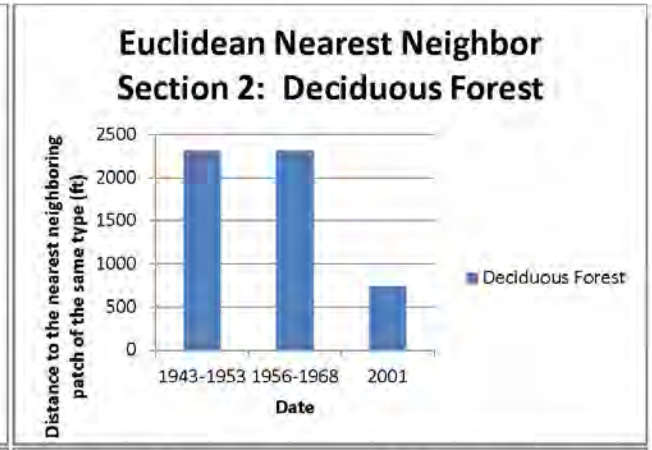

Euclidean Nearest Neighbor Section 1: DevelopedHigh Intensity
Distance to the nearest neighboring patch of the same type (ft)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

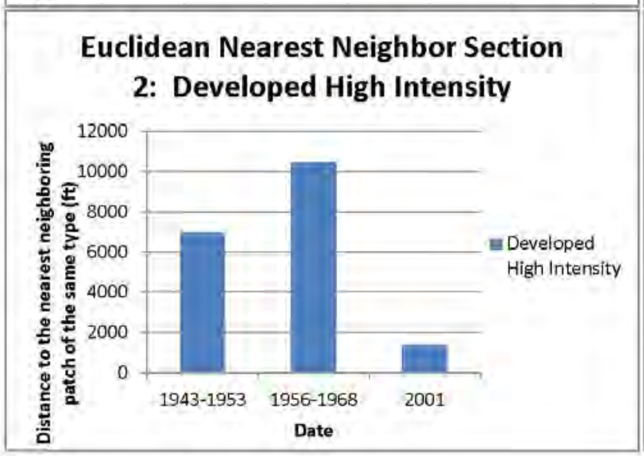

Euclidean Nearest Neighbor Section 1: Developed Low Intensity
Distance to the nearest neighboring patch of the same type (ft)
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

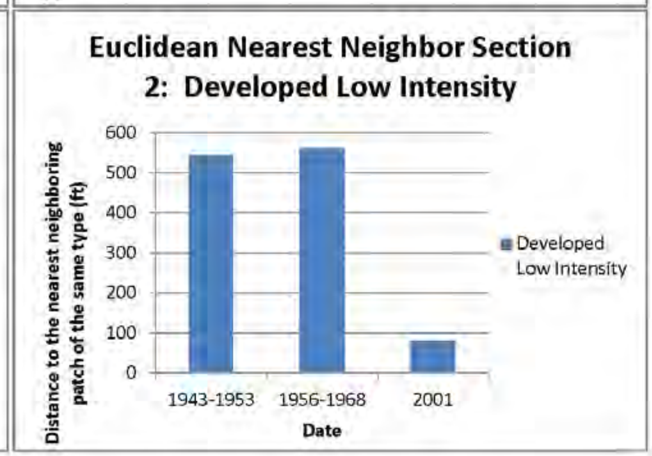

Euclidean Nearest Neighbor Section 1: Developed Medium Intensity
Distance to the nearest neighboring patch of the same type (ft)
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Development Medium Intensity
Euclidean Nearest Neighbor Section 1: Developed Open Space
Distance to the nearest neighboring patch of the same type (ft)
25000
20000
15000
10000
5000
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Euclidean Nearest Neighbor Section 1: Emergent Herbaceous Wetlands
Distance to the nearest neighboring patch of the same type (ft)
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Euclidean Nearest Neighbor Section 1: Evergreen Forest
Distance to the nearest neighboring patch of the same type (ft)
800
700
600
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

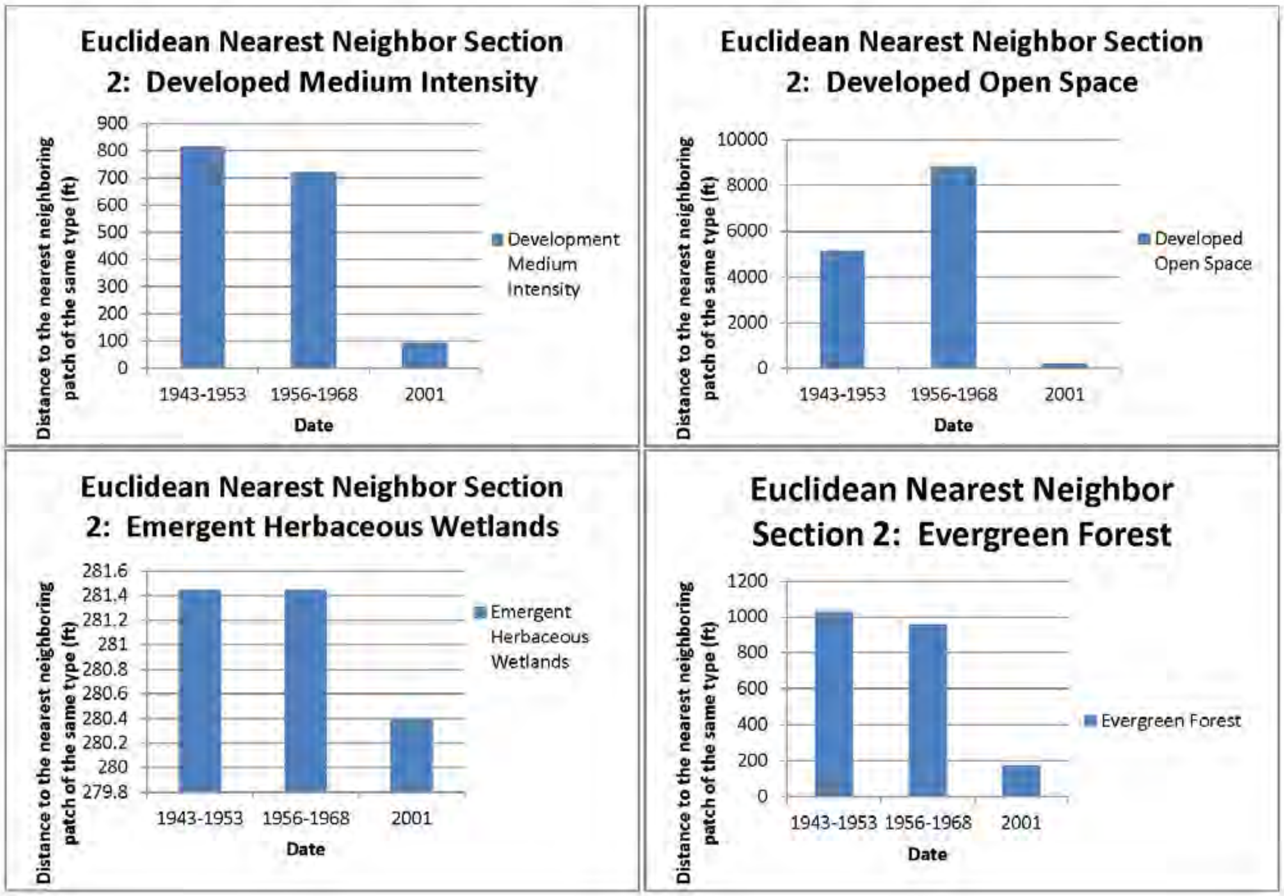

Euclidean Nearest Neighbor
Section 1: Mixed Forest
Distance to the nearest neighboring patch of the same type (ft)
1400
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Mixed Forest
Euclidean Nearest Neighbor
Section 1: Open Water
Distance to the nearest neighboring patch of the same type (ft)
3000
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Open Water
Euclidean Nearest Neighbor
Section 1: Shrub/Scrub
Distance to the nearest neighboring patch of the same type (ft)
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub
Euclidean Nearest Neighbor
Section 1: Woody Wetlands
Distance to the nearest neighboring patch of the same type (ft)
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

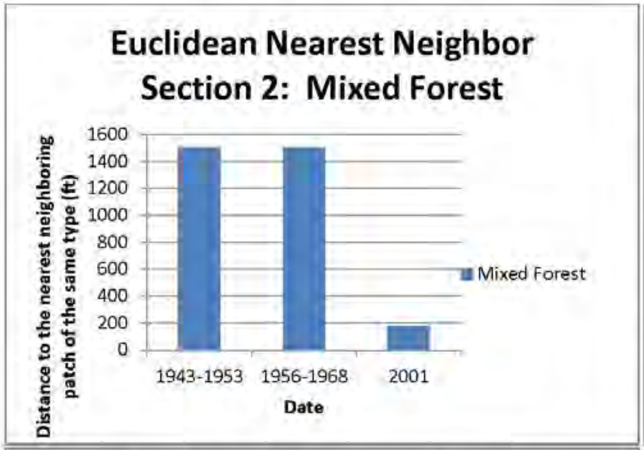

Euclidean Nearest Neighbor Section 2: Barren Land (Rock/Sand/Clay)
Distance to the nearest neighboring patch of the same type (ft)
5000
4000
3000
2000
1000
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

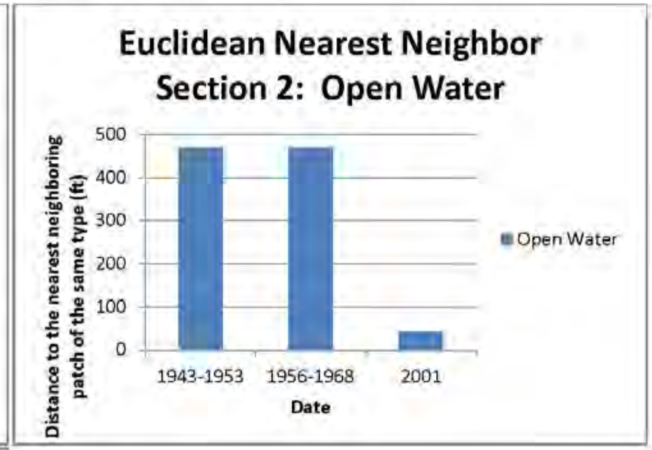

Euclidean Nearest Neighbor Section 2: Deciduous Forest
Distance to the nearest neighboring patch of the same type (ft)
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

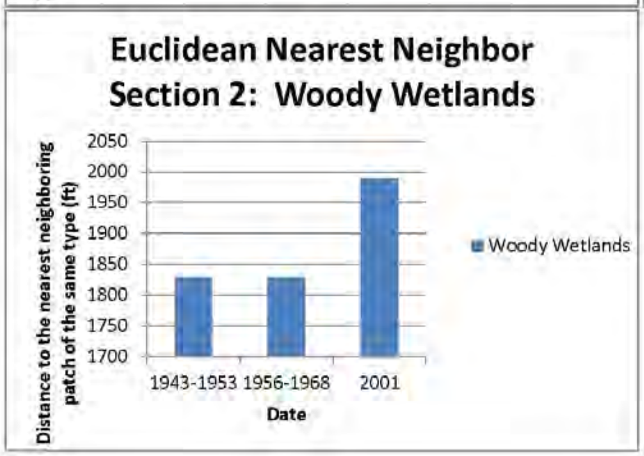

Euclidean Nearest Neighbor Section 2: Developed High Intensity
Distance to the nearest neighboring patch of the same type (ft)
12000
10000
8000
6000
4000
2000
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

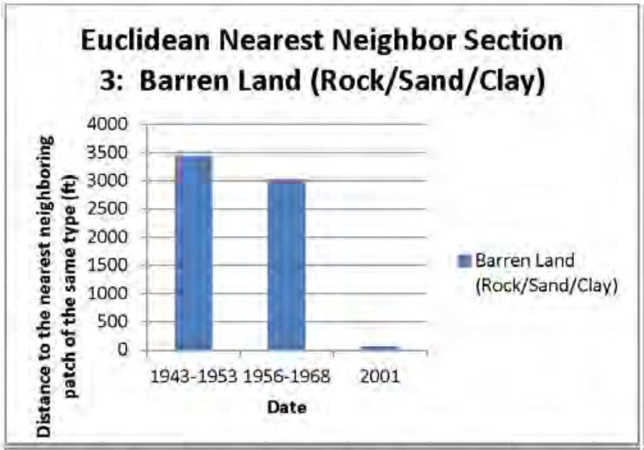

Euclidean Nearest Neighbor Section 2: Developed Low Intensity
Distance to the nearest neighboring patch of the same type (ft)
600
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

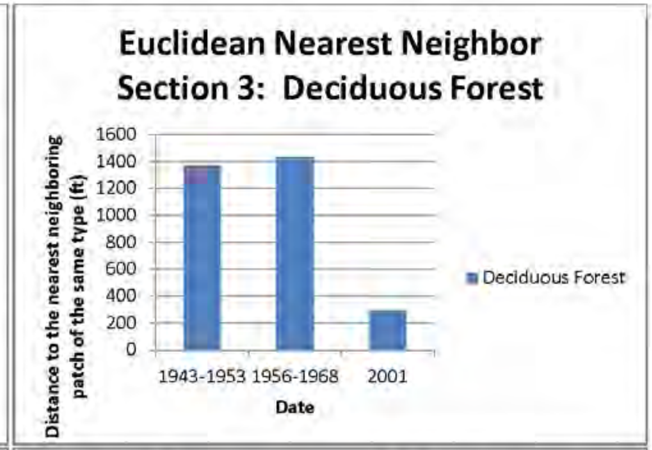

Euclidean Nearest Neighbor Section 2: Developed Medium Intensity
Distance to the nearest neighboring patch of the same type (ft)
900
800
700
600
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Development Medium Intensity
Euclidean Nearest Neighbor Section 2: Developed Open Space
Distance to the nearest neighboring patch of the same type (ft)
10000
8000
6000
4000
2000
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Euclidean Nearest Neighbor Section 2: Emergent Herbaceous Wetlands
Distance to the nearest neighboring patch of the same type (ft)
281.6
281.4
281.2
281
280.8
280.6
280.4
280.2
280
279.8
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Euclidean Nearest Neighbor Section 2: Evergreen Forest
Distance to the nearest neighboring patch of the same type (ft)
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

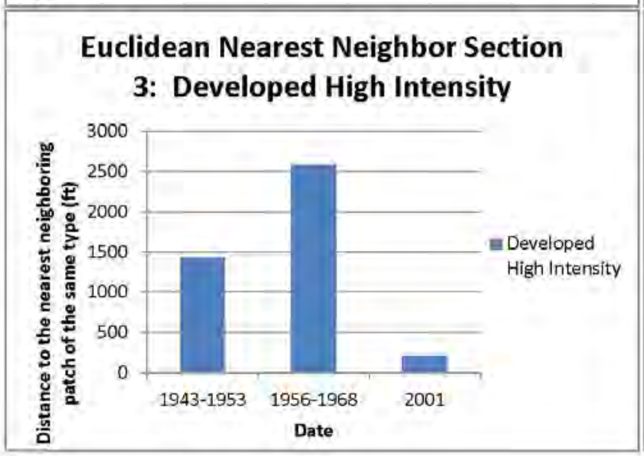

Euclidean Nearest Neighbor
Section 2: Mixed Forest
Distance to the nearest neighboring patch of the same type (ft)
1600
1400
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Mixed Forest

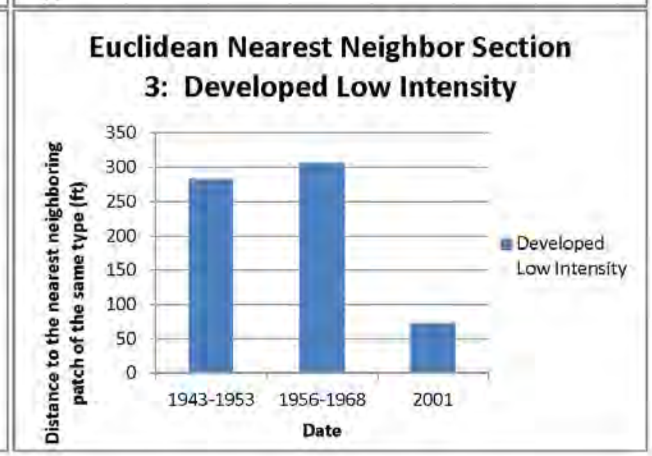

Euclidean Nearest Neighbor
Section 2: Open Water
Distance to the nearest neighboring patch of the same type (ft)
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Open Water

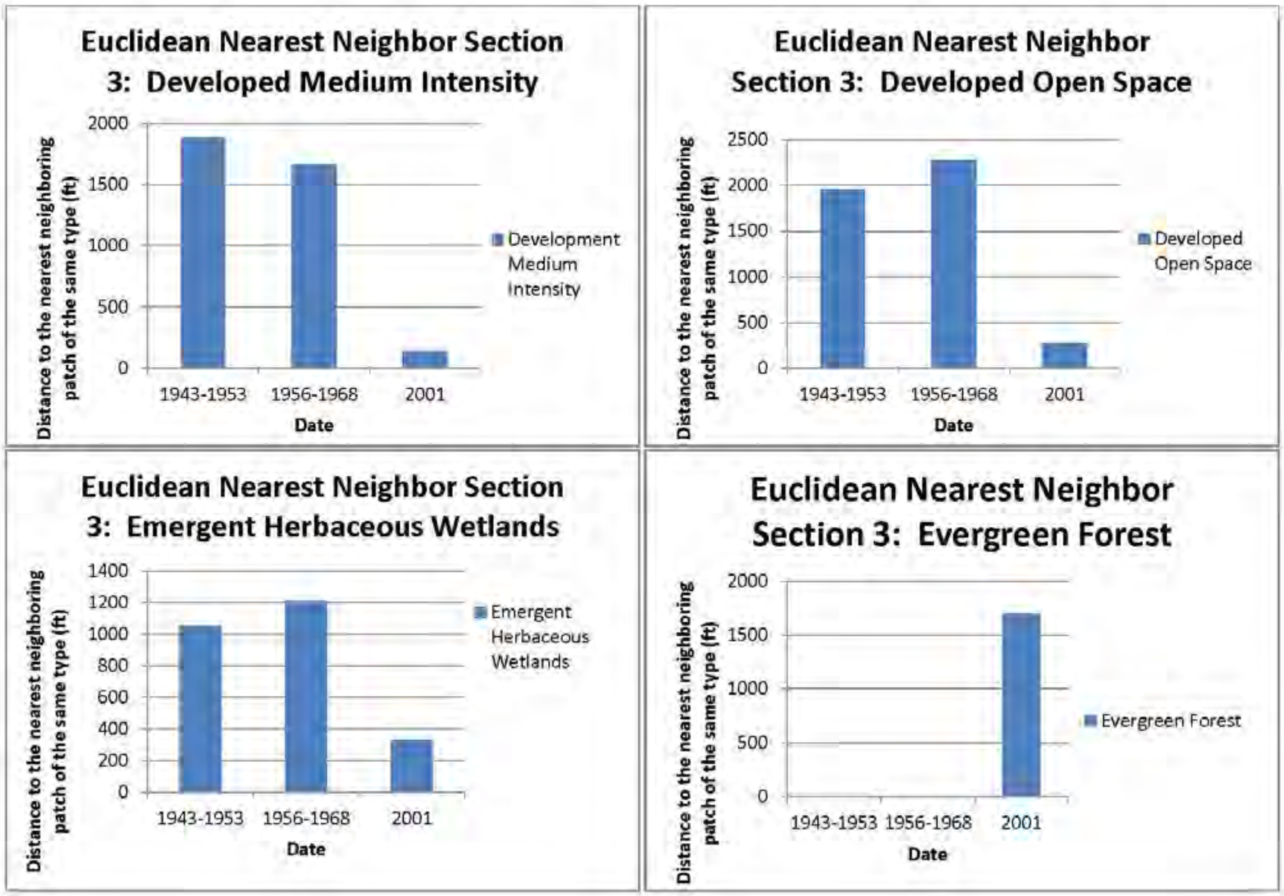

Euclidean Nearest Neighbor
Section 2: Woody Wetlands
Distance to the nearest neighboring patch of the same type (ft)
2050
2000
1950
1900
1850
1800
1750
1700
1943-1953
1956-1968
2001
Date
Woody Wetlands

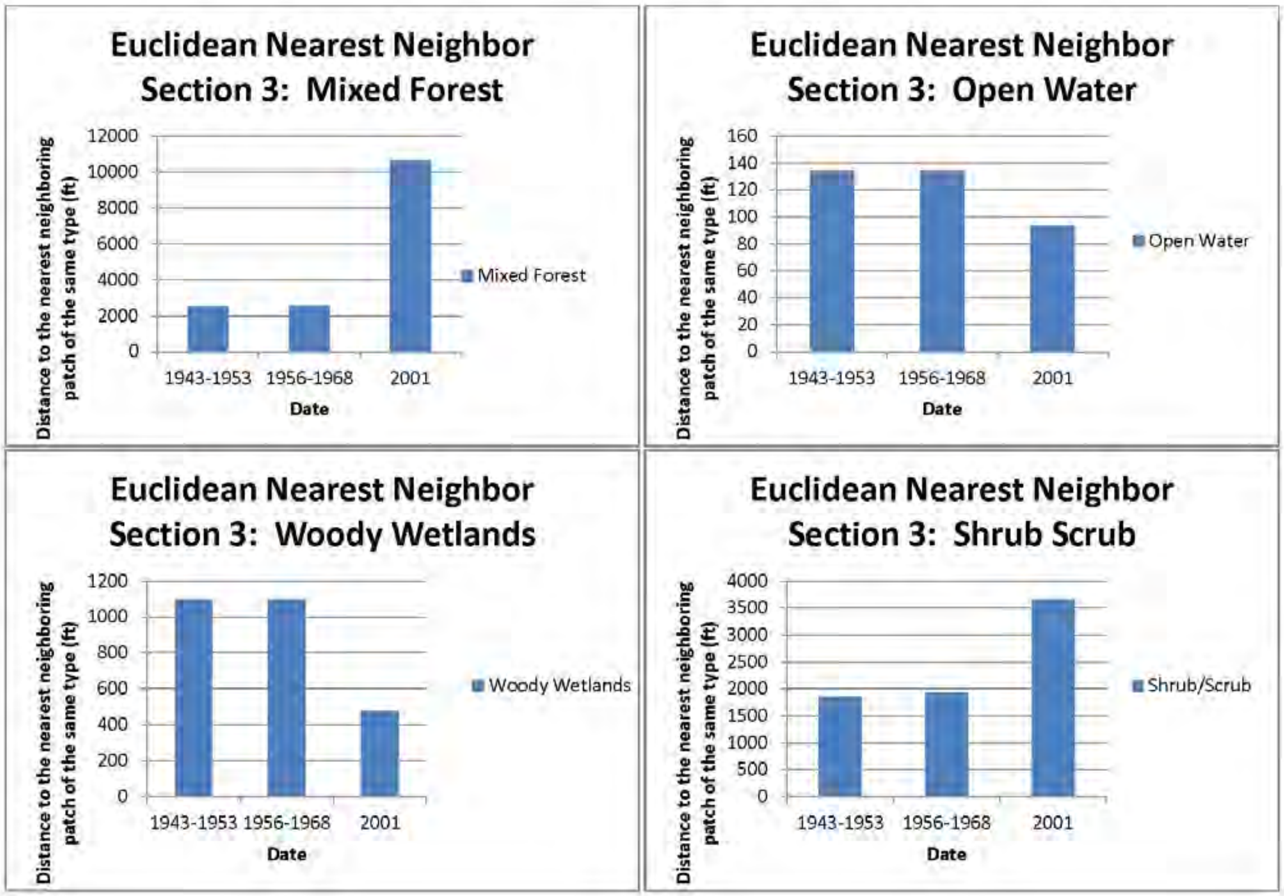

Euclidean Nearest Neighbor Section 3: Barren Land (Rock/Sand/Clay)
Distance to the nearest neighboring patch of the same type (ft)
4000
3500
3000
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

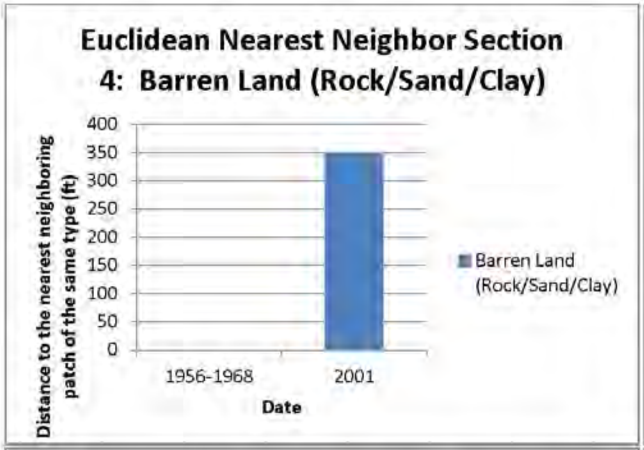

Euclidean Nearest Neighbor Section 3: Deciduous Forest
Distance to the nearest neighboring patch of the same type (ft)
1600
1400
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

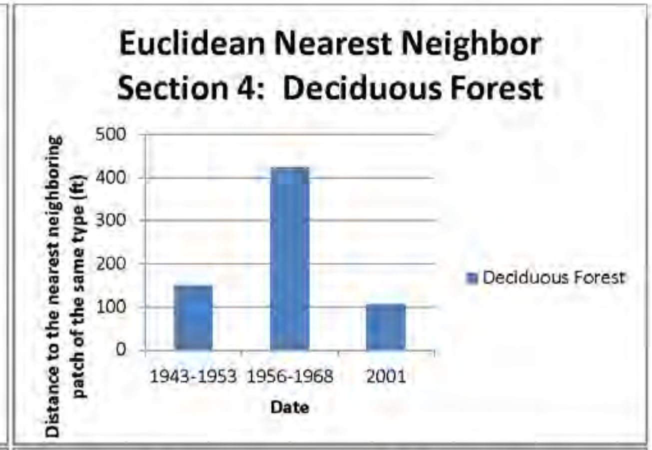

Euclidean Nearest Neighbor Section 3: Developed High Intensity
Distance to the nearest neighboring patch of the same type (ft)
3000
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

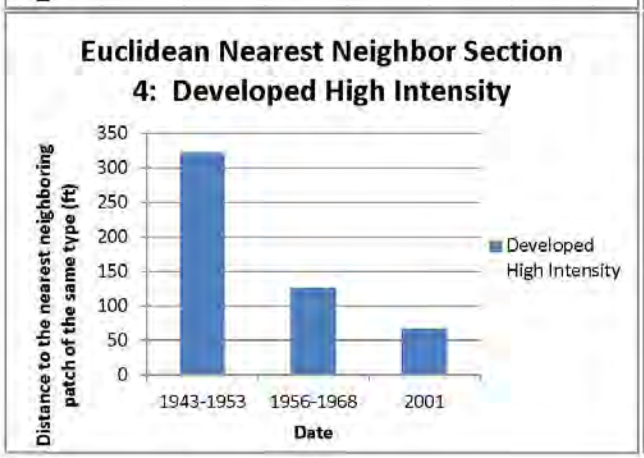

Euclidean Nearest Neighbor Section 3: Developed Low Intensity
Distance to the nearest neighboring patch of the same type (ft)
350
300
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

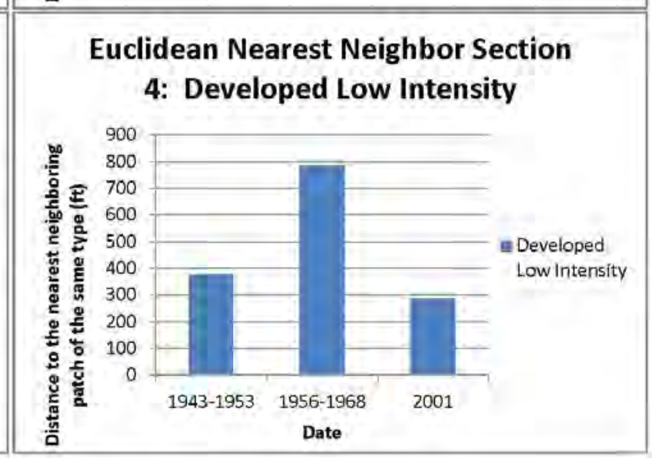

Euclidean Nearest Neighbor Section 3: Developed Medium Intensity
Distance to the nearest neighboring patch of the same type (ft)
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Development Medium Intensity
Euclidean Nearest Neighbor Section 3: Developed Open Space
Distance to the nearest neighboring patch of the same type (ft)
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Euclidean Nearest Neighbor Section 3: Emergent Herbaceous Wetlands
Distance to the nearest neighboring patch of the same type (ft)
1400
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Euclidean Nearest Neighbor Section 3: Evergreen Forest
Distance to the nearest neighboring patch of the same type (ft)
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

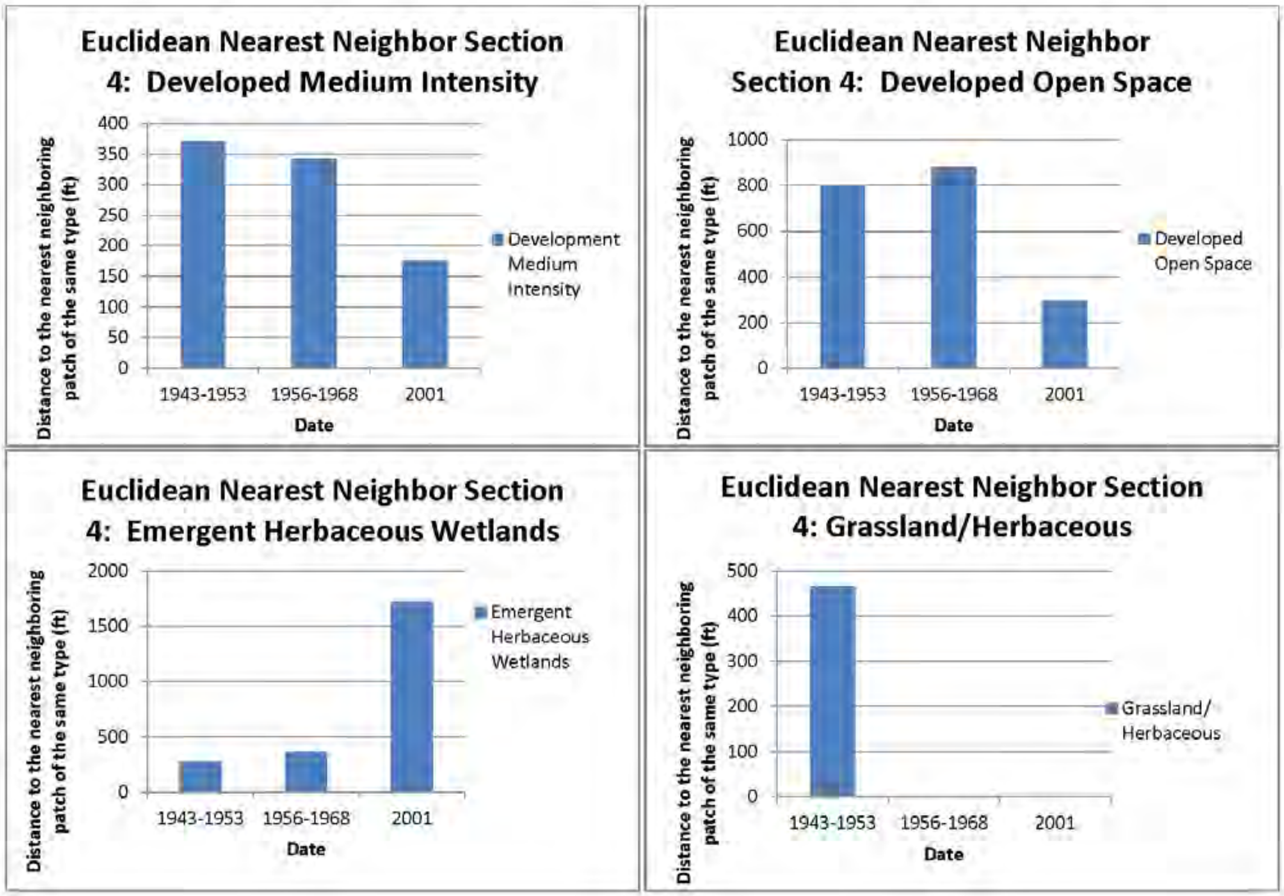

Euclidean Nearest Neighbor
Section 3: Mixed Forest
Distance to the nearest neighboring patch of the same type (ft)
12000
10000
8000
6000
4000
2000
0
1943-1953
1956-1968
2001
Date
Mixed Forest
Euclidean Nearest Neighbor
Section 3: Open Water
160
140
120
100
80
60
40
20
0
Open Water
Euclidean Nearest Neighbor
Section 3: Woody Wetlands
1200
1000
800
600
400
200
Woody Wetlands
Euclidean Nearest Neighbor
Section 3: Shrub Scrub
4000
3500
3000
2500
2000
1500
1000
500
Shrub/Scrub

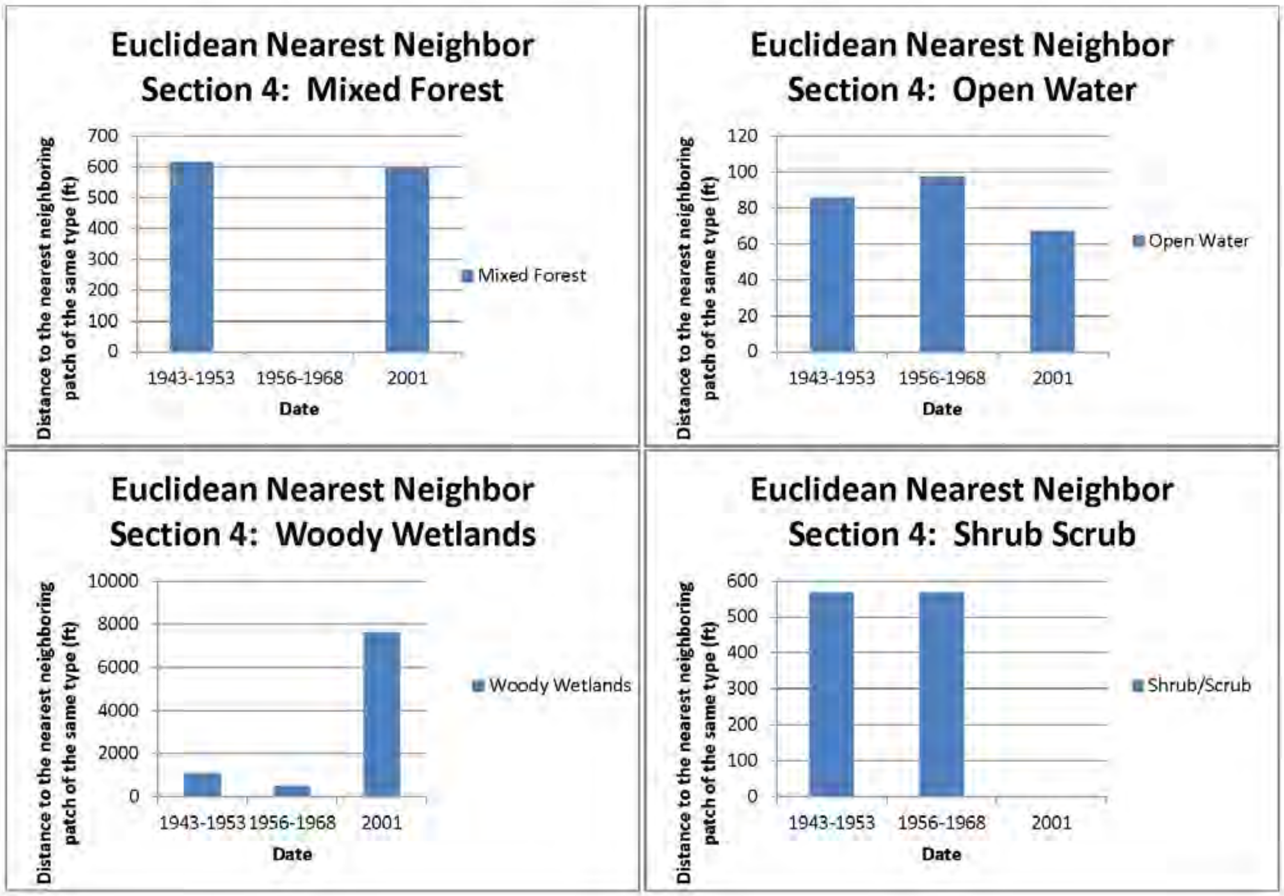

Euclidean Nearest Neighbor Section 4: Barren Land (Rock/Sand/Clay)
Distance to the nearest neighboring patch of the same type (ft)
400
350
300
250
200
150
100
50
0
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

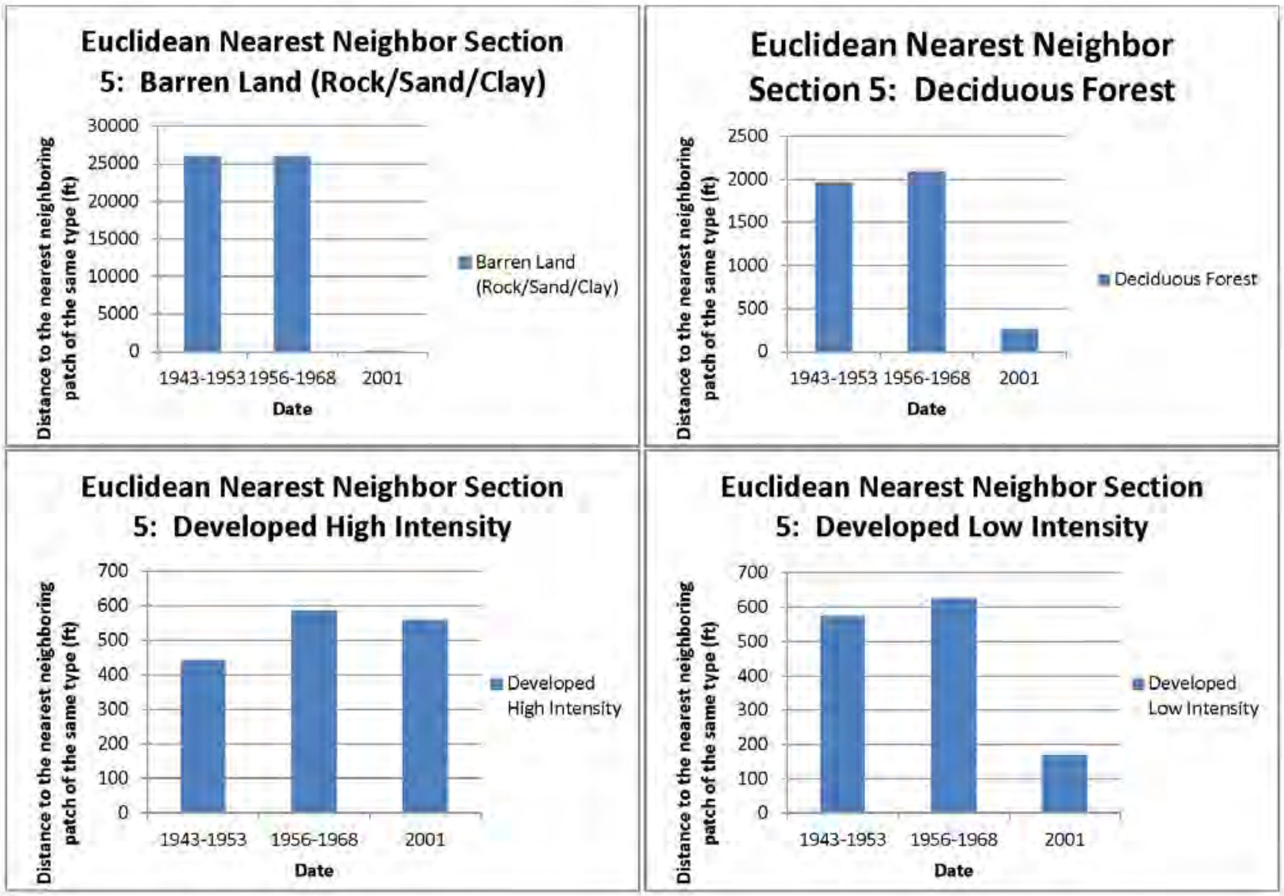

Euclidean Nearest Neighbor Section 4: Deciduous Forest
Distance to the nearest neighboring patch of the same type (ft)
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

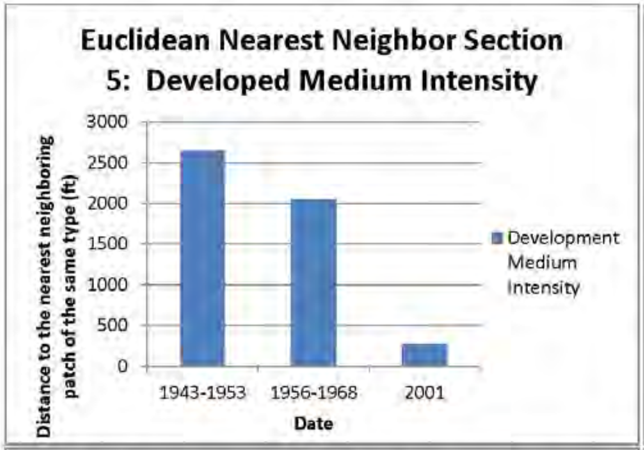

Euclidean Nearest Neighbor Section 4: Developed High Intensity
Distance to the nearest neighboring patch of the same type (ft)
350
300
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

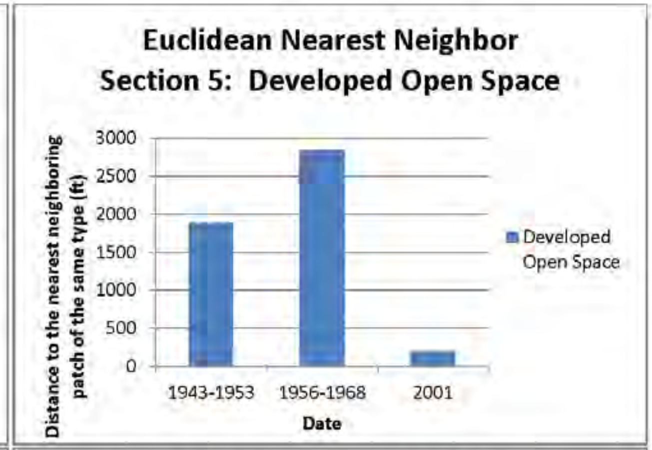

Euclidean Nearest Neighbor Section 4: Developed Low Intensity
Distance to the nearest neighboring patch of the same type (ft)
900
800
700
600
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

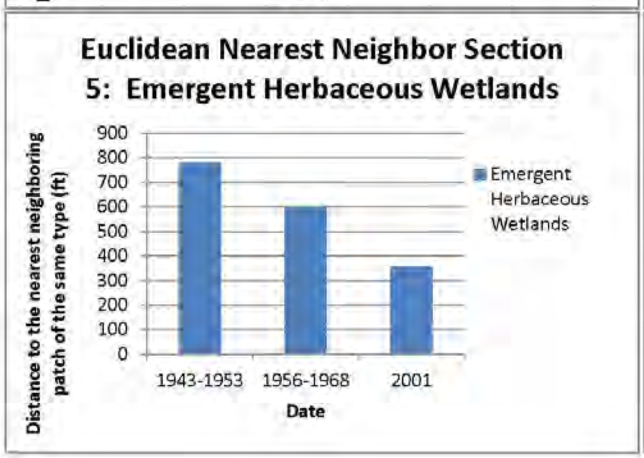

Euclidean Nearest Neighbor Section 4: Developed Medium Intensity
Distance to the nearest neighboring patch of the same type (ft)
400
350
300
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Development Medium Intensity
Euclidean Nearest Neighbor Section 4: Developed Open Space
Distance to the nearest neighboring patch of the same type (ft)
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Developed Open Space
Euclidean Nearest Neighbor Section 4: Emergent Herbaceous Wetlands
Distance to the nearest neighboring patch of the same type (ft)
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Euclidean Nearest Neighbor Section 4: Grassland/Herbaceous
Distance to the nearest neighboring patch of the same type (ft)
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Grassland/ Herbaceous

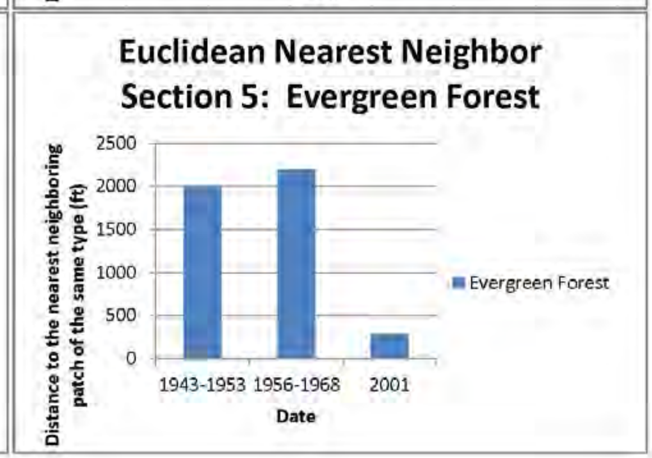

Euclidean Nearest Neighbor
Section 4: Mixed Forest
Distance to the nearest neighboring patch of the same type (ft)
700
600
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Mixed Forest
Euclidean Nearest Neighbor
Section 4: Open Water
Distance to the nearest neighboring patch of the same type (ft)
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Open Water
Euclidean Nearest Neighbor
Section 4: Woody Wetlands
Distance to the nearest neighboring patch of the same type (ft)
10000
8000
6000
4000
2000
0
1943-1953
1956-1968
2001
Date
Woody Wetlands
Euclidean Nearest Neighbor
Section 4: Shrub Scrub
Distance to the nearest neighboring patch of the same type (ft)
600
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

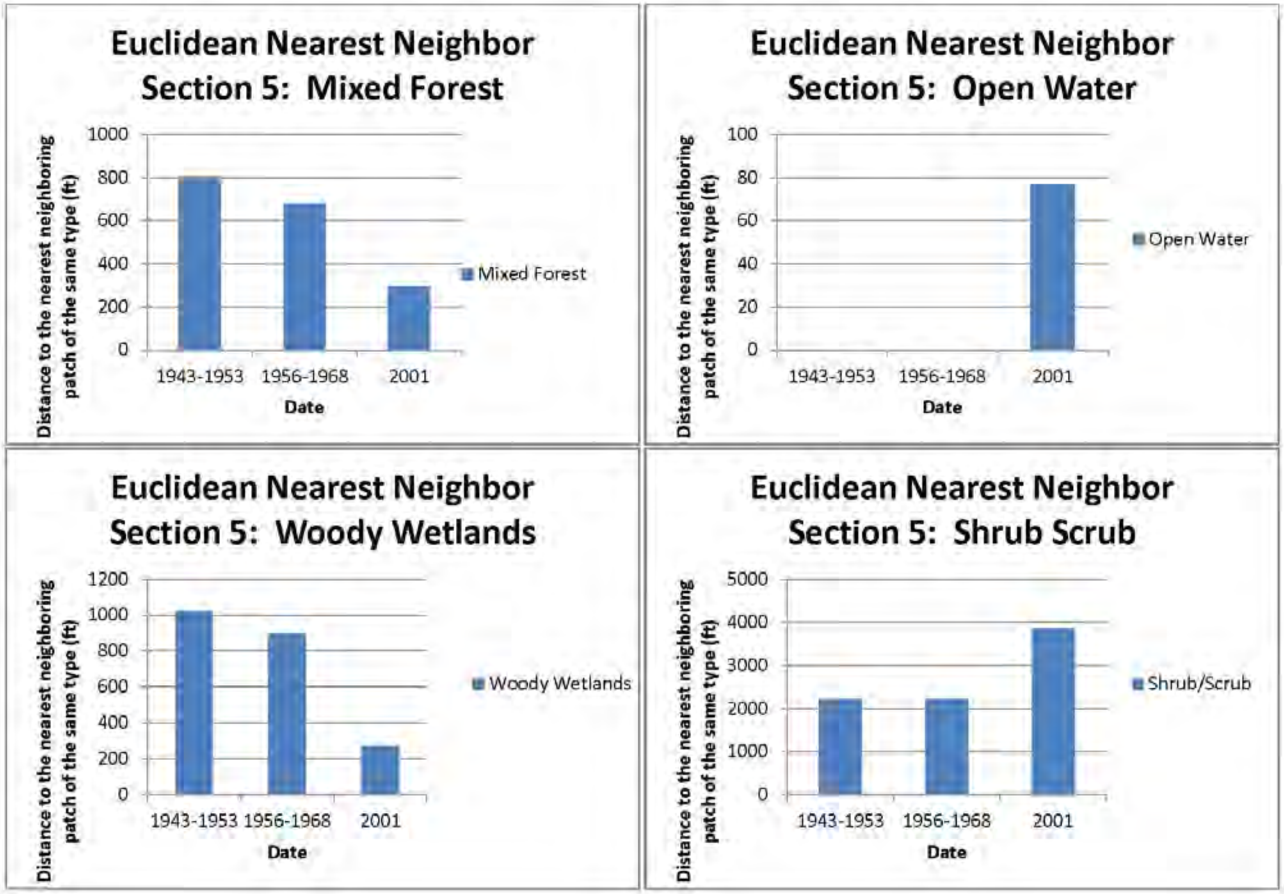

Euclidean Nearest Neighbor Section 5: Barren Land (Rock/Sand/Clay)
Distance to the nearest neighboring patch of the same type (ft)
30000
25000
20000
15000
10000
5000
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)
Euclidean Nearest Neighbor Section 5: Deciduous Forest
2500
2000
1500
1000
500
Deciduous Forest
Euclidean Nearest Neighbor Section 5: Developed High Intensity
700
600
500
400
300
200
100
Developed High Intensity
Euclidean Nearest Neighbor Section 5: Developed Low Intensity
Developed Low Intensity

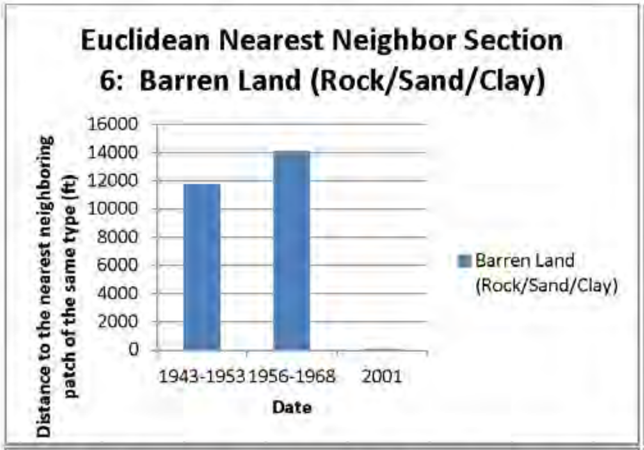

Euclidean Nearest Neighbor Section 5: Developed Medium Intensity
Distance to the nearest neighboring patch of the same type (ft)
3000
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Development Medium Intensity

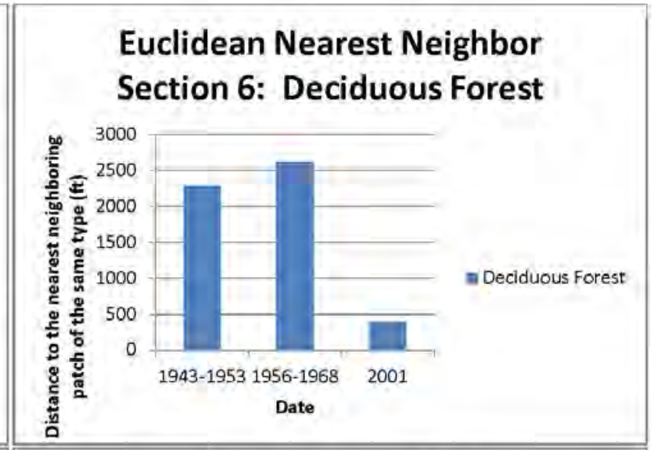

Euclidean Nearest Neighbor Section 5: Developed Open Space
Distance to the nearest neighboring patch of the same type (ft)
3000
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Developed Open Space

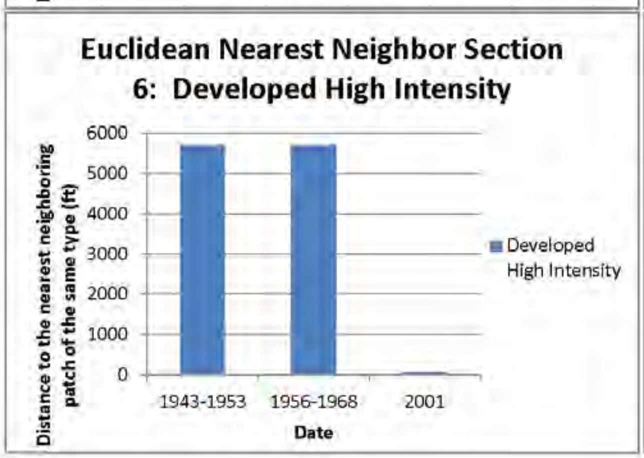

Euclidean Nearest Neighbor Section 5: Emergent Herbaceous Wetlands
Distance to the nearest neighboring patch of the same type (ft)
900
800
700
600
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

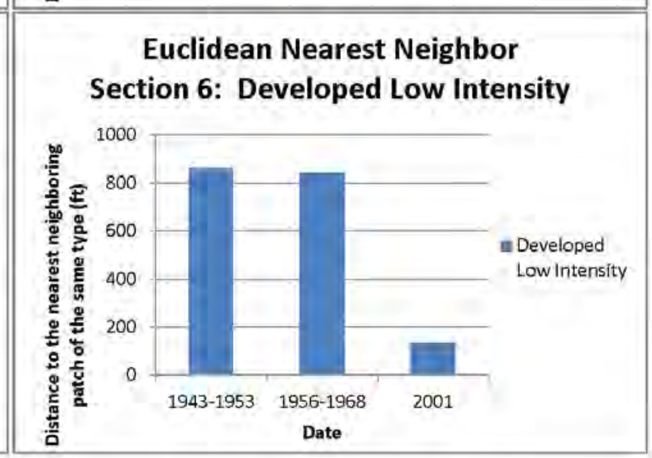

Euclidean Nearest Neighbor Section 5: Evergreen Forest
Distance to the nearest neighboring patch of the same type (ft)
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

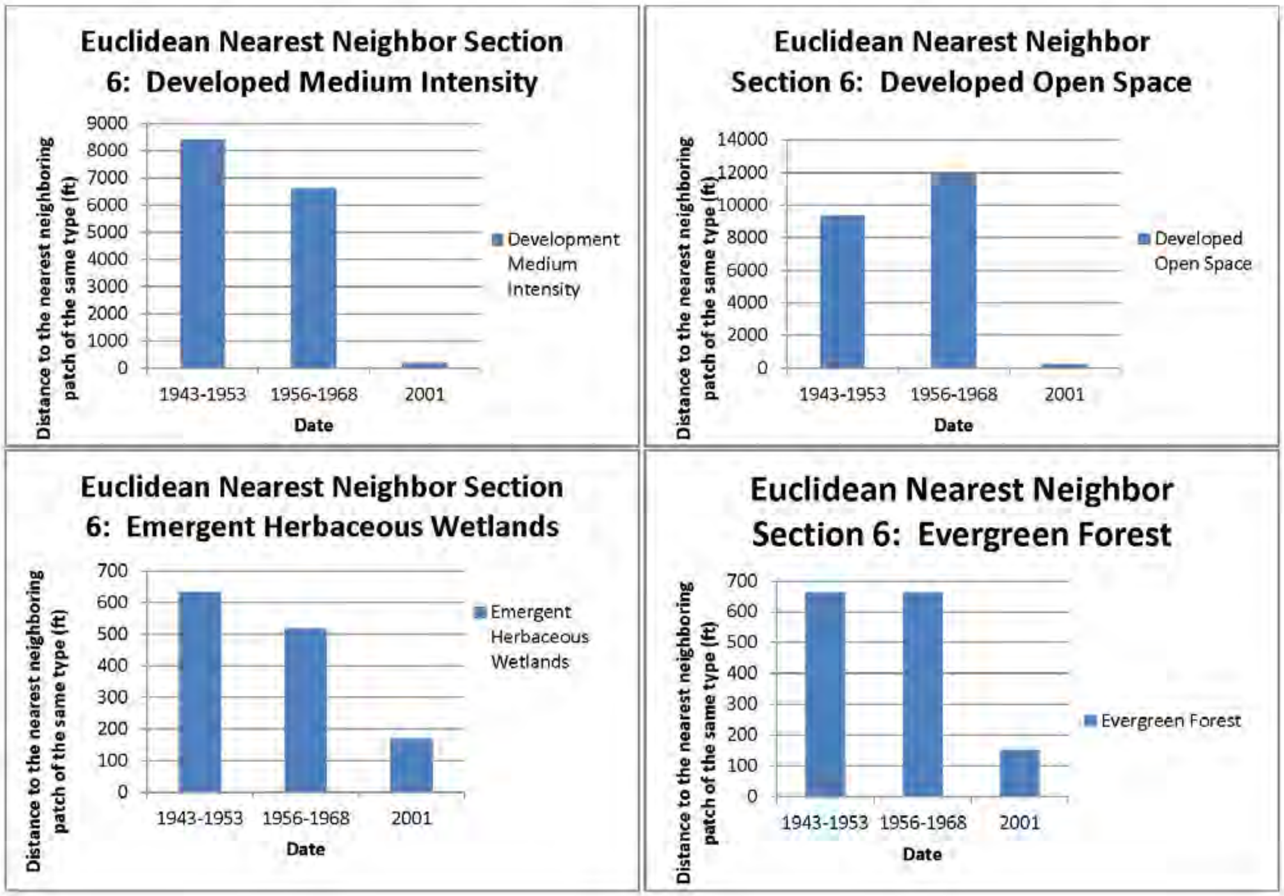

Euclidean Nearest Neighbor
Section 5: Mixed Forest
Distance to the nearest neighboring patch of the same type (ft)
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Mixed Forest
Euclidean Nearest Neighbor
Section 5: Open Water
Distance to the nearest neighboring patch of the same type (ft)
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Open Water
Euclidean Nearest Neighbor
Section 5: Woody Wetlands
Distance to the nearest neighboring patch of the same type (ft)
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Woody Wetlands
Euclidean Nearest Neighbor
Section 5: Shrub Scrub
Distance to the nearest neighboring patch of the same type (ft)
5000
4000
3000
2000
1000
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

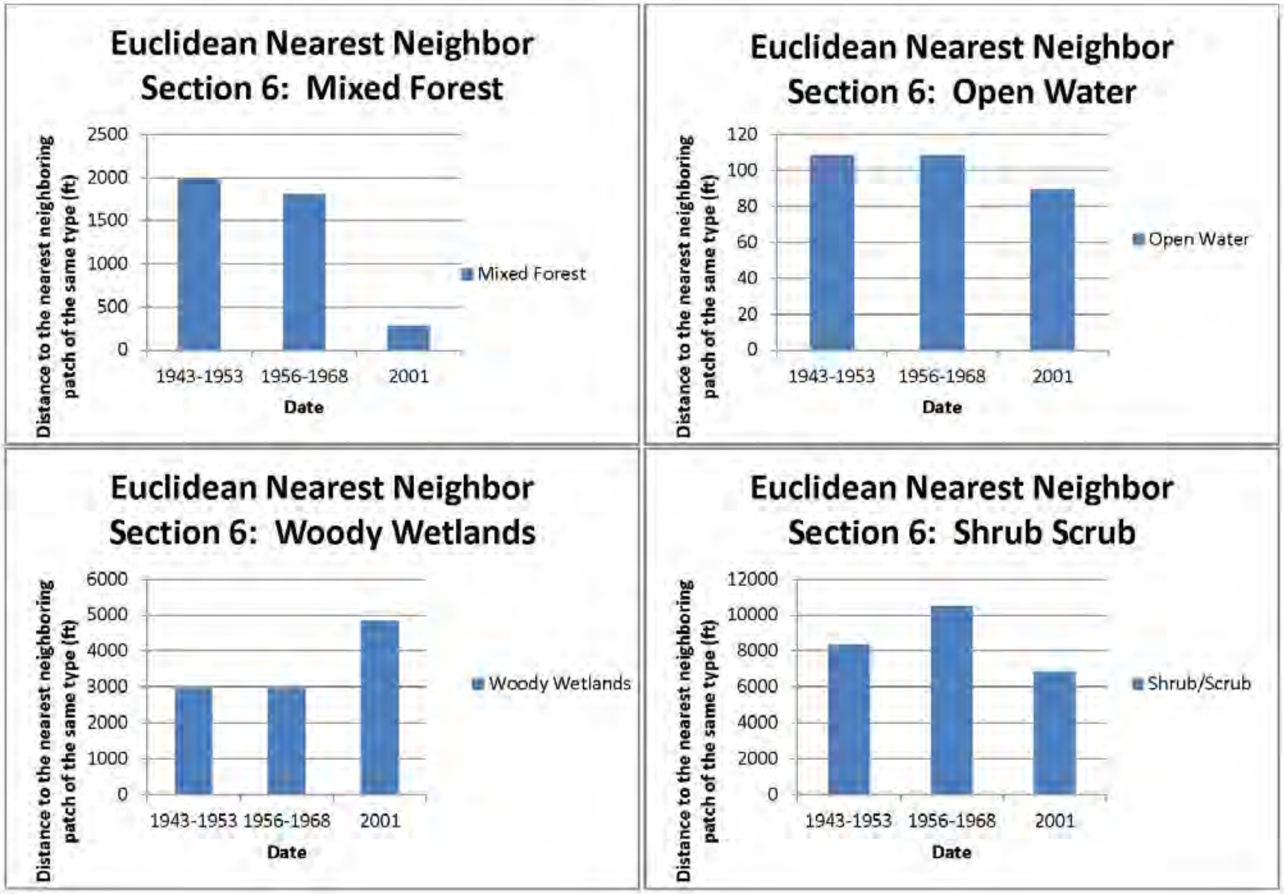

Euclidean Nearest Neighbor Section 6: Barren Land (Rock/Sand/Clay)
Distance to the nearest neighboring patch of the same type (ft)
16000
14000
12000
10000
8000
6000
4000
2000
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

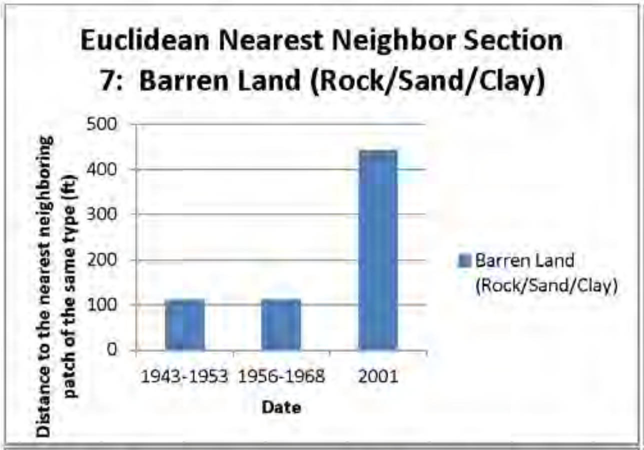

Euclidean Nearest Neighbor Section 6: Deciduous Forest
Distance to the nearest neighboring patch of the same type (ft)
3000
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

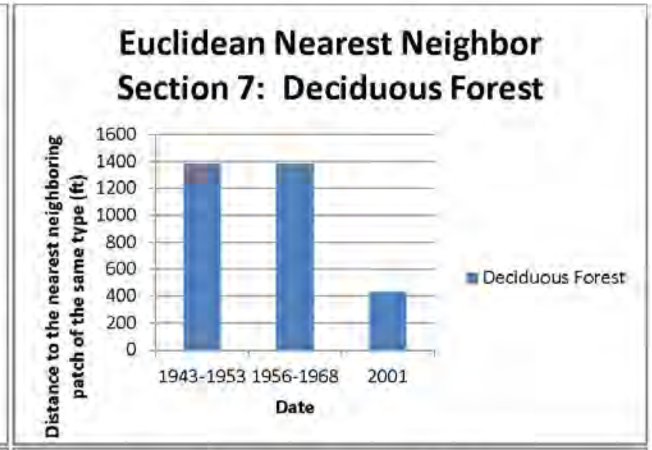

Euclidean Nearest Neighbor Section 6: Developed High Intensity
Distance to the nearest neighboring patch of the same type (ft)
6000
5000
4000
3000
2000
1000
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

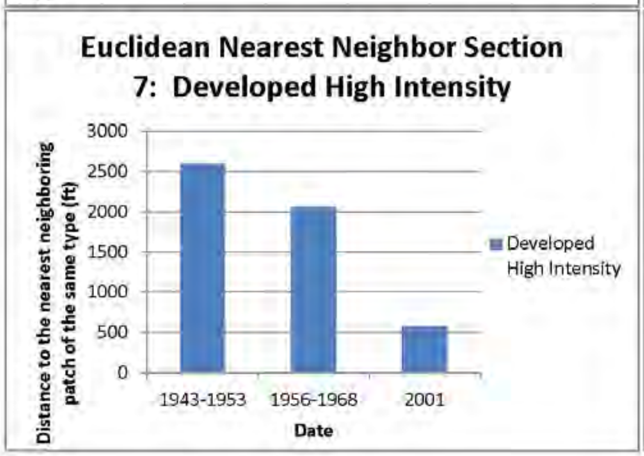

Euclidean Nearest Neighbor Section 6: Developed Low Intensity
Distance to the nearest neighboring patch of the same type (ft)
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

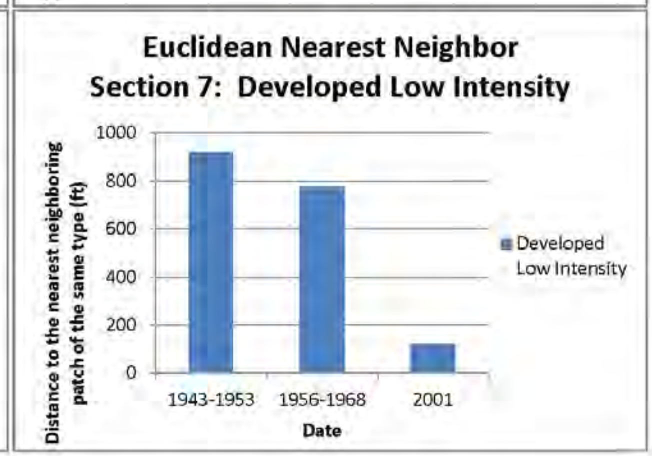

Euclidean Nearest Neighbor Section 6: Developed Medium Intensity
Distance to the nearest neighboring patch of the same type (ft)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1943-1953
1956-1968
2001
Date
Development Medium Intensity
Euclidean Nearest Neighbor Section 6: Developed Open Space
14000
12000
10000
8000
6000
4000
2000
0
Developed Open Space
Euclidean Nearest Neighbor Section 6: Emergent Herbaceous Wetlands
700
600
500
400
300
200
100
Emergent Herbaceous Wetlands
Euclidean Nearest Neighbor Section 6: Evergreen Forest
Evergreen Forest

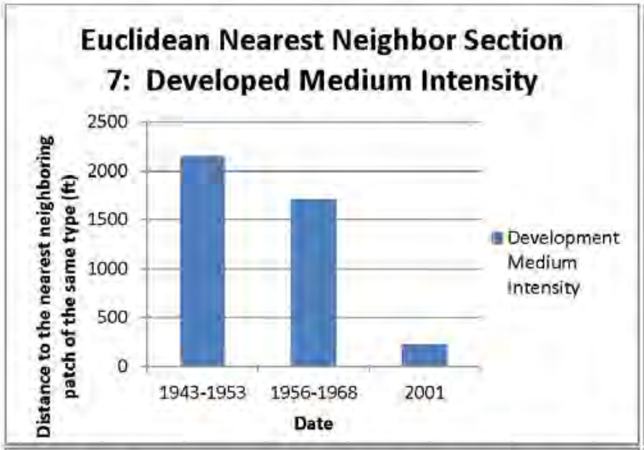

Euclidean Nearest Neighbor
Section 6: Mixed Forest
Distance to the nearest neighboring patch of the same type (ft)
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Mixed Forest
Euclidean Nearest Neighbor
Section 6: Open Water
Distance to the nearest neighboring patch of the same type (ft)
120
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Open Water
Euclidean Nearest Neighbor
Section 6: Woody Wetlands
Distance to the nearest neighboring patch of the same type (ft)
6000
5000
4000
3000
2000
1000
0
1943-1953
1956-1968
2001
Date
Woody Wetlands
Euclidean Nearest Neighbor
Section 6: Shrub Scrub
Distance to the nearest neighboring patch of the same type (ft)
12000
10000
8000
6000
4000
2000
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

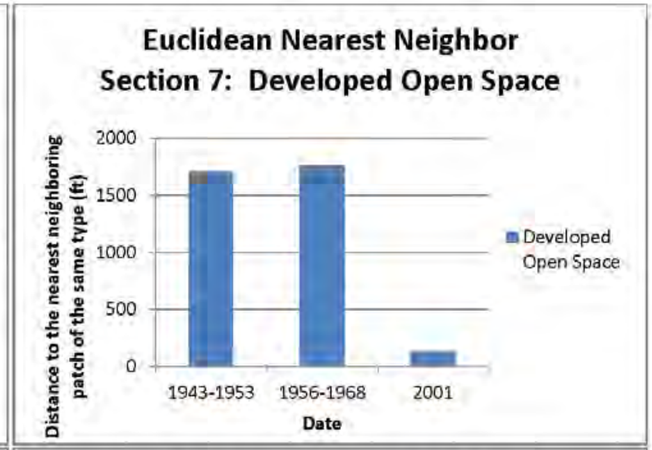

Euclidean Nearest Neighbor Section 7: Barren Land (Rock/Sand/Clay)
Distance to the nearest neighboring patch of the same type (ft)
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

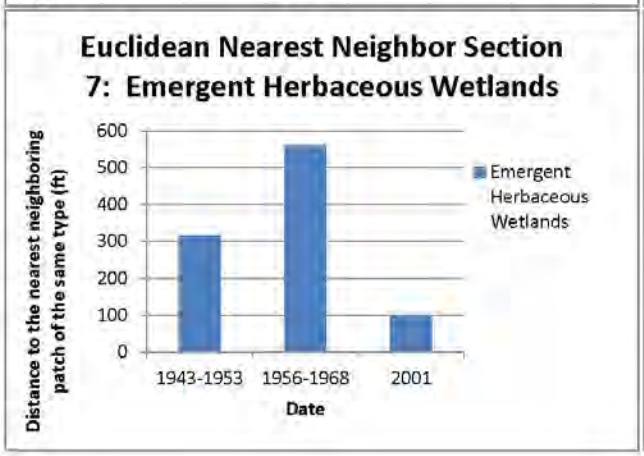

Euclidean Nearest Neighbor Section 7: Deciduous Forest
Distance to the nearest neighboring patch of the same type (ft)
1600
1400
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Deciduous Forest

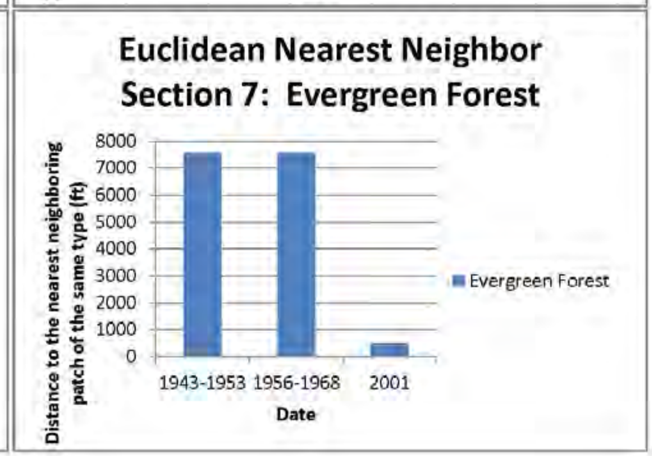

Euclidean Nearest Neighbor Section 7: Developed High Intensity
Distance to the nearest neighboring patch of the same type (ft)
3000
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

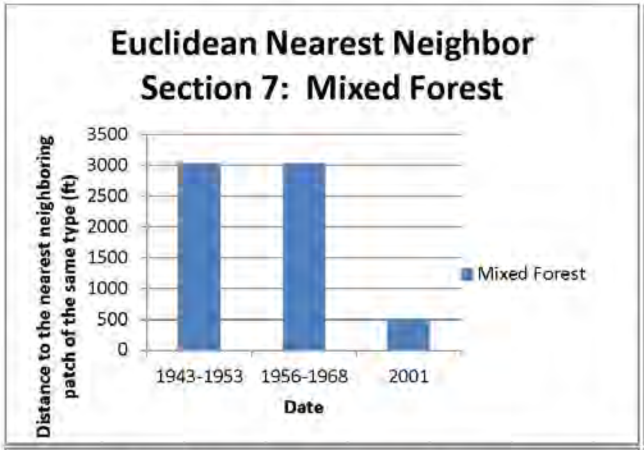

Euclidean Nearest Neighbor Section 7: Developed Low Intensity
Distance to the nearest neighboring patch of the same type (ft)
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

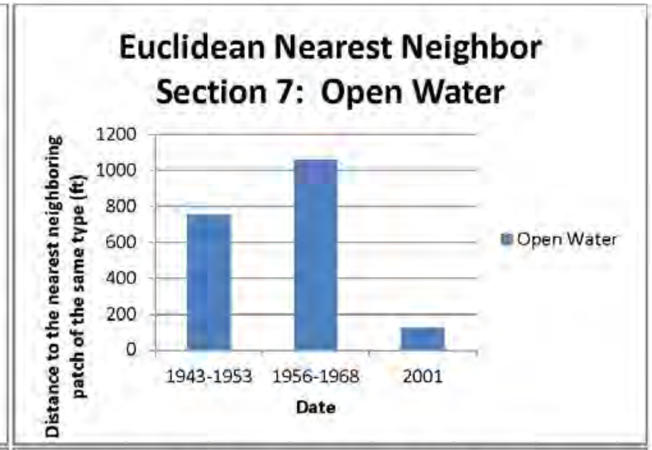

Euclidean Nearest Neighbor Section 7: Developed Medium Intensity
Distance to the nearest neighboring patch of the same type (ft)
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Development Medium Intensity

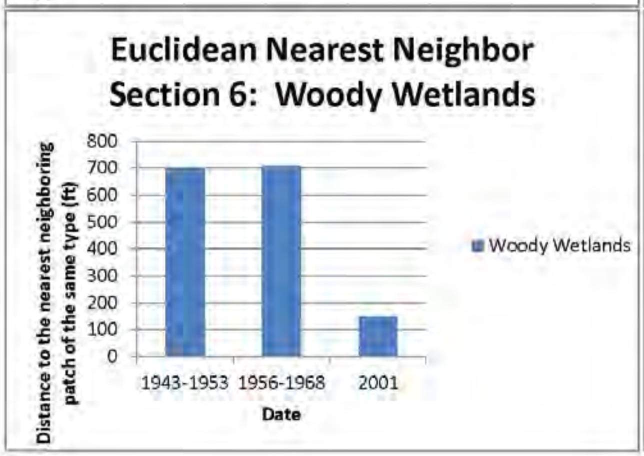

Euclidean Nearest Neighbor Section 7: Developed Open Space
Distance to the nearest neighboring patch of the same type (ft)
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Developed Open Space

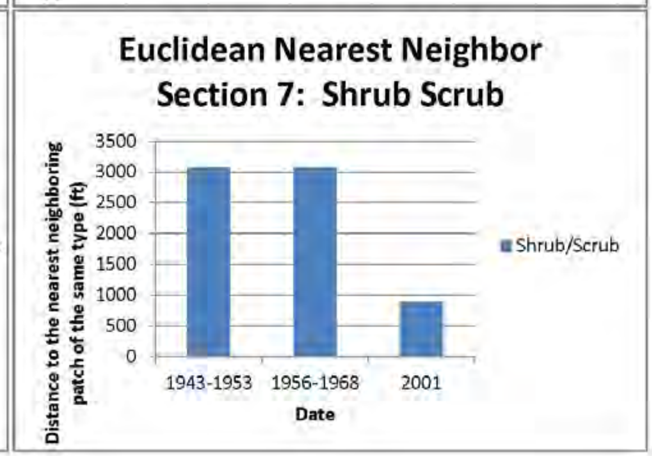

Euclidean Nearest Neighbor Section 7: Emergent Herbaceous Wetlands
Distance to the nearest neighboring patch of the same type (ft)
600
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

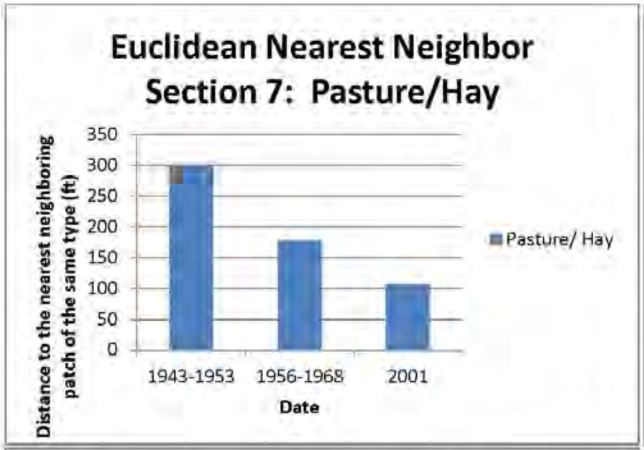

Euclidean Nearest Neighbor Section 7: Evergreen Forest
Distance to the nearest neighboring patch of the same type (ft)
8000
7000
6000
5000
4000
3000
2000
1000
0
1943-1953
1956-1968
2001
Date
Evergreen Forest

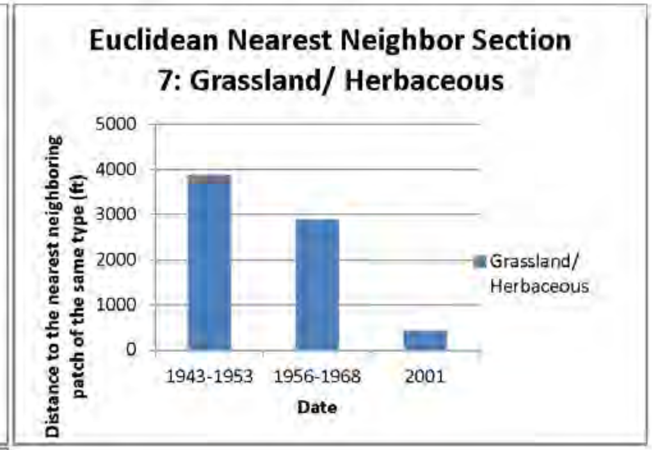

Euclidean Nearest Neighbor
Section 7: Mixed Forest
Distance to the nearest neighboring patch of the same type (ft)
3500
3000
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Mixed Forest

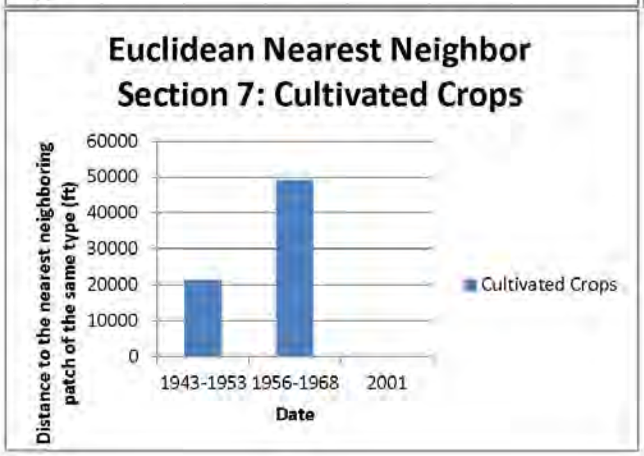

Euclidean Nearest Neighbor
Section 7: Open Water
Distance to the nearest neighboring patch of the same type (ft)
1200
1000
800
600
400
200
0
1943-1953
1956-1968
2001
Date
Open Water

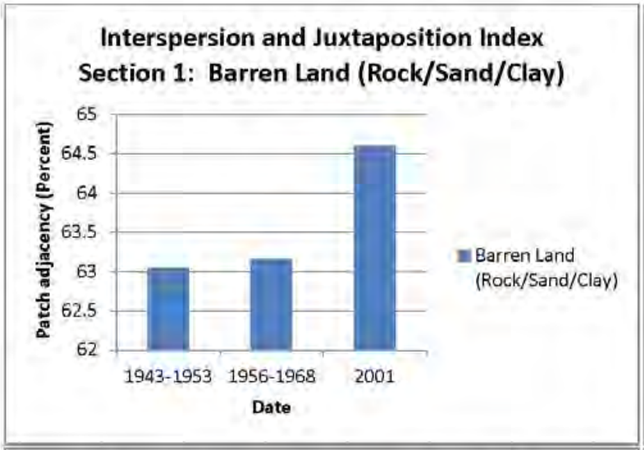

Euclidean Nearest Neighbor
Section 6: Woody Wetlands
Distance to the nearest neighboring patch of the same type (ft)
800
700
600
500
400
300
200
100
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

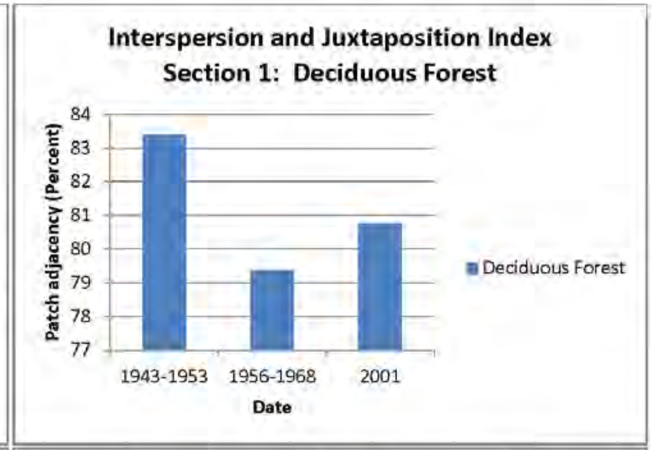

Euclidean Nearest Neighbor
Section 7: Shrub Scrub
Distance to the nearest neighboring patch of the same type (ft)
3500
3000
2500
2000
1500
1000
500
0
1943-1953
1956-1968
2001
Date
Shrub/Scrub

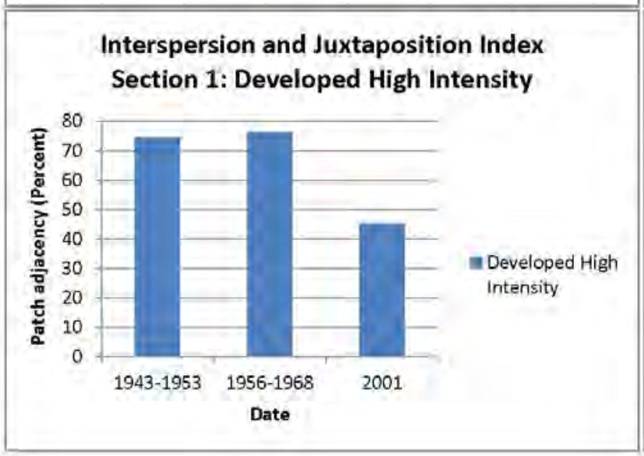

Euclidean Nearest Neighbor Section 7: Pasture/Hay
Distance to the nearest neighboring patch of the same type (ft)
350
300
250
200
150
100
50
0
1943-1953
1956-1968
2001
Date
Pasture/ Hay

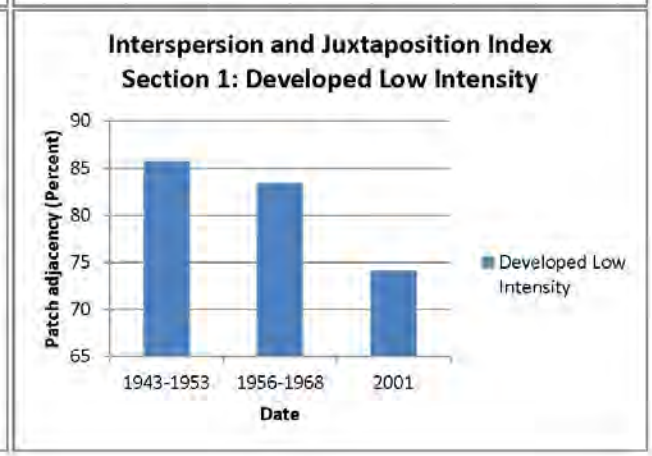

Euclidean Nearest Neighbor Section 7: Grassland/ Herbaceous
Distance to the nearest neighboring patch of the same type (ft)
5000
4000
3000
2000
1000
0
1943-1953
1956-1968
2001
Date
Grassland/ Herbaceous

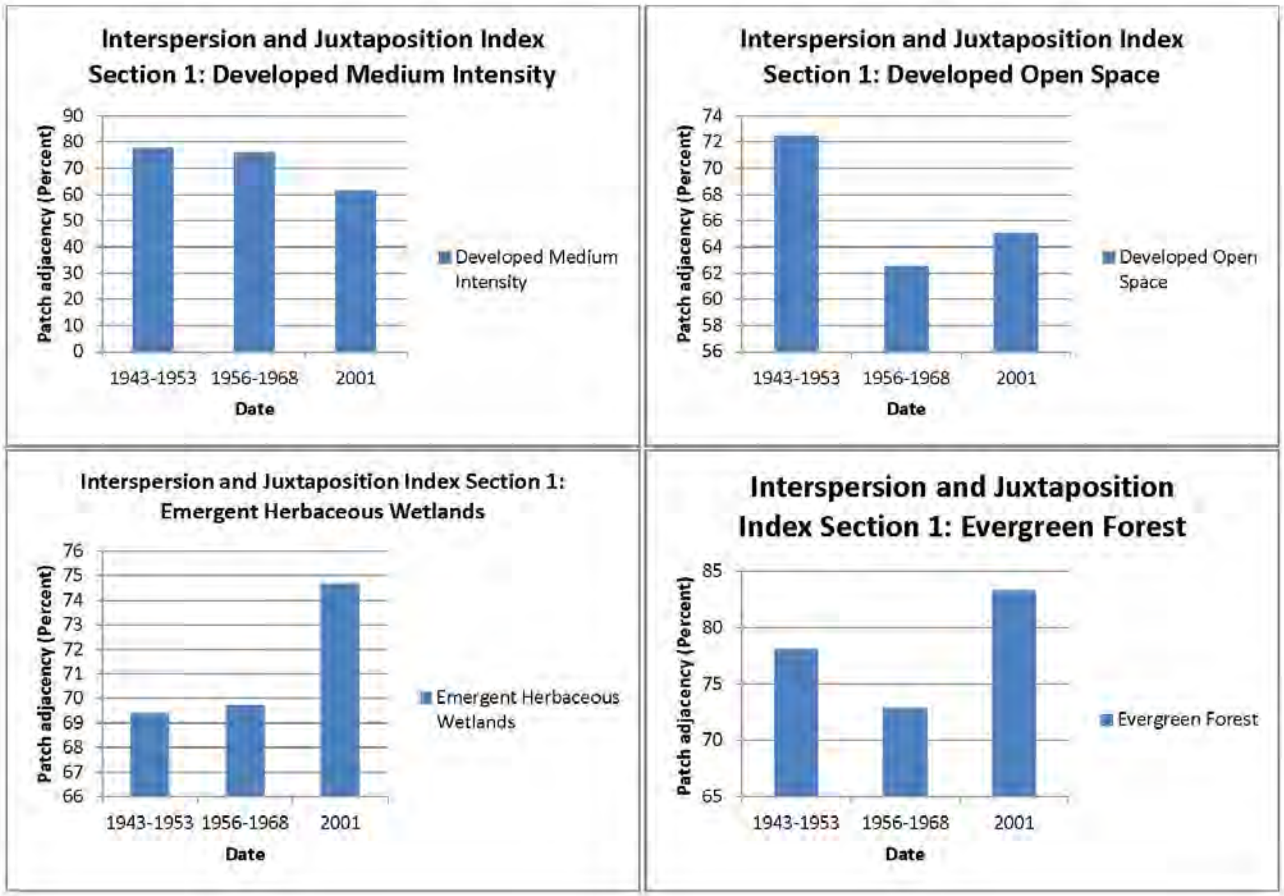

Euclidean Nearest Neighbor Section 7: Cultivated Crops
Distance to the nearest neighboring patch of the same type (ft)
60000
50000
40000
30000
20000
10000
0
1943-1953
1956-1968
2001
Date
Cultivated Crops

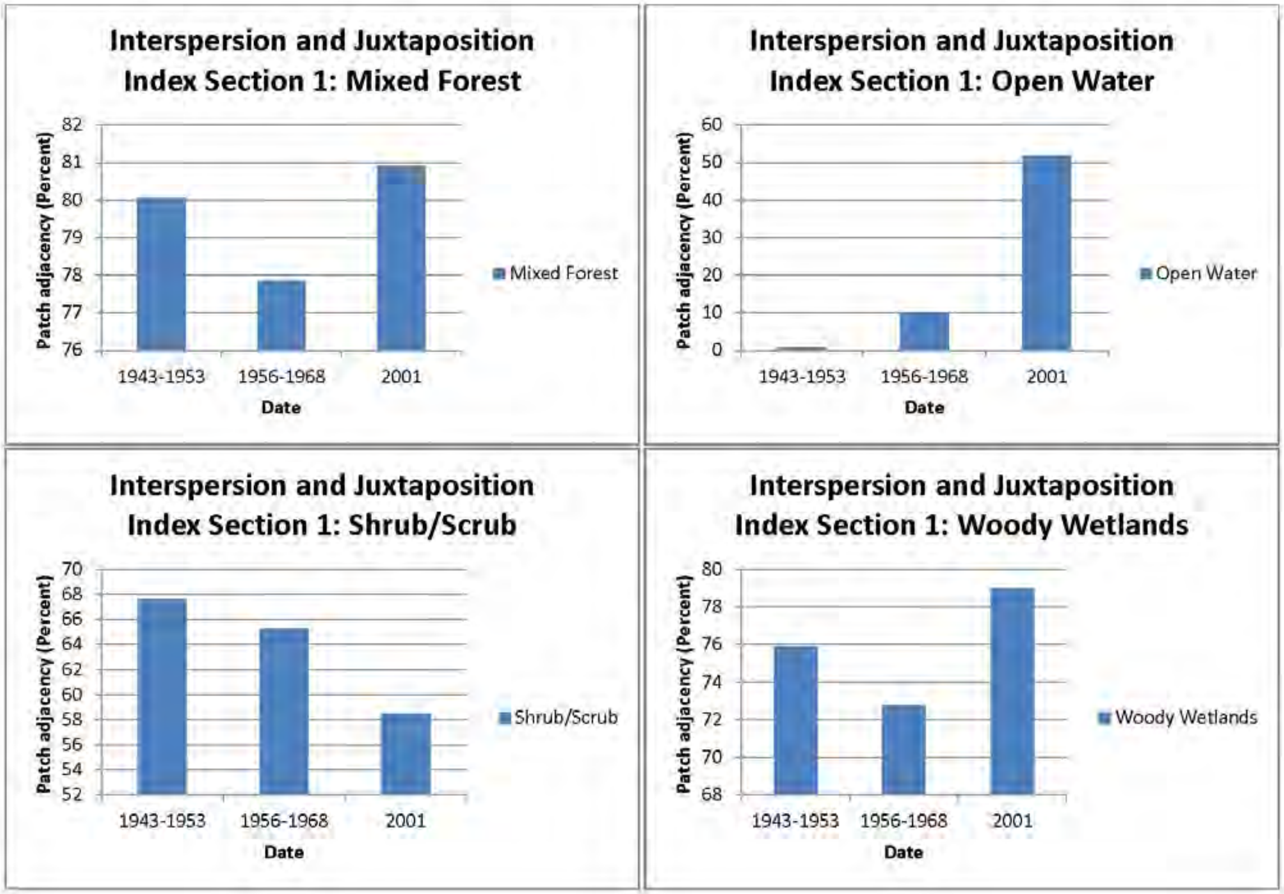

Interspersion and Juxtaposition Index
Section 1: Barren Land (Rock/Sand/Clay)
Patch adjacency (Percent)
65
64.5
64
63.5
63
62.5
62
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

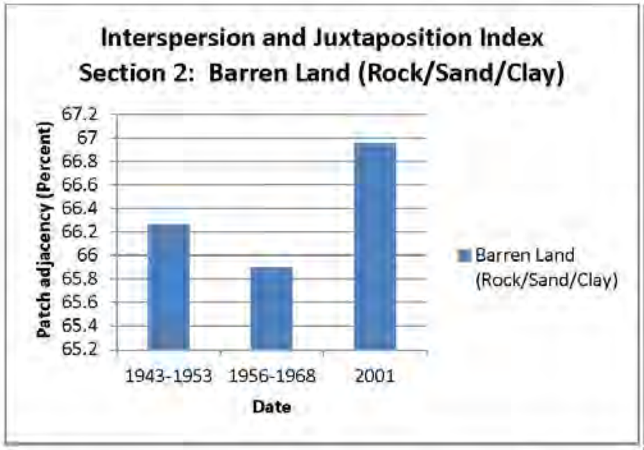

Interspersion and Juxtaposition Index
Section 1: Deciduous Forest
Patch adjacency (Percent)
84
83
82
81
80
79
78
77
1943-1953
1956-1968
2001
Date
Deciduous Forest

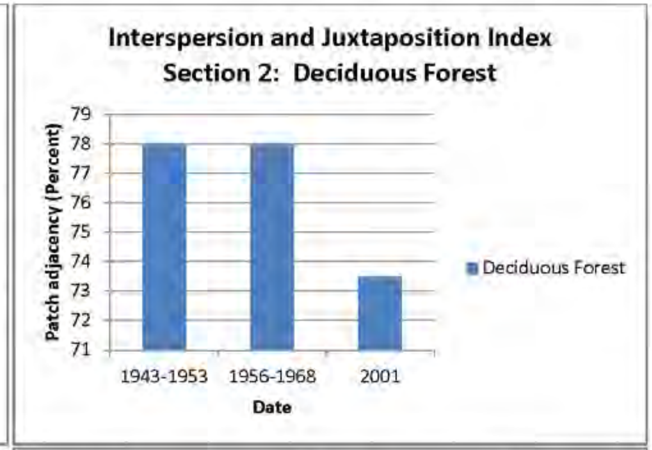

Interspersion and Juxtaposition Index
Section 1: Developed High Intensity
Patch adjacency (Percent)
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

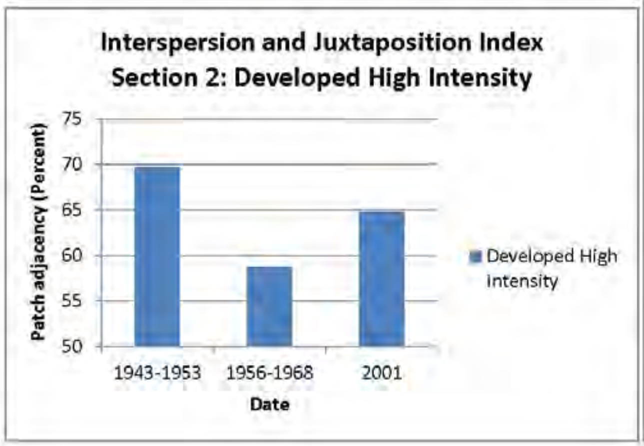

Interspersion and Juxtaposition Index
Section 1: Developed Low Intensity
Patch adjacency (Percent)
90
85
80
75
70
65
1943-1953
1956-1968
2001
Date
Developed Low Intensity

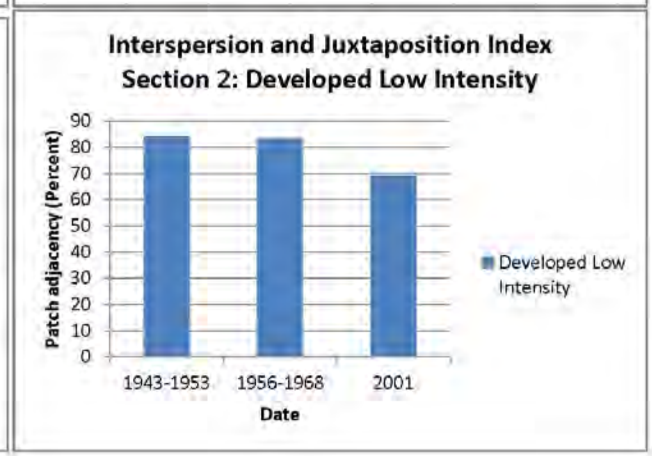

Interspersion and Juxtaposition Index
Section 1: Developed Medium Intensity
Patch adjacency (Percent)
90
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Interspersion and Juxtaposition Index
Section 1: Developed Open Space
74
72
70
68
66
64
62
60
58
56
Developed Open Space
Interspersion and Juxtaposition Index Section 1:
Emergent Herbaceous Wetlands
76
75
74
73
72
71
69
68
67
66
Emergent Herbaceous Wetlands
Interspersion and Juxtaposition
Index Section 1: Evergreen Forest
85
75
65
Evergreen Forest

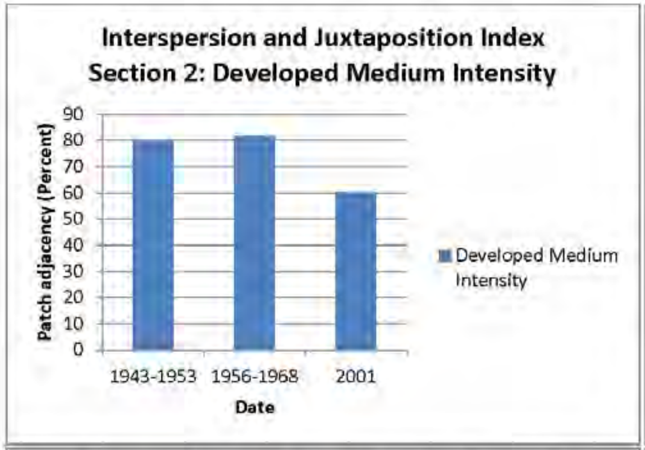

Interspersion and Juxtaposition Index Section 1: Mixed Forest
Patch adjacency (Percent)
82
81
80
79
78
77
76
1943-1953
1956-1968
2001
Date
Mixed Forest
Interspersion and Juxtaposition Index Section 1: Open Water
Patch adjacency (Percent)
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Open Water
Interspersion and Juxtaposition Index Section 1: Shrub/Scrub
Patch adjacency (Percent)
70
68
66
64
62
60
58
56
54
52
1943-1953
1956-1968
2001
Date
Shrub/Scrub
Interspersion and Juxtaposition Index Section 1: Woody Wetlands
Patch adjacency (Percent)
80
78
76
74
72
70
68
1943-1953
1956-1968
2001
Date
Woody Wetlands

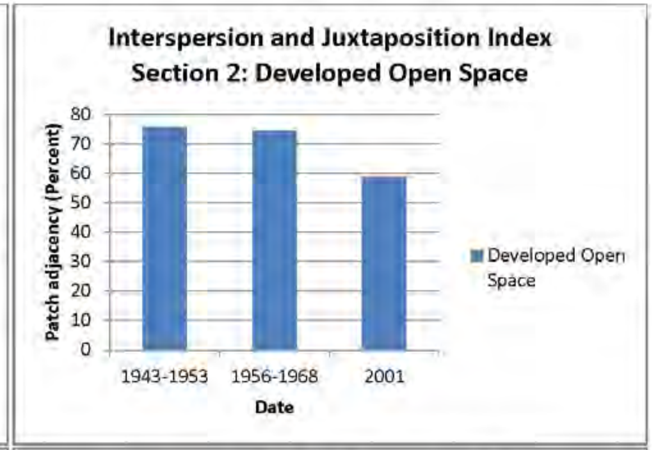

Interspersion and Juxtaposition Index
Section 2: Barren Land (Rock/Sand/Clay)
Patch adjacency (Percent)
67.2
67
66.8
66.6
66.4
66.2
66
65.8
65.6
65.4
65.2
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

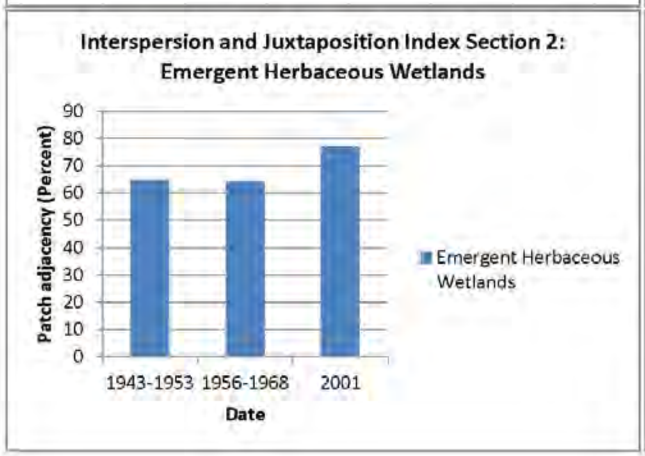

Interspersion and Juxtaposition Index
Section 2: Deciduous Forest
Patch adjacency (Percent)
79
78
77
76
75
74
73
72
71
1943-1953
1956-1968
2001
Date
Deciduous Forest

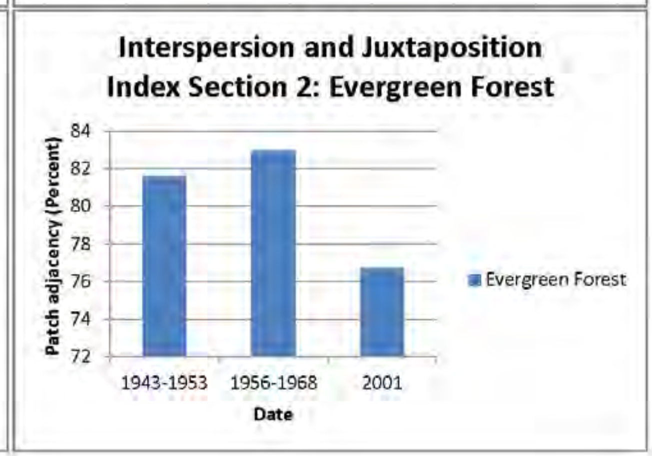

Interspersion and Juxtaposition Index
Section 2: Developed High Intensity
Patch adjacency (Percent)
75
70
65
60
55
50
1943-1953
1956-1968
2001
Date
Developed High Intensity

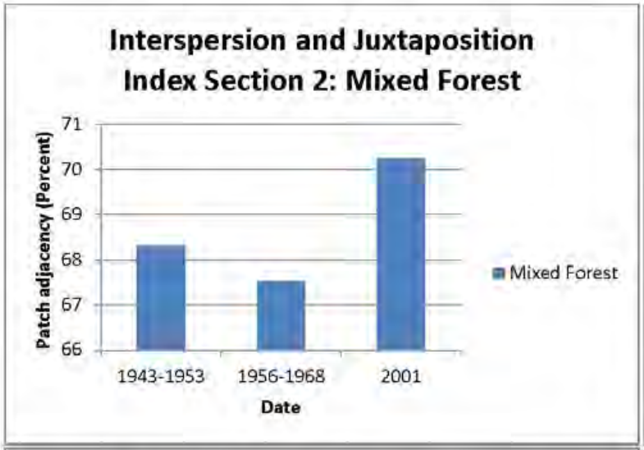

Interspersion and Juxtaposition Index
Section 2: Developed Low Intensity
Patch adjacency (Percent)
90
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

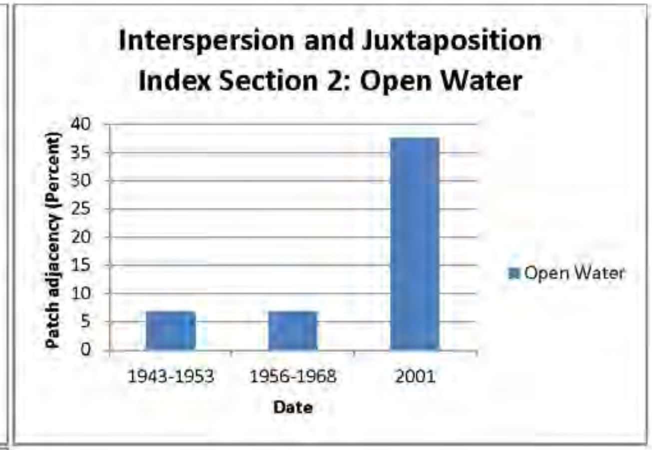

Interspersion and Juxtaposition Index
Section 2: Developed Medium Intensity
Patch adjacency (Percent)
90
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

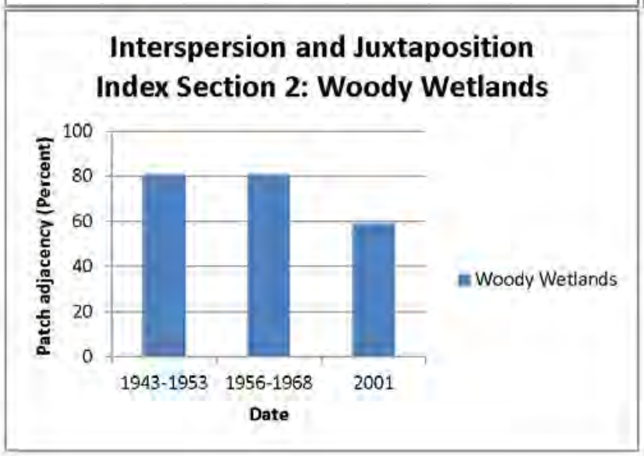

Interspersion and Juxtaposition Index
Section 2: Developed Open Space
Patch adjacency (Percent)
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Developed Open Space

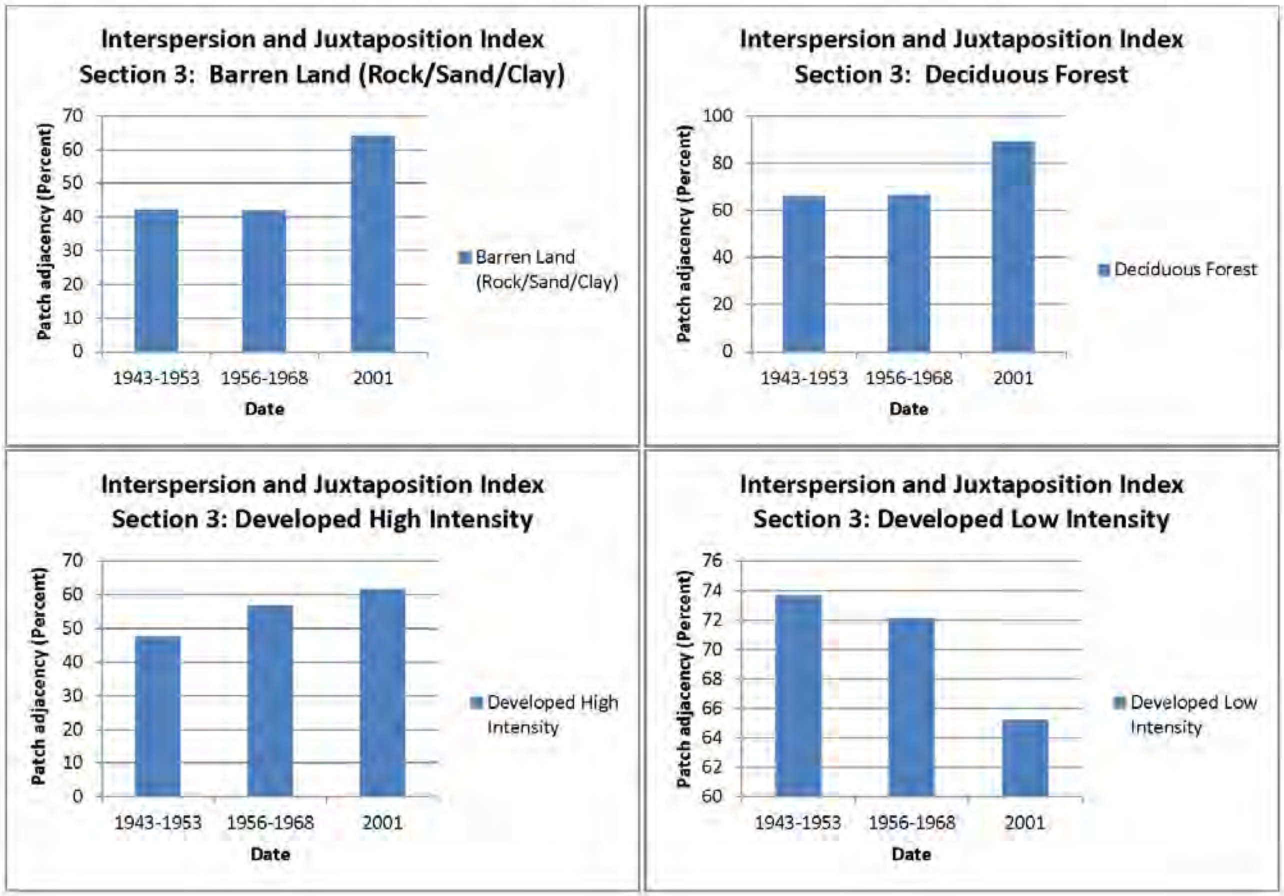

Interspersion and Juxtaposition Index Section 2:
Emergent Herbaceous Wetlands
Patch adjacency (Percent)
90
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

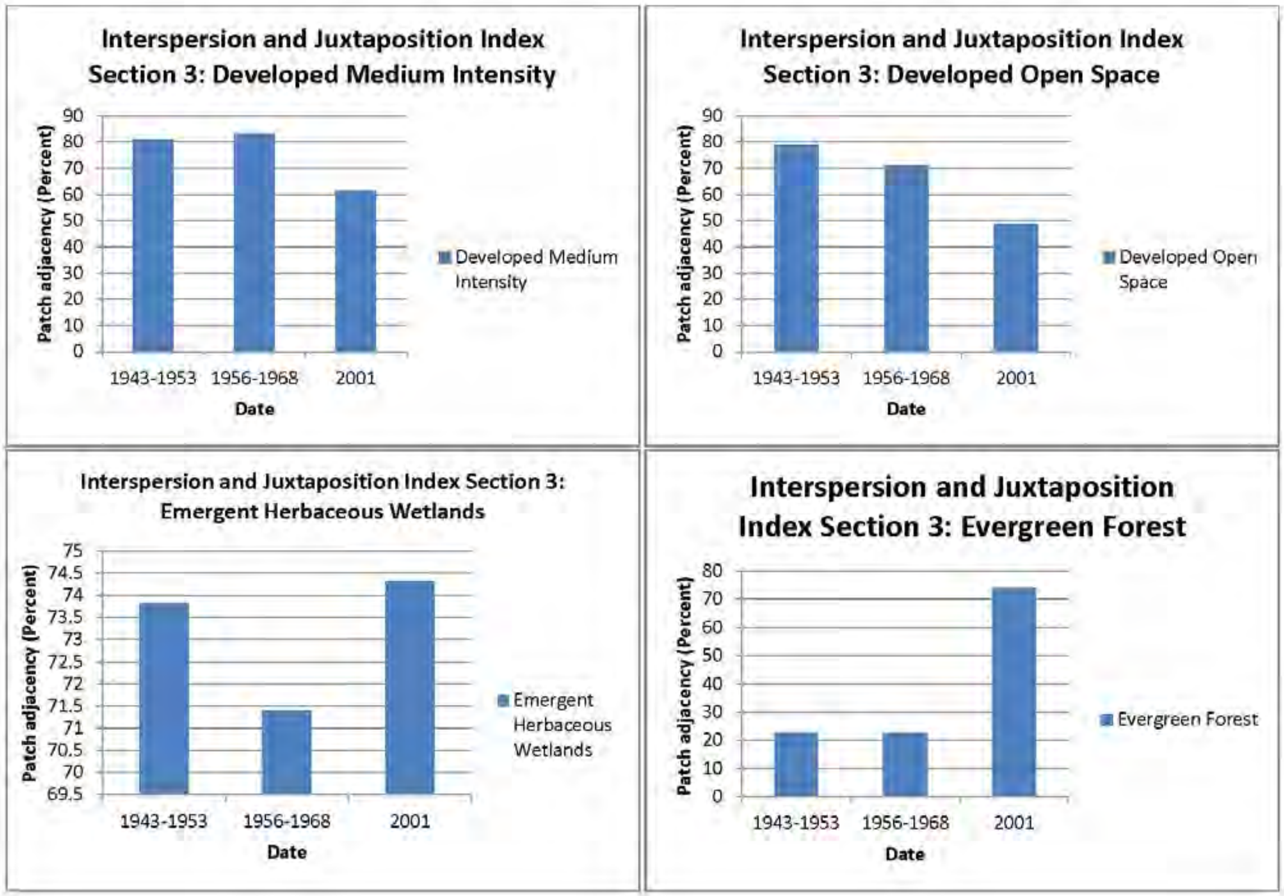

Interspersion and Juxtaposition
Index Section 2: Evergreen Forest
Patch adjacency (Percent)
84
82
80
78
76
74
72
1943-1953
1956-1968
2001
Date
Evergreen Forest

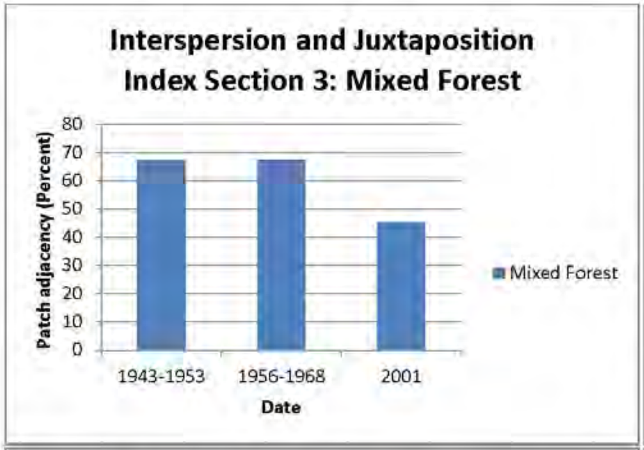

Interspersion and Juxtaposition Index Section 2: Mixed Forest
Patch adjacency (Percent)
71
70
69
68
67
66
1943-1953
1956-1968
2001
Date
Mixed Forest

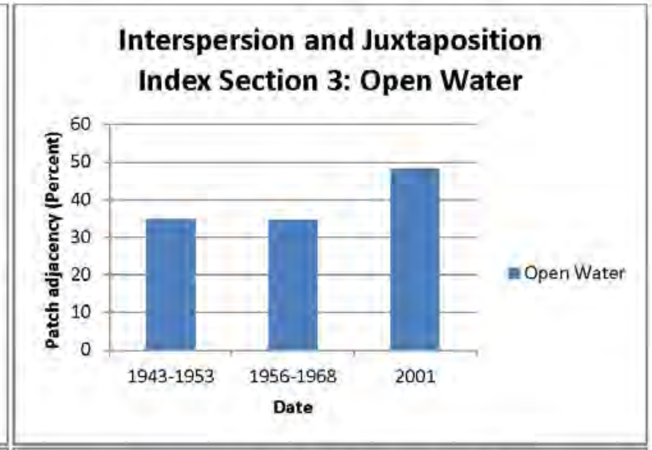

Interspersion and Juxtaposition Index Section 2: Open Water
Patch adjacency (Percent)
40
35
30
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Open Water

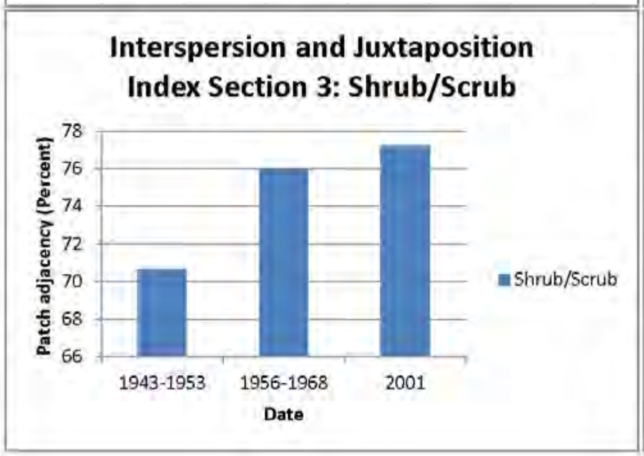

Interspersion and Juxtaposition Index Section 2: Woody Wetlands
Patch adjacency (Percent)
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

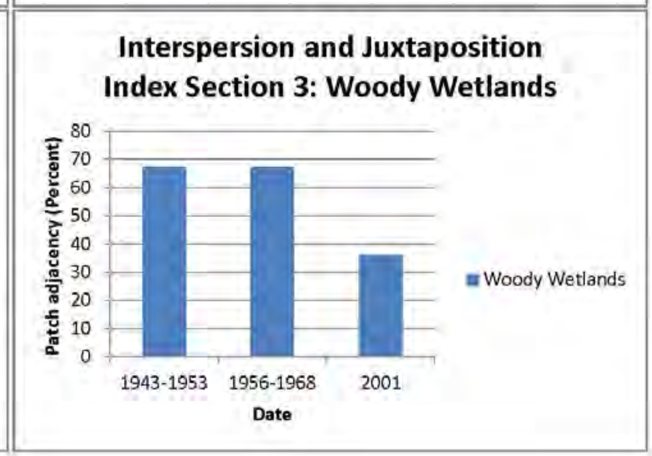

Interspersion and Juxtaposition Index
Section 3: Barren Land (Rock/Sand/Clay)
Patch adjacency (Percent)
0
10
20
30
40
50
60
70
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)
Interspersion and Juxtaposition Index
Section 3: Deciduous Forest
Patch adjacency (Percent)
0
20
40
60
80
100
1943-1953
1956-1968
2001
Date
Deciduous Forest
Interspersion and Juxtaposition Index
Section 3: Developed High Intensity
Patch adjacency (Percent)
0
10
20
30
40
50
60
70
1943-1953
1956-1968
2001
Date
Developed High Intensity
Interspersion and Juxtaposition Index
Section 3: Developed Low Intensity
Patch adjacency (Percent)
60
62
64
66
68
70
72
74
76
1943-1953
1956-1968
2001
Date
Developed Low Intensity

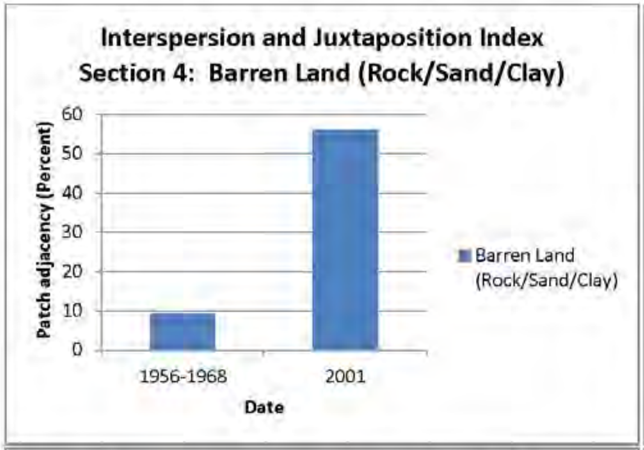

Interspersion and Juxtaposition Index
Section 3: Developed Medium Intensity
Patch adjacency (Percent)
0
10
20
30
40
50
60
70
80
90
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Interspersion and Juxtaposition Index
Section 3: Developed Open Space
Patch adjacency (Percent)
0
10
20
30
40
50
60
70
80
90
1943-1953
1956-1968
2001
Date
Developed Open Space
Interspersion and Juxtaposition Index Section 3:
Emergent Herbaceous Wetlands
Patch adjacency (Percent)
69.5
70
70.5
71
71.5
72
72.5
73
73.5
74
74.5
75
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Interspersion and Juxtaposition
Index Section 3: Evergreen Forest
Patch adjacency (Percent)
0
10
20
30
40
50
60
70
80
1943-1953
1956-1968
2001
Date
Evergreen Forest

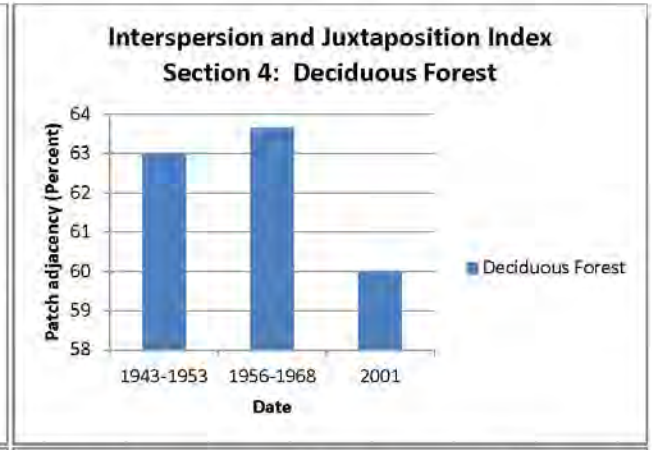

Interspersion and Juxtaposition Index Section 3: Mixed Forest
Patch adjacency (Percent)
0
10
20
30
40
50
60
70
80
1943-1953
1956-1968
2001
Date
Mixed Forest

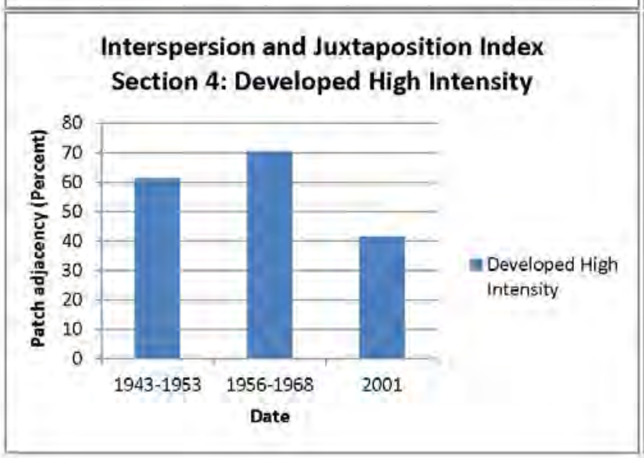

Interspersion and Juxtaposition Index Section 3: Open Water
Patch adjacency (Percent)
0
10
20
30
40
50
60
1943-1953
1956-1968
2001
Date
Open Water

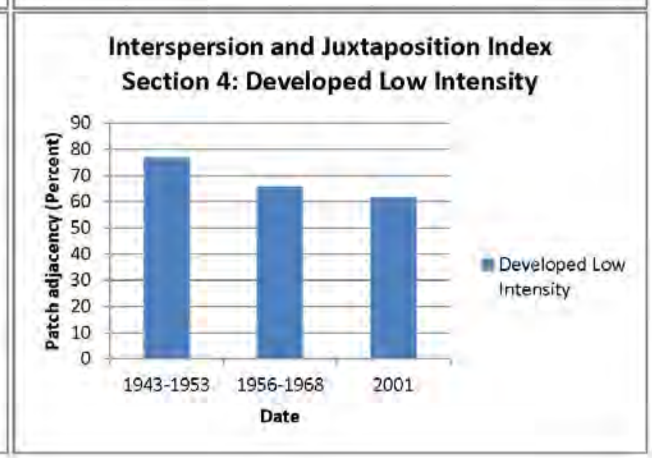

Interspersion and Juxtaposition Index Section 3: Shrub/Scrub
Patch adjacency (Percent)
66
68
70
72
74
76
78
1943-1953
1956-1968
2001
Date
Shrub/Scrub

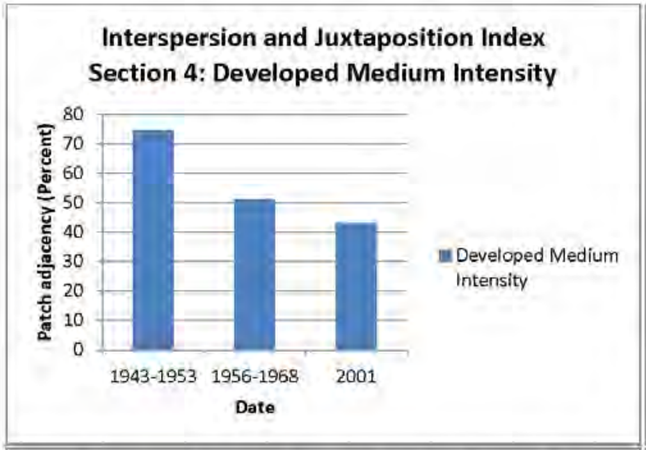

Interspersion and Juxtaposition Index Section 3: Woody Wetlands
Patch adjacency (Percent)
0
10
20
30
40
50
60
70
80
1943-1953
1956-1968
2001
Date
Woody Wetlands

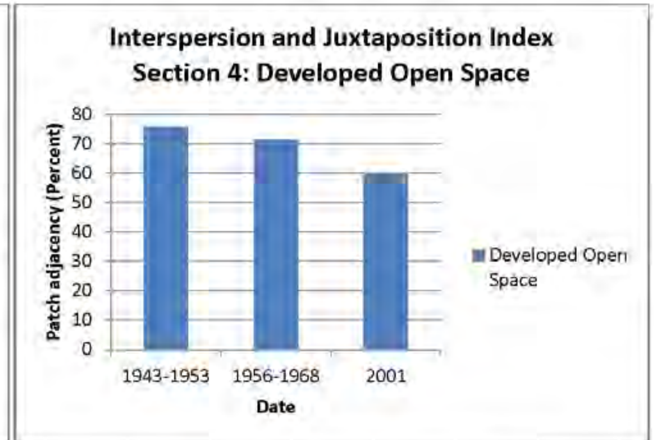

Interspersion and Juxtaposition Index
Section 4: Barren Land (Rock/Sand/Clay)
Patch adjacency (Percent)
60
50
40
30
20
10
0
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

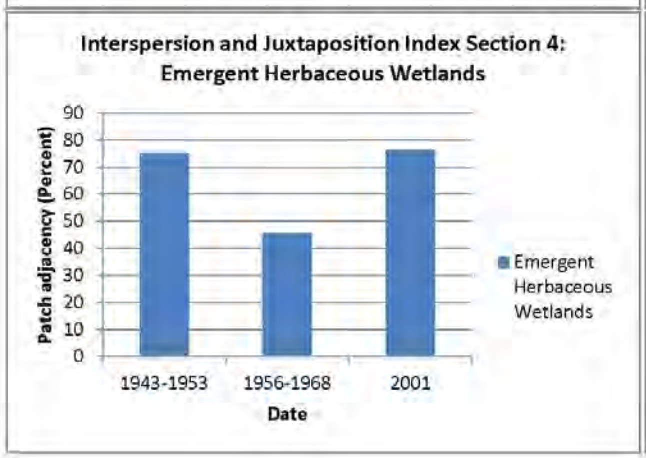

Interspersion and Juxtaposition Index
Section 4: Deciduous Forest
Patch adjacency (Percent)
64
63
62
61
60
59
58
1943-1953
1956-1968
2001
Date
Deciduous Forest

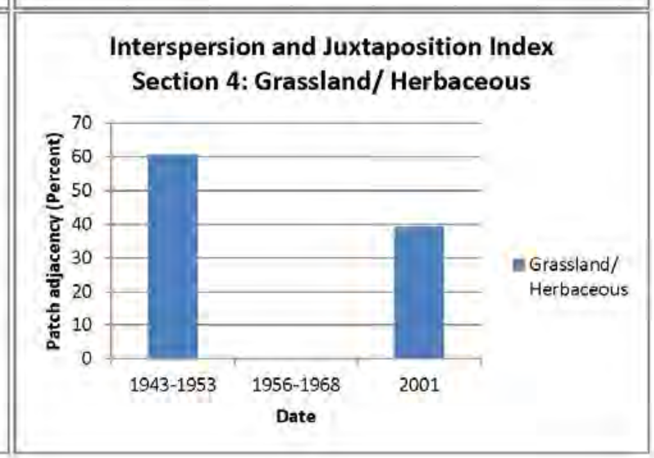

Interspersion and Juxtaposition Index
Section 4: Developed High Intensity
Patch adjacency (Percent)
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Developed High Intensity

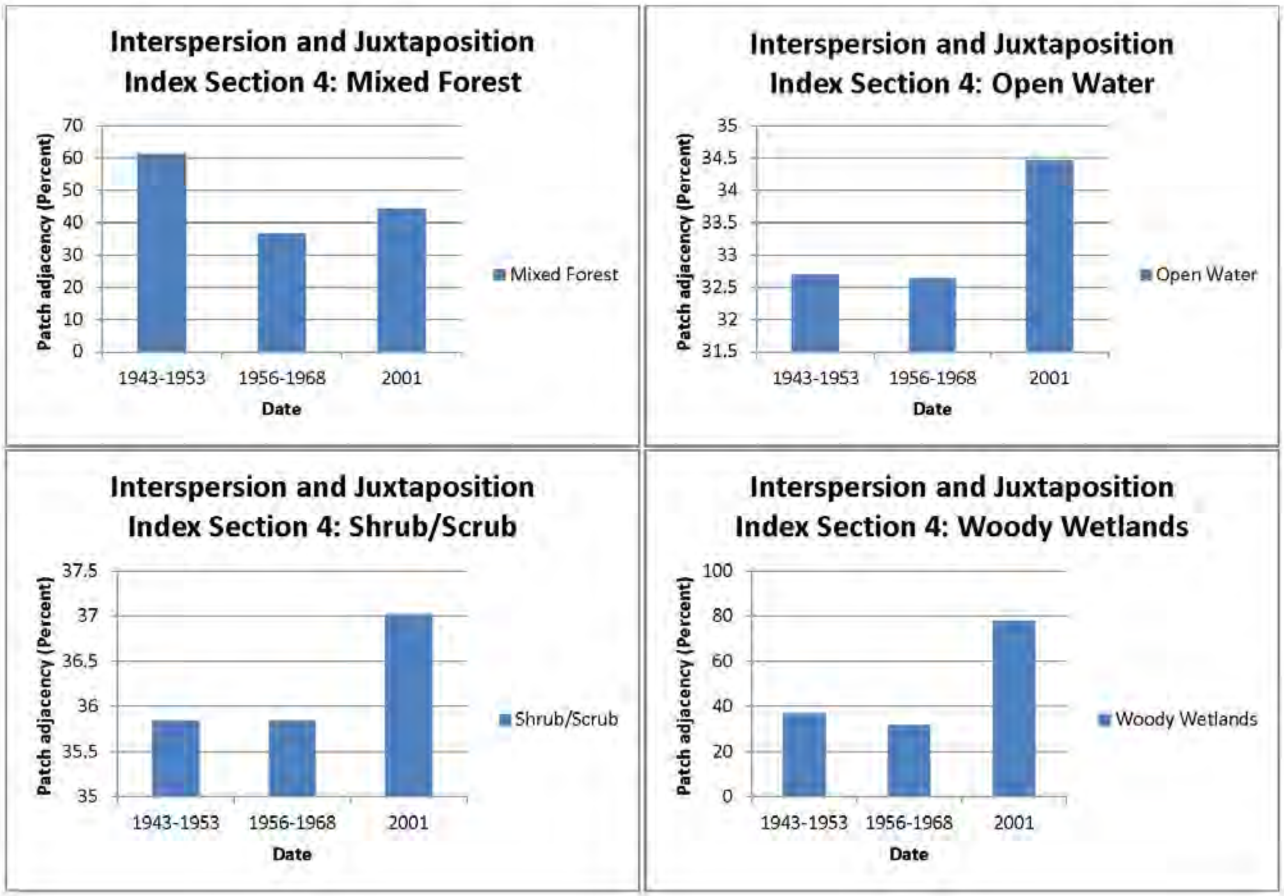

Interspersion and Juxtaposition Index
Section 4: Developed Low Intensity
Patch adjacency (Percent)
90
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Developed Low Intensity

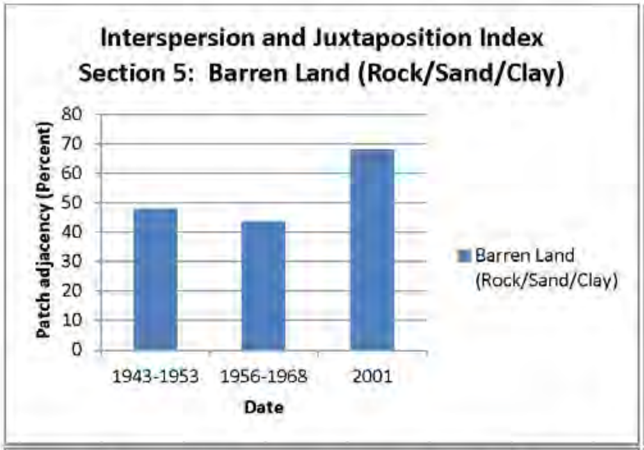

Interspersion and Juxtaposition Index
Section 4: Developed Medium Intensity
Patch adjacency (Percent)
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

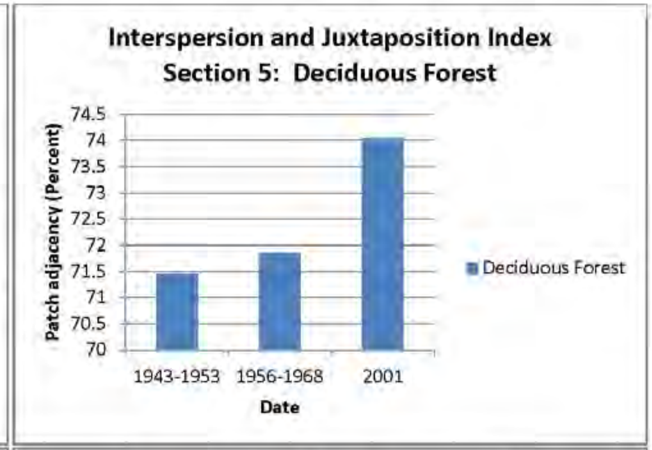

Interspersion and Juxtaposition Index
Section 4: Developed Open Space
Patch adjacency (Percent)
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Developed Open Space

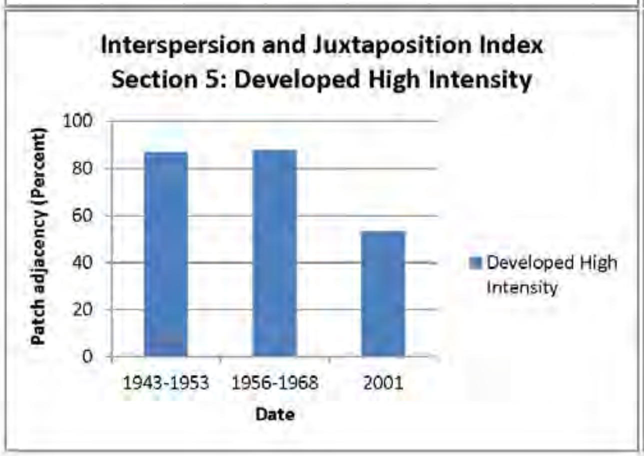

Interspersion and Juxtaposition Index Section 4:
Emergent Herbaceous Wetlands
Patch adjacency (Percent)
90
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands

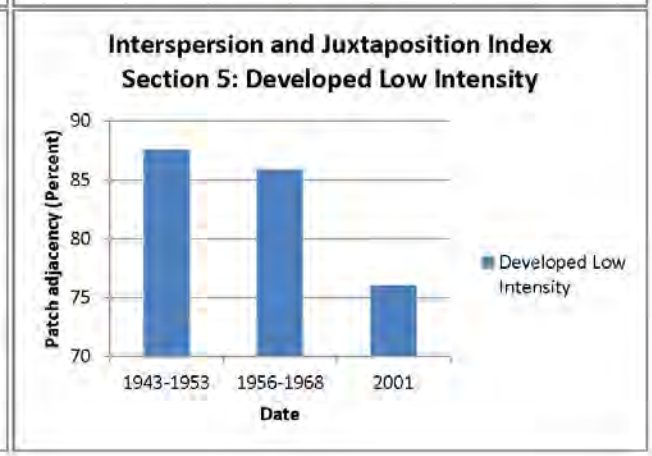

Interspersion and Juxtaposition Index
Section 4: Grassland/ Herbaceous
Patch adjacency (Percent)
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Grassland/ Herbaceous

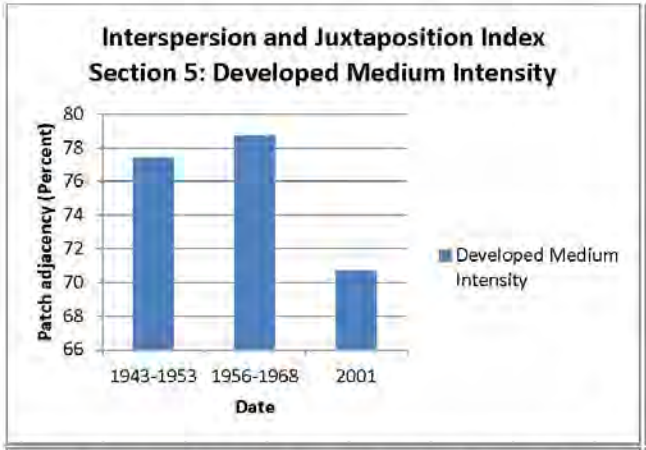

Interspersion and Juxtaposition Index Section 4: Mixed Forest
Patch adjacency (Percent)
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Mixed Forest
Interspersion and Juxtaposition Index Section 4: Open Water
Patch adjacency (Percent)
35
34.5
34
33.5
33
32.5
32
31.5
1943-1953
1956-1968
2001
Date
Open Water
Interspersion and Juxtaposition Index Section 4: Shrub/Scrub
Patch adjacency (Percent)
37.5
37
36.5
36
35.5
35
1943-1953
1956-1968
2001
Date
Shrub/Scrub
Interspersion and Juxtaposition Index Section 4: Woody Wetlands
Patch adjacency (Percent)
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Woody Wetlands

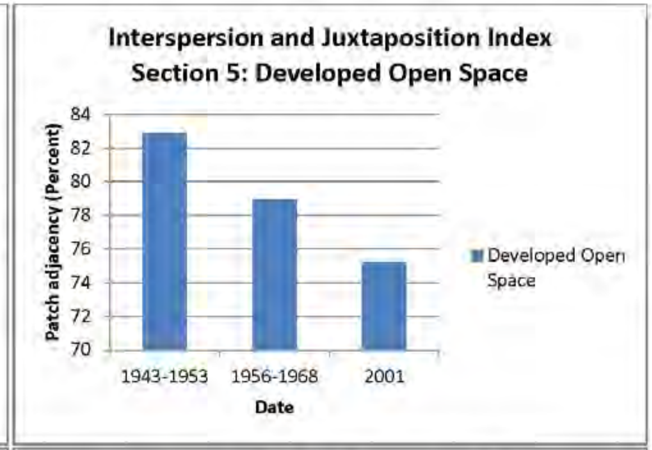

Interspersion and Juxtaposition Index
Section 5: Barren Land (Rock/Sand/Clay)
Patch adjacency (Percent)
0
10
20
30
40
50
60
70
80
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)

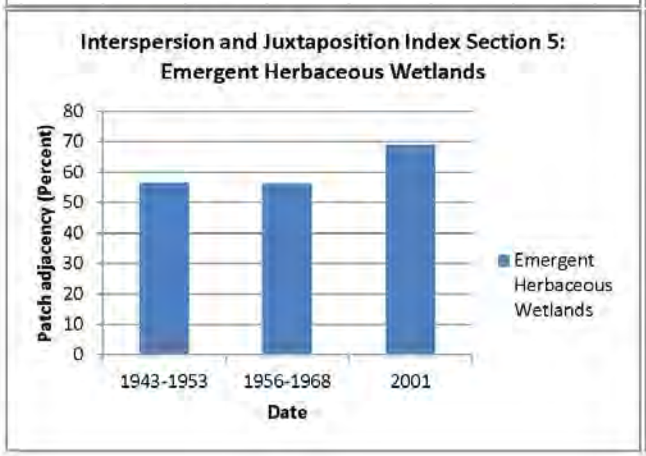

Interspersion and Juxtaposition Index
Section 5: Deciduous Forest
Patch adjacency (Percent)
70
70.5
71
71.5
72
72.5
73
73.5
74
74.5
1943-1953
1956-1968
2001
Date
Deciduous Forest

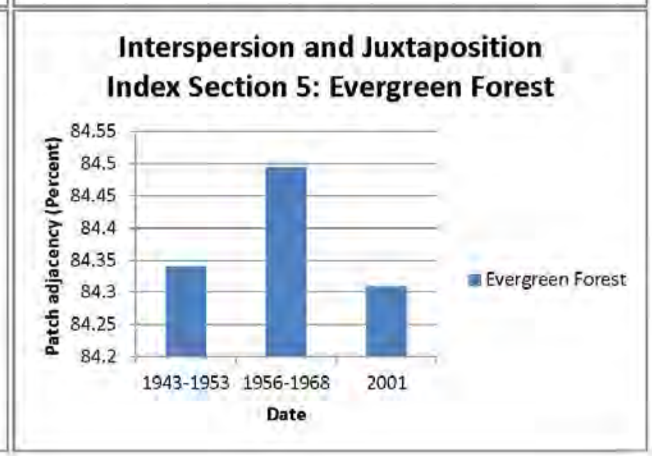

Interspersion and Juxtaposition Index
Section 5: Developed High Intensity
Patch adjacency (Percent)
0
20
40
60
80
100
1943-1953
1956-1968
2001
Date
Developed High Intensity

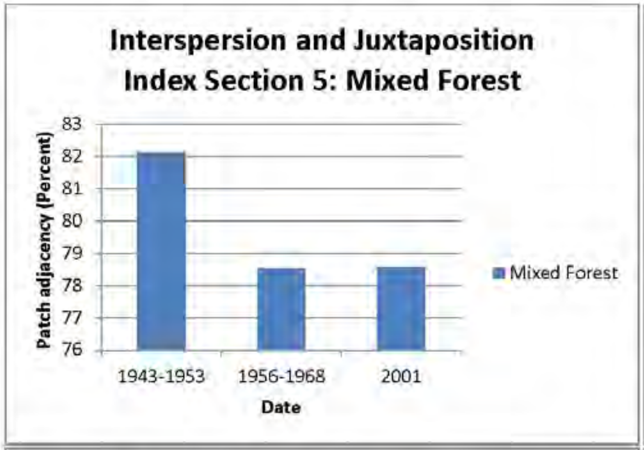

Interspersion and Juxtaposition Index
Section 5: Developed Low Intensity
Patch adjacency (Percent)
70
75
80
85
90
1943-1953
1956-1968
2001
Date
Developed Low Intensity

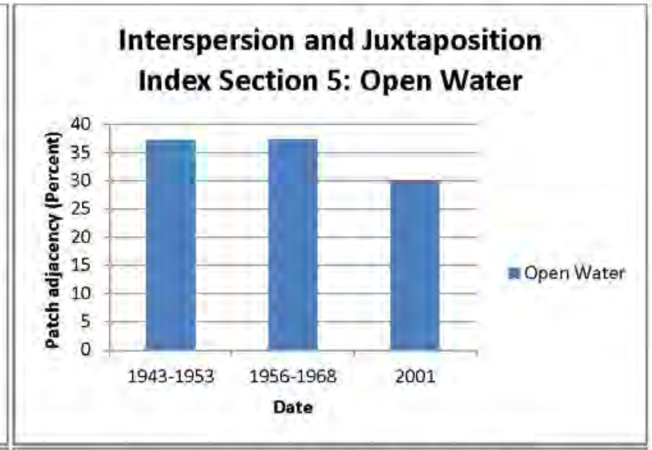

Interspersion and Juxtaposition Index
Section 5: Developed Medium Intensity
Patch adjacency (Percent)
80
78
76
74
72
70
68
66
1943-1953
1956-1968
2001
Date
Developed Medium Intensity

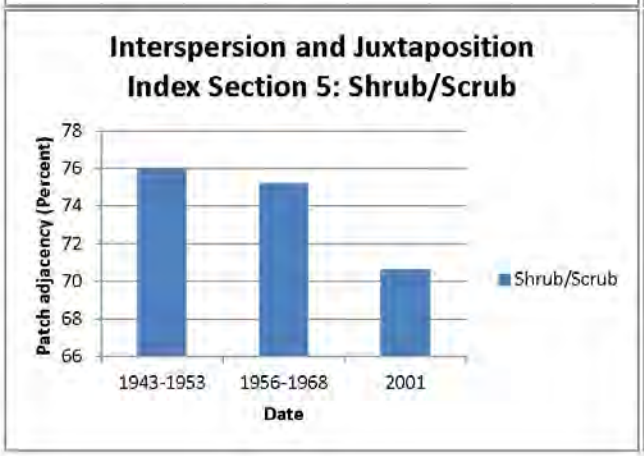

Interspersion and Juxtaposition Index
Section 5: Developed Open Space
Patch adjacency (Percent)
84
82
80
78
76
74
72
70
1943-1953
1956-1968
2001
Date
Developed Open Space

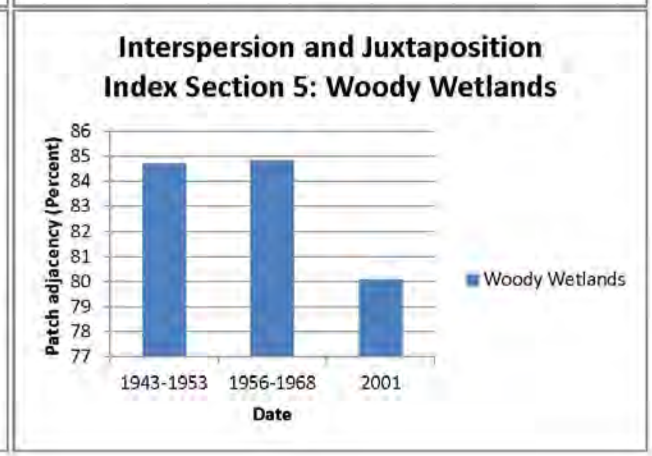

Interspersion and Juxtaposition Index Section 5:
Emergent Herbaceous Wetlands
Patch adjacency (Percent)
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands


Interspersion and Juxtaposition
Index Section 5: Evergreen Forest
Patch adjacency (Percent)
84.55
84.5
84.45
84.4
84.35
84.3
84.25
84.2
1943-1953
1956-1968
2001
Date
Evergreen Forest


Interspersion and Juxtaposition Index Section 5: Mixed Forest
Patch adjacency (Percent)
83
82
81
80
79
78
77
76
1943-1953
1956-1968
2001
Date
Mixed Forest


Interspersion and Juxtaposition Index Section 5: Open Water
Patch adjacency (Percent)
40
35
30
25
20
15
10
5
0
1943-1953
1956-1968
2001
Date
Open Water


Interspersion and Juxtaposition Index Section 5: Shrub/Scrub
Patch adjacency (Percent)
78
76
74
72
70
68
66
1943-1953
1956-1968
2001
Date
Shrub/Scrub


Interspersion and Juxtaposition Index Section 5: Woody Wetlands
Patch adjacency (Percent)
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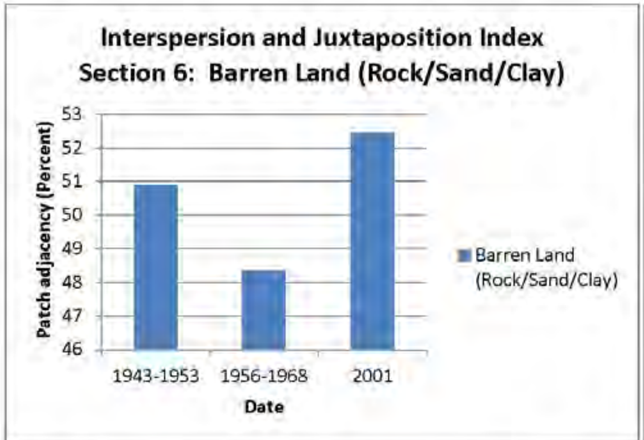
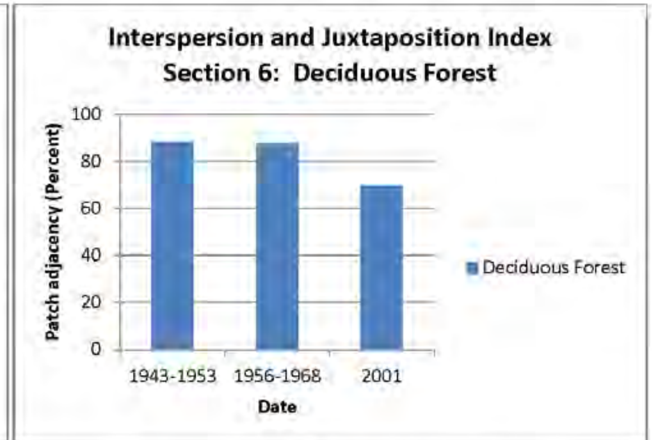
85
84
83
82
81
80
79
78
77
1943-1953
1956-1968
2001
Date
Woody Wetlands


Interspersion and Juxtaposition Index
Section 6: Barren Land (Rock/Sand/Clay)
Patch adjacency (Percent)
53
52
51
50
49
48
47
46
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)


Interspersion and Juxtaposition Index
Section 6: Deciduous Forest
Patch adjacency (Percent)
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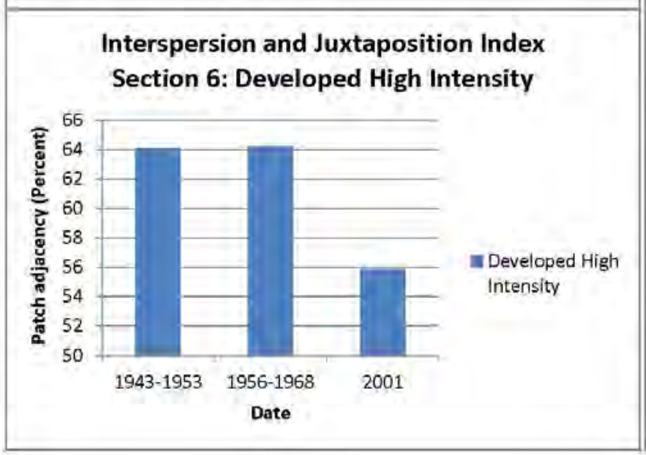
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Deciduous Forest


Interspersion and Juxtaposition Index
Section 6: Developed High Intensity
Patch adjacency (Percent)
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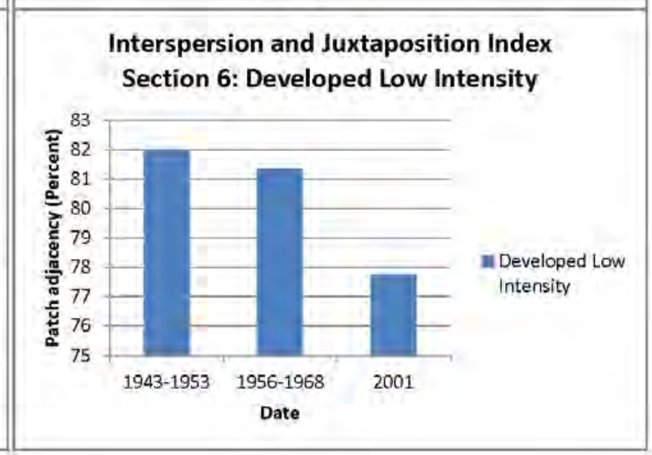
64
62
60
58
56
54
52
50
1943-1953
1956-1968
2001
Date
Developed High Intensity


Interspersion and Juxtaposition Index
Section 6: Developed Low Intensity
Patch adjacency (Percent)
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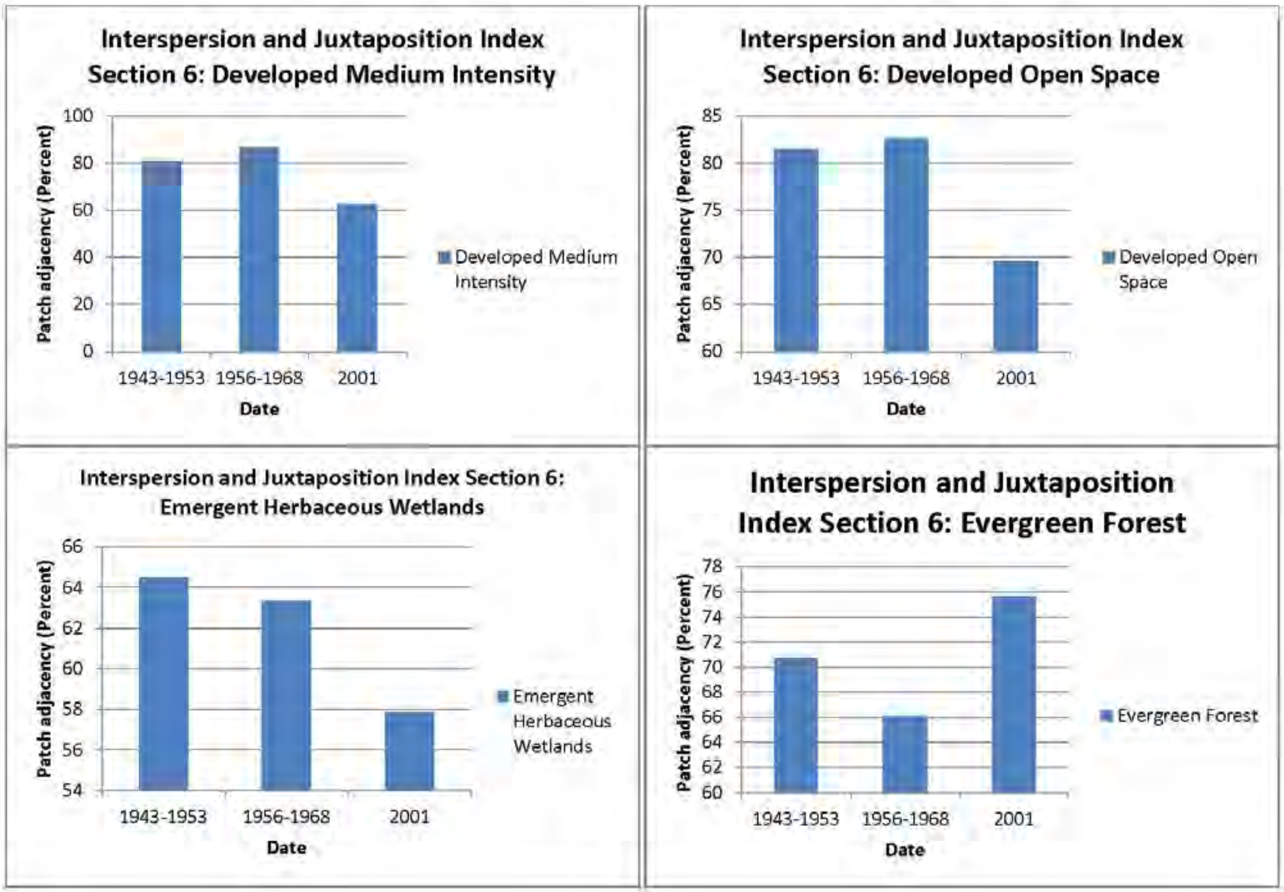
82
81
80
79
78
77
76
75
1943-1953
1956-1968
2001
Date
Developed Low Intensity


Interspersion and Juxtaposition Index
Section 6: Developed Medium Intensity
Patch adjacency (Percent)
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Interspersion and Juxtaposition Index
Section 6: Developed Open Space
Patch adjacency (Percent)
85
80
75
70
65
60
1943-1953
1956-1968
2001
Date
Developed Open Space
Interspersion and Juxtaposition Index Section 6:
Emergent Herbaceous Wetlands
Patch adjacency (Percent)
66
64
62
60
58
56
54
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Interspersion and Juxtaposition
Index Section 6: Evergreen Forest
Patch adjacency (Percent)
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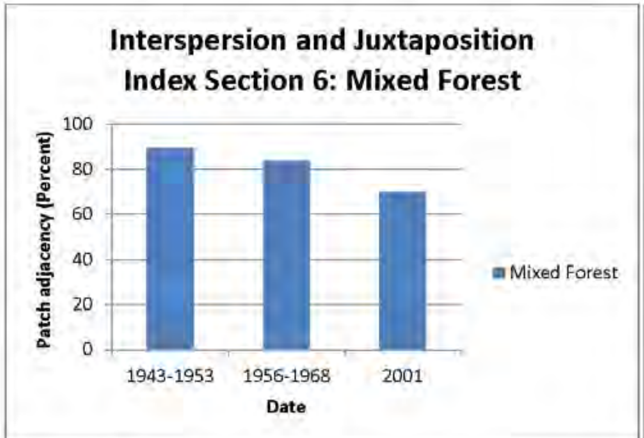
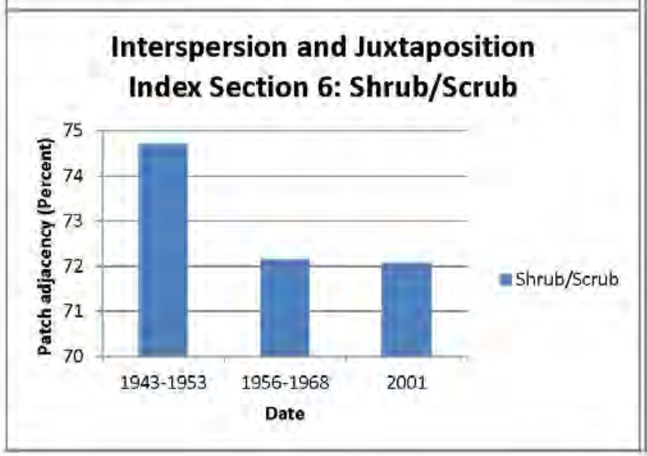
76
74
72
70
68
66
64
62
60
1943-1953
1956-1968
2001
Date
Evergreen Forest


Interspersion and Juxtaposition Index Section 6: Mixed Forest
Patch adjacency (Percent)
100
80
60
40
20
0
1943-1953
1956-1968
2001
Date
Mixed Forest


Interspersion and Juxtaposition Index Section 6: Open Water
Patch adjacency (Percent)
38.5
38
37.5
37
36.5
36
35.5
35
34.5
34
1943-1953
1956-1968
2001
Date
Open Water


Interspersion and Juxtaposition Index Section 6: Shrub/Scrub
Patch adjacency (Percent)
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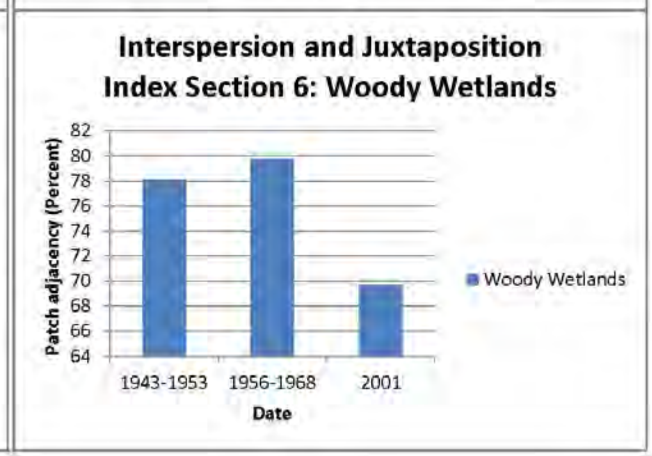
74
73
72
71
70
1943-1953
1956-1968
2001
Date
Shrub/Scrub


Interspersion and Juxtaposition Index Section 6: Woody Wetlands
Patch adjacency (Percent)
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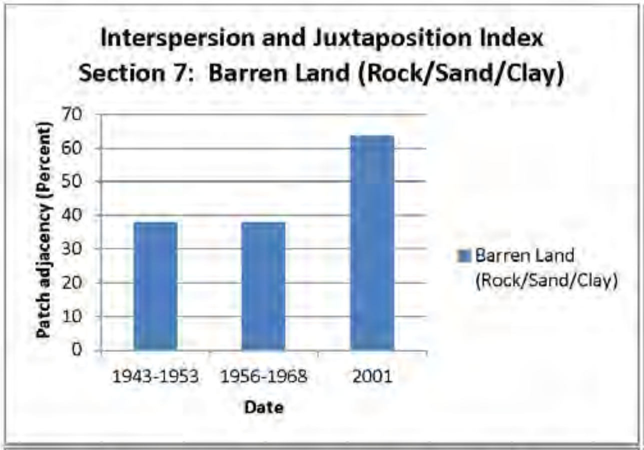
80
78
76
74
72
70
68
66
64
1943-1953
1956-1968
2001
Date
Woody Wetlands


Interspersion and Juxtaposition Index
Section 7: Barren Land (Rock/Sand/Clay)
Patch adjacency (Percent)
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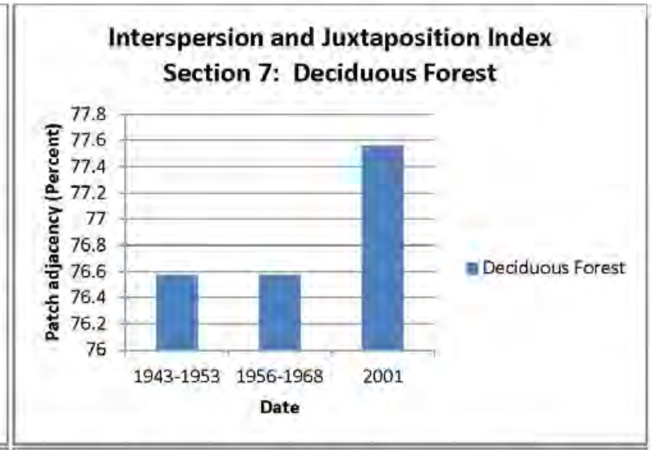
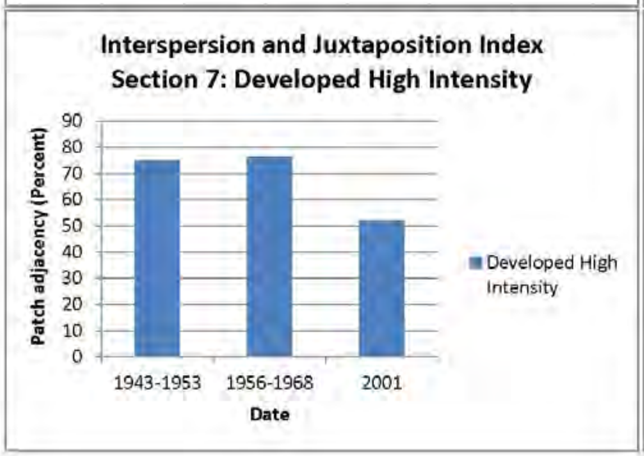
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Barren Land (Rock/Sand/Clay)


Interspersion and Juxtaposition Index
Section 7: Deciduous Forest
Patch adjacency (Percent)
77.8
77.6
77.4
77.2
77
76.8
76.6
76.4
76.2
76
1943-1953
1956-1968
2001
Date
Deciduous Forest


Interspersion and Juxtaposition Index
Section 7: Developed High Intensity
Patch adjacency (Percent)
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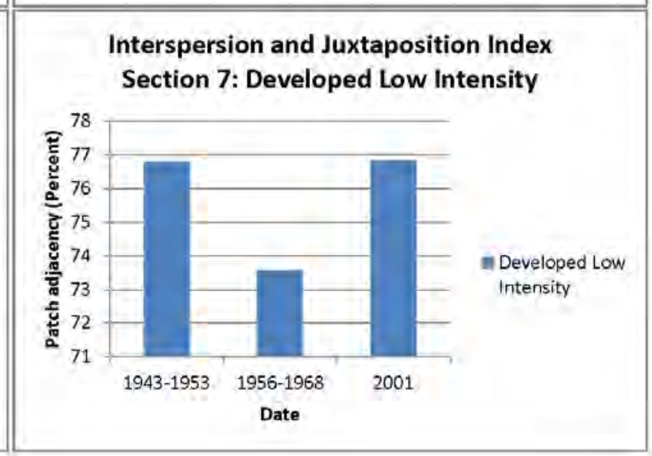
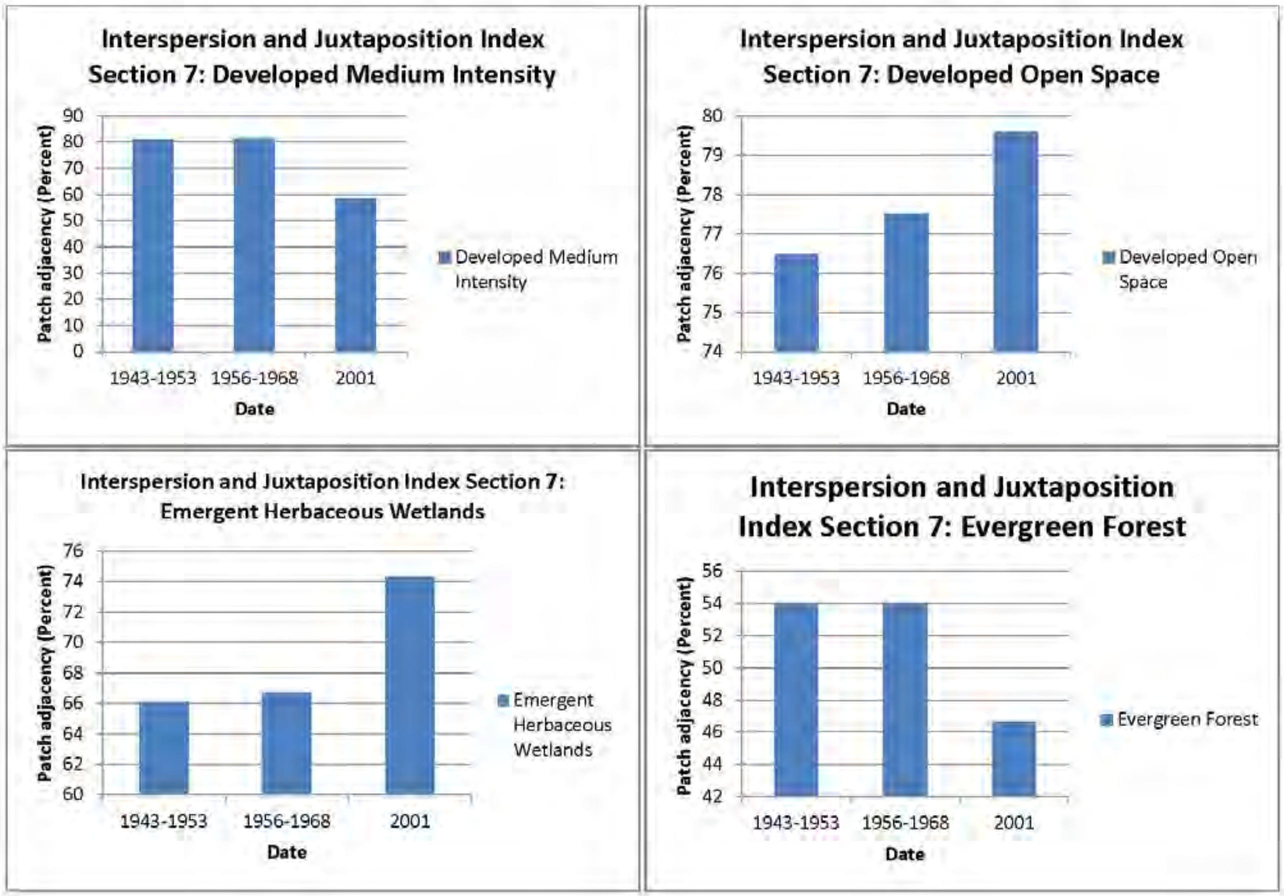
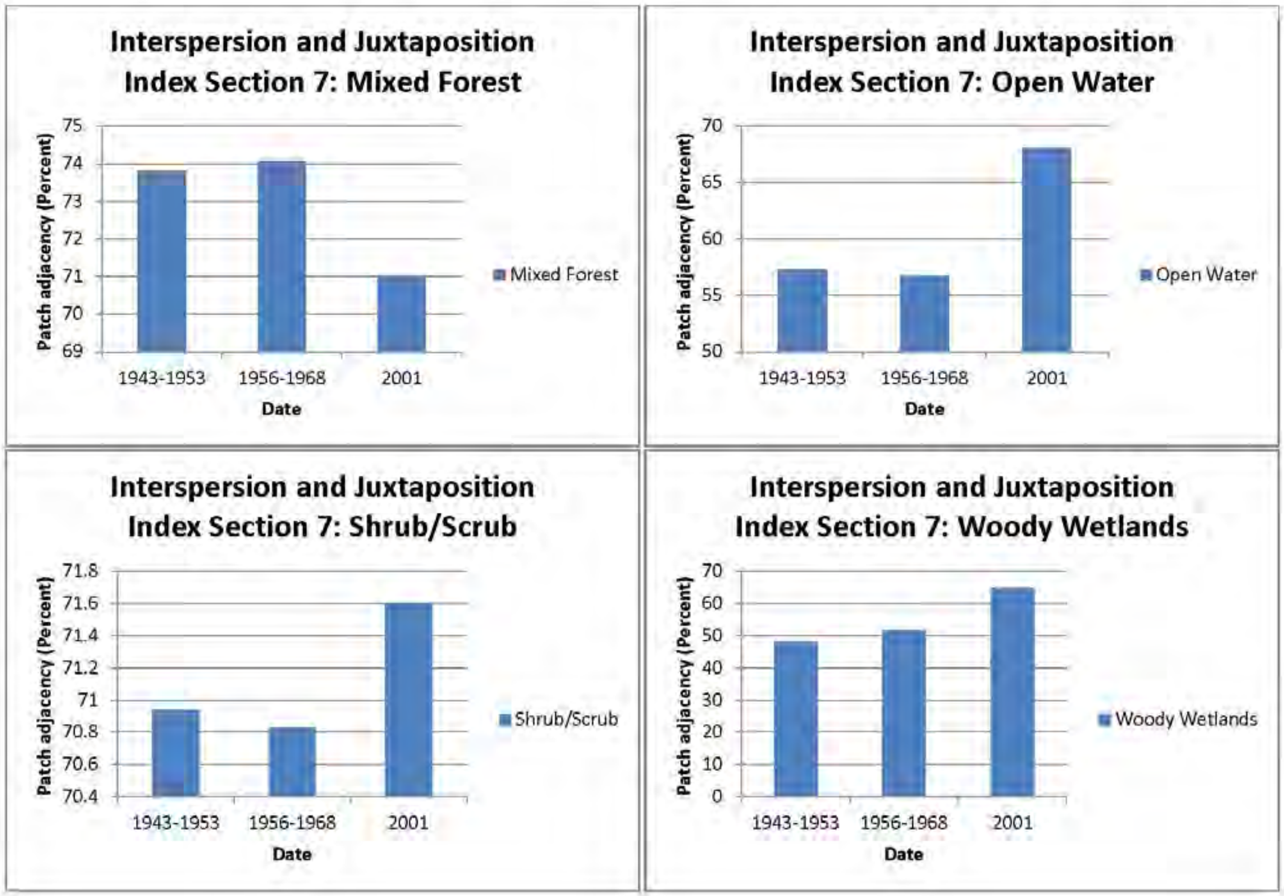
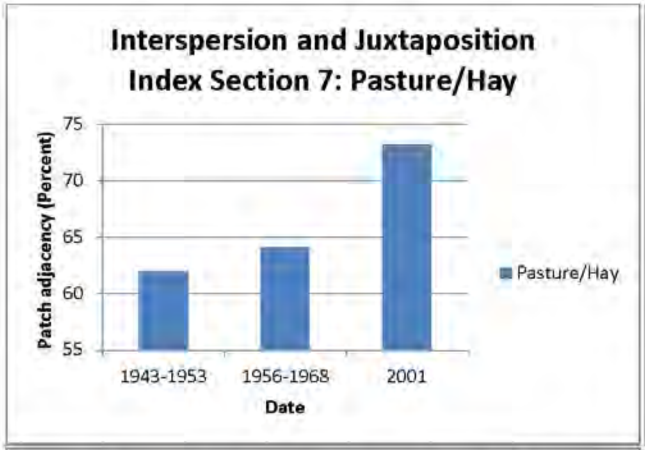
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Developed High Intensity


Interspersion and Juxtaposition Index
Section 7: Developed Low Intensity
Patch adjacency (Percent)
78
77
76
75
74
73
72
71
1943-1953
1956-1968
2001
Date
Developed Low Intensity


Interspersion and Juxtaposition Index
Section 7: Developed Medium Intensity
Patch adjacency (Percent)
90
80
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Developed Medium Intensity
Interspersion and Juxtaposition Index
Section 7: Developed Open Space
Patch adjacency (Percent)
80
79
78
77
76
75
74
1943-1953
1956-1968
2001
Date
Developed Open Space
Interspersion and Juxtaposition Index Section 7:
Emergent Herbaceous Wetlands
Patch adjacency (Percent)
76
74
72
70
68
66
64
62
60
1943-1953
1956-1968
2001
Date
Emergent Herbaceous Wetlands
Interspersion and Juxtaposition
Index Section 7: Evergreen Forest
Patch adjacency (Percent)
56
54
52
50
48
46
44
42
1943-1953
1956-1968
2001
Date
Evergreen Forest


Interspersion and Juxtaposition Index Section 7: Mixed Forest
Patch adjacency (Percent)
75
74
73
72
71
70
69
1943-1953
1956-1968
2001
Date
Mixed Forest
Interspersion and Juxtaposition Index Section 7: Open Water
Patch adjacency (Percent)
70
65
60
55
50
1943-1953
1956-1968
2001
Date
Open Water
Interspersion and Juxtaposition Index Section 7: Shrub/Scrub
Patch adjacency (Percent)
71.8
71.6
71.4
71.2
71
70.8
70.6
70.4
1943-1953
1956-1968
2001
Date
Shrub/Scrub
Interspersion and Juxtaposition Index Section 7: Woody Wetlands
Patch adjacency (Percent)
70
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Woody Wetlands


Interspersion and Juxtaposition Index Section 7: Pasture/Hay
Patch adjacency (Percent)
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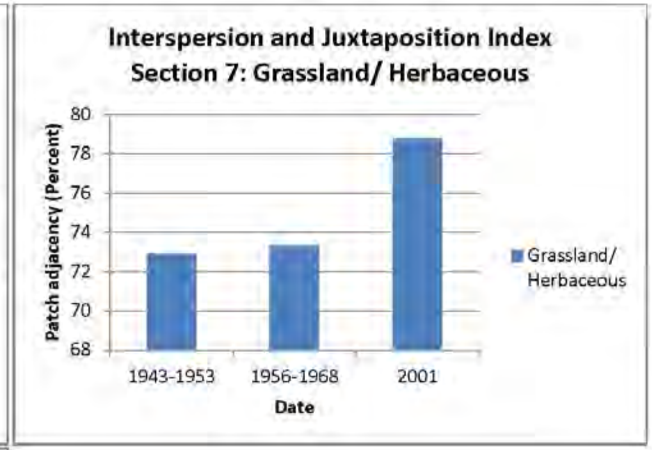
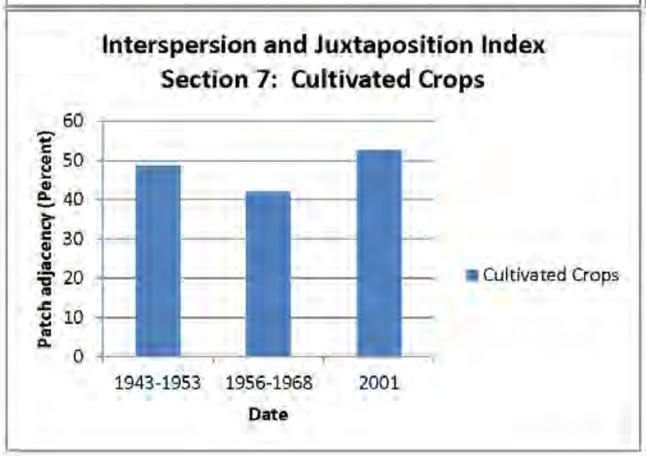
70
65
60
55
1943-1953
1956-1968
2001
Date
Pasture/Hay


Interspersion and Juxtaposition Index Section 7: Grassland/ Herbaceous
Patch adjacency (Percent)
80
78
76
74
72
70
68
1943-1953
1956-1968
2001
Date
Grassland/ Herbaceous


Interspersion and Juxtaposition Index Section 7: Cultivated Crops
Patch adjacency (Percent)
60
50
40
30
20
10
0
1943-1953
1956-1968
2001
Date
Cultivated Crops

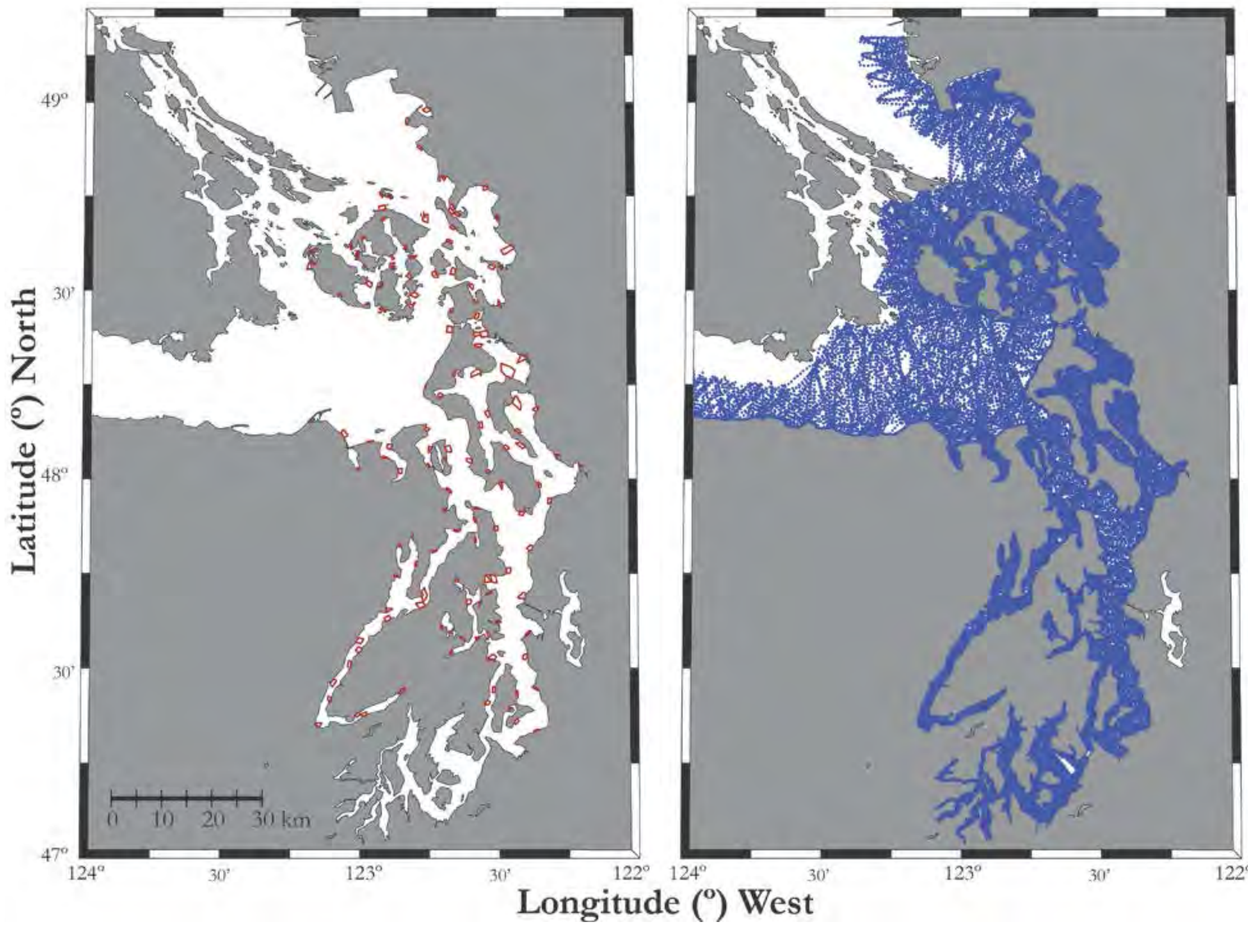
Appendix C

Brown's to Tulalip Point SeaDuck Evaluation Study

Ignacio Vilchis & Julia K. Parrish

Because of their natural history, life history, ubiquity, and ease of identification, marine birds are commonly used as sentinels of ecosystem health (Furness and Greenwood 1993, Furness and Camphuysen 1997). Ideally, comprehensive long-term monitoring of marine bird populations would allow both basic demographic monitoring as well as coincident monitoring of the strength of likely forcing factors producing trends in abundance. However, the degree to which seabirds reflect environmental change is not necessarily a linear function of environmental forcing (e.g. Aebischer et al. 1990, Oedekoven et al. 2001), necessitating caution in interpreting causality. A variety of anthropogenic activities have been implicated as significant marine bird mortality agents, including hunting, bycatch in fisheries (Kaiser 1993, Hamel et al. 2009), marine pollution (Camphuysen et al. 1999), increasing algal toxins/harmful algal blooms (Shumway et al. 2003) disturbance (Carney and Sydeman 1999), loss of food resources (Brooke et al. 2006), habitat degradation/loss (Boersma and Parrish 1998), and global climate change (Veit et al. 1997). Along the North American west coast, millions of marine birds, including both resident breeders and winter migrants, winter and forage along the protected coastal shelf and estuarine waters. Marine birds - including seabirds, marine waterfowl, and select shorebirds and wading birds - comprise the most numerous and highly visible components of coastal marine environments throughout the Pacific Northwest. In the Puget Sound, marine birds, and especially marine waterfowl, are both resident and migrant, with a maximum number of species using the Sound as a wintering area (Angell and Balcomb 1982). Changes in the amount of wintering habitat, and the quality of habitat relative to food production have been cited as factors affecting the abundance of wintering waterfowl in Puget Sound (Anderson et al. 2009, Bower 2009). We know that Puget Sound has faced an increasing rate of local extinctions in its wildlife (Gaydos and Brown 2011). These have been either results of direct of indirect effects of fisheries or from cascading effects of ecosystem deterioration from a growing human population. We also know that as conspicuous long-lived apex predators in marine systems, seabirds and waterfowl can integrate ecosystem dynamics over large spatial scales and long temporal scales – making them excellent indicators of ecosystem health and flagship species for marine conservation.

Figure 1. Regional sampling of Puget Sound by the Historical Marine Bird Aerial Census (HMBAC) and Puget Sound Ambient Monitoring Program (PSAMP). HMBAC surveys occurred from 1958 to 1985, and PSAMP from 1994 to 2010.



This report is part of a cumulative study by the U.S. Army Corps of Engineers (USACE), examining changes in aquatic resources within the coastline between Tulalip Point and Brown's Point in Central Puget Sound, Washington State. Our specific goals were to:

- Describe a set of salvaged and recently electronically archived data of historical Puget Sound marine bird surveys, including data origins, data collection methods in as far as they could be determined, data limitations, and data interpretation.
- Explain how we used these historical survey data along with contemporary marine bird survey data collected by the Puget Sound Ambient Monitoring Program (PSAMP) to evaluate interannual trends for select seaduck densities found within the nearshore habitat along the Brown's Point to Tulalip Point coastline in Central Puget Sound, including data standardization and statistical analysis.
- Discern and interpret any interannual trends in these data.

Methods

To quantify interdecadal changes in marine waterfowl utilizing nearshore habitats of Puget Sound between Tulalip Point and Brown's Point, we gathered available multi-year datasets that had comparable methods. Although some shore-side counts are available, including the Audubon Christmas Bird Count and the Seattle Audubon Marine Bird Survey (much more recently), we deemed these data insufficient due to sampling design issues including but not limited to: unstandardized differences among observers, lack of confidence in area determination (essential for calculation of density), and area under-sampling. The two most promising datasets were aerial surveys spanning nearly 50 years (1961-2010) with a total of 39 years sampled.

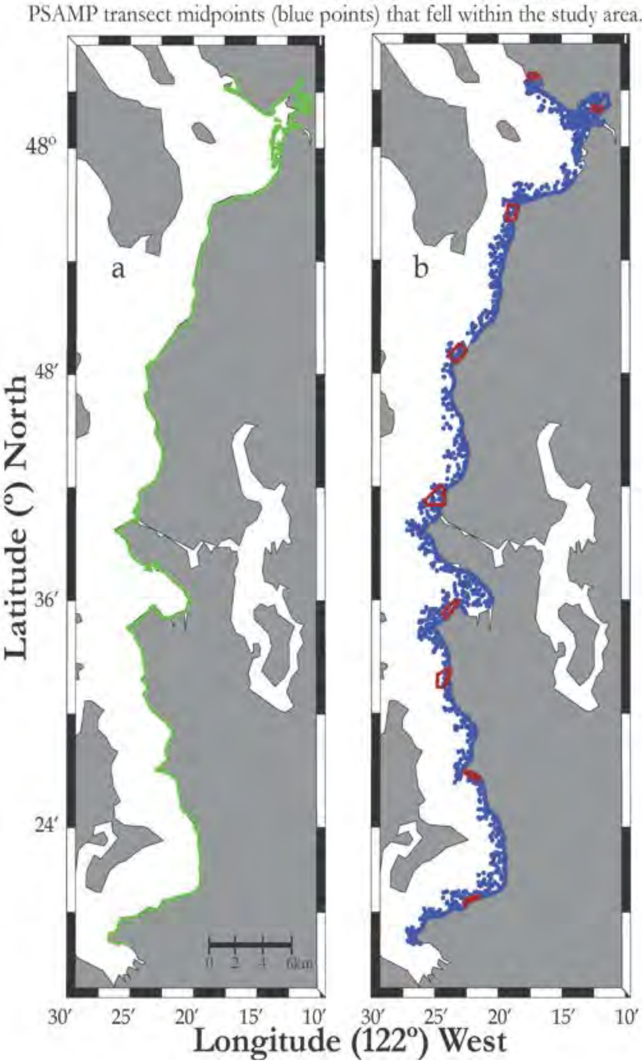


Figure 2. a Study area: 175km stretch of coast between Tulalip Point and Brown's Point; b HMBAC sampling polygons (red polygons) and PSAMP transect midpoints (blue points) that fell within the study area.

During the late 1950s through the 1980s, the Washington Department of Fish and Wildlife (WDFW) aerially surveyed waterfowl species along the nearshore habitats of Puget Sound. Don Kraege (WDFW) salvaged 377 data-sheets from a historical marine bird aerial census (hereafter HMBAC) and provided copies to the University of Washington (Parrish). All paper data were electronically archived, making them available for use in this report. An ongoing marine monitoring program also run by WDFW and sponsored by PSAMP has been aerially surveying Puget Sound marine birds since 1994.

We have little information of the survey methodology used by HMBAC surveys as no written methods survive. Joe Evenson and Don Kraege (WDFW) provided personal accounts of likely methods used. In addition, we used notes written directly on salvaged datasheets to further define likely methodology. Surveys were likely point-counts (Bibby et al. 2000) most likely taken from the air with either a Cessna-206 or 186 equipped with floats flying ~65 meters above sea level at 80-90 knots. There is no information about survey effort (start and stop times, flight pattern, etc.), thus it remains unclear whether the overflight was a single pass, or multiple passes. It does appear that attempts were made to do direct counts of all of the waterfowl found within each polygon area. We also had access to map cutouts of the sampling polygons that were used as reference areas for completing the aerial point-counts by the

Table 1. Marine bird taxa categories recorded throughout the 28 survey years of the Historical Marine Bird Aerial Censuses (HMBAC) surveys. Common names shown in bold are those species or species groups that were included in trend analyses - all others were excluded due to insufficient sample sizes.

Common name	Latin name
Redheads	*Aythya Americana*
Canvasbacks	*Aythya valisineria*
Scaup species	*Aythya marila & A. affinis*
Goldeneye species	*Bucephala clangula & B. islandica*
Buffleheads	*Bucephala albeola*
Scoter species	*Melanitta nigra, M. fusca & M. perspicillata*
Ruddy duck	*Oxyura jamaicensis*
Hooded merganser	*Lophodytes cucullatus*
Merganser species	*Mergus serrator & M. merganser*
Long-tailed ducks	*Clangula hyemalis*
American wigeons	*Anas americana*
Mallards	*Anas platyrhynchos*
Northern pintails	*Anas acuta*
Green-winged teal	*Anas crecca*
Harlequin ducks	*Histrionicus histrionicus*
Brants	*Branta bernicla*
American coots	*Fulica Americana*
Gadwalls	*Anas strepera*
Western grebes	*Aechmophorus occidentalis*
Cormorant speciess	*Phalacrocorax auritus, P. penicillatus & P. pelagicus*

HMBAC surveyors. These reference sampling polygons were later scanned and geo-referenced by USACE.

In total, HMBAC surveys were completed during winter months starting in 1958 and ending in 1985, surveying 187 polygons throughout Puget Sound on an annual basis during this time frame. Of these 187 sampling polygons, only 134 corresponding reference maps were found allowing data geo-referencing (Figure 1) and density estimation. Polygon areas ranged from 0.16 and 10.0 km2, averaging 1.32 km2.

Survey pilots probably used landmarks to pinpoint and find each polygon for a particular survey year (Kraege, Evenson, pers. comm. to I. Vilchis). Once flying above a specific polygon and having its boundaries clearly defined, onboard observers most likely completed point-counts of all waterfowl species observed within each survey polygon. On average, each survey polygon was sampled for 21 years of the 28-year long monitoring program. In total, historical data sheets contained 3,974 unique survey-year: survey-polygon sampling units. Just over 20 marine bird taxon categories were recorded (Table 1), including single species and species groups (e.g., scoters). We created a database containing all counts as a function of taxon group, survey year and survey polygon. For this report, we used HMBAC data from 9 polygons that fell within the ~175km stretch of coastline between Tulalip Point and Brown's Point (Figure 2; hereafter, the study area).

Table 2. Shoreline type classification of the study area according to the Dethier (1990) classification.

Percent cover	Shoreline type
30.50	Estuarine, intertidal, mixed coarse, partly enclosed, eulittoral
24.34	Estuarine, intertidal, sand, partly enclosed, eulittoral
18.92	Estuarine, intertidal, artificial, partly enclosed, eulittoral
9.62	Estuarine, intertidal, organic, channel/slough, eulittoral
7.39	Estuarine, intertidal, artificial, lagoon, eulittoral
4.47	Estuarine, intertidal, mud, partly enclosed, eulittoral
1.30	Estuarine, intertidal, mixed fine, lagoon, eulittoral
1.27	Estuarine, intertidal, hardpan, partly enclosed, eulittoral
0.83	Estuarine, intertidal, mud, lagoon, eulittoral
0.79	Estuarine, intertidal, organic, partly enclosed, eulittoral
0.36	Estuarine, intertidal, mixed fine, partly enclosed, eulittoral
0.22	Estuarine, intertidal, reef, partly enclosed, eulittoral

PSAMP surveys (Nysewander et al. 2005) were completed using standard 100 meter-strip aerial transect methods (Briggs et al. 1985, Bibby et al. 2000) using a DeHaviland Beaver floatplane flying approximately 65 meters above sea level at 80-90 knots, with two observers stationed at starboard and port-side windows, respectively, recording all birds seen along a 50 meter-wide strip of marine habitat. Observers included observation times to the neatest 5 seconds and corresponding time-stamped positions were recorded every 5 to 10 seconds by an on-board computer and global positioning unit. A third person operated a computer, monitored positions and directed the pilot. Surveys were completed during all daylight hours with weather permitting (generally up to Beaufort 3, i.e. when 7-10 knot winds begin to create whitecaps). Tracklines followed nearshore habitats, following the coastline in roughly a parallel pattern (Figure 1). For this study, we divided the PSAMP data into sequential 1 km segments, and used the location of the midpoint of each segment to georeference it to a given habitat type and depth strata, as well as associate it with a particular HMBAC polygon (e.g., Figure 2). In order to assess trends in densities of marine birds wintering in the nearshore habitat between Tulalip Point and Brown's Point, we selected all HMBAC survey polygons and all PSAMP 1km transect segment midpoints that fell within 1 nautical mile of the study area (Figure 2).

Table 3. Shoreline type classification of the study area according to the British Columbia (BC) 'coastal class' or 'shoreline type; characteristics are based on sediment type and slope.

Percent cover	Shoreline type
24.62	Man-made, permeable
18.79	Sand and gravel flat or fan
14.01	Sand and gravel beach, narrow
13.16	Sand flat
12.37	Organics/fines
6.56	Sand beach
5.30	Mud flat
3.50	Sand beach
1.61	Man-made, impermeable
0.10	Sand and gravel flat or fan

Table 4. Shoreline type classification of the study area according to the Natural Resource Damage Assessment (NRDA) classification shoreline classification system.

Percent cover	Shoreline type
30.50	open mixed coarse beaches (estuarine)
24.69	open sandy beaches (estuarine)
20.19	open rocky shores (estuarine)
11.93	unclassified
7.39	protected rocky shores (marine)
5.30	mud flats (estuarine)

Of the 21 species groups encountered by HMBAC surveys, only 19 were found within the Tulalip Point to Brown's Point study area. All of these species were within the Anatidae family and included: three Aythya species (canvasbacks, A. valisineria; and lesser and greater scaups: A. marila and A. affinis, respectively); three Bucephala species (Barrow's and common goldeneyes: B. islandica and B. clangula, respectively; and buffleheads, B. albeola); three Melanitta species (black, surf and white-winged scoters: M. nigra, M. fusca and M. perspicillata, respectively); ruddy ducks (Oxyura jamaicensis); hooded mergansers (Lophodytes cucullatus); common and red-breasted mergansers (Mergus serrator and M. merganser, respectively); long-tailed ducks (Clangula hyemalis); harlequin ducks (Histrionicus histrionicus); and four Anas species (American wigeons, mallards, northern pintails and green-winged teals: A. americana, A. platyrhynchos, A. acuta, and A. crecca, respectively).

Because of difficulties encountered while identifying and separating similar looking species within the same genus from an airplane (Evenson, pers. comm. to I. Vilchis), both scaup species were grouped into one category, as were all scoters, and the two Mergus species, respectively. Barrow's and common goldeneyes were also grouped into one category; buffleheads were kept separate. This reduced the taxon groups for trend analyses from 19 to 14. Several taxon groups contained few sightings, including: merganser species 2, harlequin ducks 2, long-tailed ducks 19, ruddy ducks 21, and green-winged teals 50. All other taxon groups had more than 100 total counts. In order to not create artificial rates of increase in species that were probably not actively searched for or were rare to begin with, we excluded all taxon groups with less than or equal to 50 total counts in HMBAC surveys from the trend analyses, reducing the trend analyses to nine species groups. Because canvasbacks are uncommon winter residents of Puget Sound, this species was also excluded, resulting in eight taxon groups for which temporal trends in their densities within the study area were estimated. We restricted our use of the PSAMP data to only these groups.

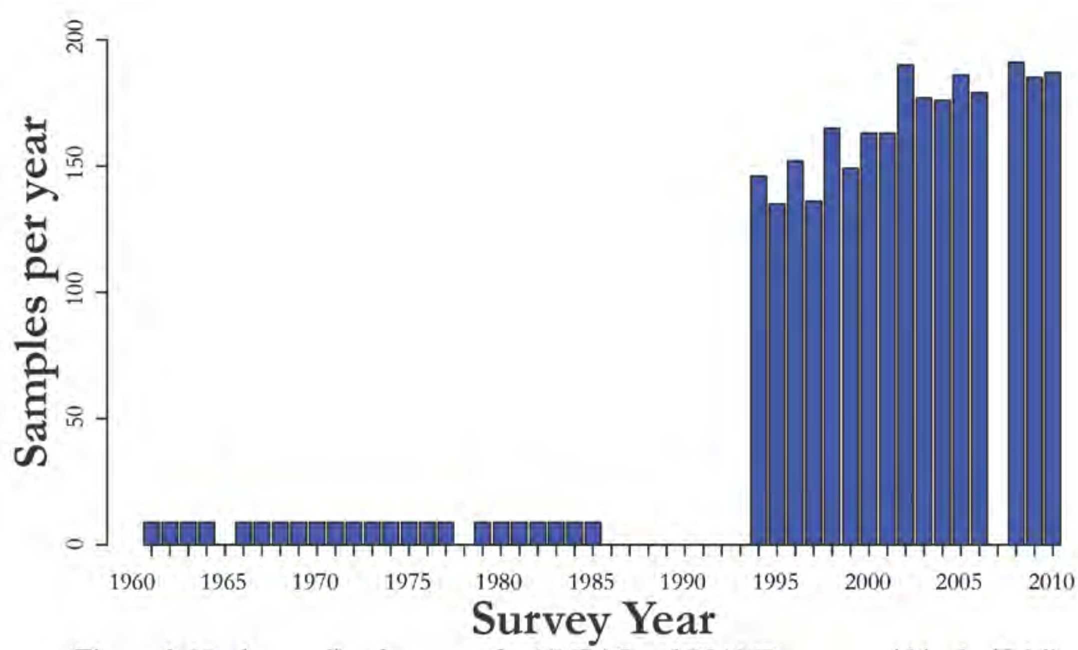


Figure 3. Yearly sampling frequency for HMBAC and PSAMP surveys within the Tulalip Point to Brown's Point study area. Each of the 9 HMBAC polygons was on a yearly basis, while on average 158 PSAMP transect segmets fell within the study area every year.

Because both the historical and the contemporary surveys applied complete counts to predetermined survey areas, with a focus on larger duck species, we assumed that densities estimated from both survey types would be comparable. However, comparing marine bird densities from aerial surveys each using different methodologies (strip transects vs. point-counts) does not come without caveats. Cessna propeller aircraft (i.e., HMBAC surveys) are known to be quieter than DeHaviland Beavers (i.e., PSAMP surveys), in addition to differences in observer viewing areas (i.e., window size) and viewing angle. As a result, quieter Cessnas might permit smaller and/or wary species of diving ducks to be observed. Larger species should have been observed similarly with either plane.

Because HMBAC surveys used point-counts and PSAMP surveys are strip-transects, the resulting sampling units for each survey are different. HMBAC sampling units were the combinations of unique survey polygons and survey years, resulting in a single polygon survey annually. Of all 134 HMBAC geo-referenced survey polygons (Figure 1), only nine were within the coastline between Tulalip Point and Brown's Point (Figure 2). Except for 1965 and 1978, all nine survey areas were sampled once yearly during winter months between 1961 and 1985 (Figure 3). PSAMP sampling units are 1km by 100 meter wide strip-transect segments, resulting in thousands of segments annually. PSAMP surveys were also completed during winter months. Begun in 1994, PSAMP survey data are currently available up to 2010. Different methods were used during the 2007 survey; therefore, we excluded this year from the trend analysis. For the remaining 16 survey years of available PSAMP data, we extracted transect segments with midpoints falling within 1 km of the study area (2,680 segments in total over the 16 years; Figure 2). On average, PSAMP surveyed the Tulalip Point to Brown's Point coastline resulting in an average of 158 1 km segments per year (range: 135-191; Figure 3). Thus, there are extreme differences in the effective number of data-points collected annually: nine versus an average of 158.

In order to compare estimated densities from the HMBAC and PSAMP surveys, both sampling units were averaged over the study area by year to create our analysis unit: Tulalip Point to Brown's Point species average density per year. Using this analysis unit, we calculated least square fits (finding slopes and intercept values that make the data most likely) for these time series, respectively.

Finally, we combined both datasets into a single analysis in order to assess the 49-year temporal trends (1961-2010). Due, in part, to differences in sampling design and, in part, to actual differences in speices abundance through time, various species density estimates had observations that were distinctly larger than in any other year within the time series. The presence of outliers is a strong sign that data should be transformed in order to down-weight the influence of such observations in discerning any trends (Zuur et al. 2007); therefore we applied a square root transformation to all density estimates. Because we are attempting to discern long-term trends in densities within the study area, we normalised density estimates so that all annual estimates (regardless of survey type) had the same weight in the trend analysis for each species. To do this we first centered density estimates of each species by subtracting the long-term mean and then dividing that number by the standard deviation of the long-term mean (Griffin and Shallenberger 1989, Zuur et al. 2007). We limited all trend analyses to linear, as data were noisy and there was no a priori reason to select a non-linear fit. The datasets were initially separated to explore whether taxon group level patterns within each were consistent.

To assess the type(s) of nearshore habitats available to wintering waterfowl within the study area, we used habitat classifications provided by the Nearshore Habitat Program of Washington State's Department of Natural Resources (DNR). Over a three year period during the late 1990s, the Nearshore Habitat Program classified and inventoried all of Washington State's saltwater coastlines. This major feat was accomplished by surveying all coastlines at low tide with helicopters flying at 60 mph and 300 feet above sea level, while recording video imagery of the shoreline along with corresponding coordinates. Geomorphologists and marine ecologists then classified coastlines according to physical and biological features and integrated this information with coastline coordinates in shapefiles using mapping software (Berry et al. 2001b). The resulting Shore-zone Inventory that was created describes the physical and biological characteristics of intertidal and shallow subtidal areas, and is publicly available. Besides recording other informational aspects of the coastline, three shoreline indices were used to classify the shoreline type: (i) a shoreline classification commonly used in British Columbia (Howes et al. 1994, Searing and Frith 1995), (ii) Dethier's (1990) A Marine and Estuarine Classification System for Washington State, and (iii) the National Resource Damage Assessment (NRDA) classification (Berry et al. 2001a). These three indices of shoreline type can be used to interpret the kinds of habitats available to marine waterfowl wintering in the nearshore habitat of the coastline between Tulalip Point and Brown's Point.

Breakdowns by percentage of the shoreline types described by each index are listed in Tables 2 – 4. As these tables show, most if not all of the shoreline habitat between Tulalip Point and Brown's point consists of estuarine intertidal habitat made up of open mixed coarse beaches, sandy beaches, and rocky shores, with few kelp beds. All three indices indicate that more than half of the coastline between Tulalip Point and Brown's point as being composed of coarse sandy beaches. According to Dethier's classification scheme, at least half of the coastline habitat is composed of partly enclosed embayments (Table 2). While the latter classification type does not assign a type to habitats modified for anthropogenic use, the British Columbia classification scheme does. This classification scheme associates approximately one fourth of the habitat with man-made features (Table 3).

Natural Histories of the eight waterfowl species included in trend analyses

Aythya marila and A. affinis - lesser and greater scaups: Both of these diving species are common winter residents in Puget Sound, where they frequent almost exclusively marine and brackish water habitats. While breeding, both of these species migrate to northern Canada and Alaska, with the breeding range of greater scaups reaching farther into Alaska. Non-breeding scaups in Puget Sound, prefer, ice-free bays, harbors and river inlets with fine soft substrates, which provide appropriate habitat for these epibenthic feeding ducks. Being associated with both shallow water habitats of estuaries and wetlands, as well as deeper habitats of bays and coastal lagoons, scaup species can exploit a variety of prey. While in deeper waters of bays and harbors, scaups dive for bivalves, snails and crustaceans. In shallower habitats scaups can also dabble for aquatic plants like sea lettuce (Ulva sp.) and eelgrass (Zostera sp.), as well as aquatic insects and other invertebrates. When available, scaups are also known to feed on herring spawn. Although both scaup species are commonly seen foraging together in coastal bays, lesser scaups are also commonly found foraging close to beaches. Both species use nearshore areas to rest and preen (Munro 1941, Poulton et al. 2002).

Bucephala islandica and B. clangula - Barrow's and common goldeneyes: Barrow's and common goldeneyes are both common migrants and winter residents of the Puget Sound region, where they primarily utilize marine nearshore habitats. Breeding North American populations of goldeneyes use freshwater lakes and sloughs in Canada and Alaska, with Barrow's goldeneyes being more limited western Canada and Alaska. Although both species do feed on vegetation including seeds and tubers, while wintering in marine habitats goldeneyes prefer animal prey. Wintering goldeneyes dive to the benthos or subsurface vegetation searching for aquatic insects, mollusks (both clams and mussels), crustaceans (shrimp and amphipods), small fish and fish eggs (Vermeer 1982), stirring up prey in the relatively shallow water along rocky and sandy beaches with the sweeping motion of their feet (Angell and Balcomb 1982). Goldeneyes typically forage in pairs and have been observed to isolate themselves and defend territories along protected rocky shores (Savard 1984). However, goldeneye species are also seen in small flocks of up to 30 birds near sources of fresh water such as creeks, waterfalls, or even storm drains. Preferring sheltered waters of shallow coastal bays, estuaries and harbors, goldeneyes are also known to forage in open waters off these nearshore habitats.

Bucephala albeola: Buffleheads are the smallest diving duck in North America and common winter residents of Puget Sound. In this region, buffleheads are known to avoid open coastlines instead preferring sheltered marine nearshore areas including secluded coves, harbors, and estuaries as well as along protected beaches. Feeding both day and night, buffleheads are frequently found in open waters within estuaries and shallow bays diving for snails, clams, aquatic insects, small fish or fish eggs. Calm waters within inlets and bays are important habitats for this species (Hirsch 1980). Buffleheads feed by solely diving, usually foraging in waters less that 3 meters deep with a variety of different substrates. In Puget Sound, buffleheads have also been observed joining multi-species flocks feeding on herring eggs (Erskine 1972). Breeding populations of buffleheads in North America are tied to boreal forests central and Canada and Alaska.

Melanitta. nigra, M. fusca and M. perspicillata: All three scoter species are common winter residents of Puget Sound, although black scoters are less common. Habitat and food preferences for these species are essentially the same (Vermeer 1981). Scoters prefer shallow marine coastal waters, diving for epibenthic prey in water depths generally near 5 meters; but are also known to forage in waters up to 20 meters deep, mostly over rocky or sandy substrates of bays and open coastlines with relatively shallow water and abundant shellfish beds. While wintering, scoters predominantly feed on mollusks (mussels, clams, snails and periwinkles), also at times feeding on crustaceans and herring spawn. Surf scoters are known to prefer rocky substrates and outnumber other scoters along steep rocky shores along inlets (Hirsch 1980, Zydelis et al. 2006). Surf scoters winter and breed exclusively in North America, breeding in northern Canada and Alaska; North American populations of white-winged scoters breed on freshwater lakes and wetlands in the northwestern interior of Canada also reaching into Alaska; and North American breeding populations of black scoters breed in both in the lake country of northeastern Canada (Quebec) and in the in the coastal wetlands of western and northern Alaska.

Lophodytes cucullatus: Hooded mergansers are considered uncommon permanent residents of Puget Sound. This species breeds in forested areas of southern Canada and northern United Sates – its most common breeding grounds are in the Great Lakes region. Wintering hooded mergansers in Puget Sound inhabit marine nearshore habitats like bays and inlets. Protected nearshore waters are common feeding grounds for this species. However, this species will also preferentially inhabit shallow, freshwater and brackish bays, estuaries, and tidal creeks where they often concentrate along the edge of ice (Angell and Balcomb 1982). Hooded mergansers are visual predators needing relatively clear waters where they feed on a wide range of freshwater-to-marine prey, including aquatic insects, fish, snails, earthworms, crayfish, and amphibians (Dugger and Dugger 2009).

Anas platyrhynchos: Mallards are abundant permanent residents of Puget Sound. While this species does prefer to feed on vegetation when foraging in the nearshore environment, mallards also feed on small crustaceans and mollusks. During winter, mallards are frequently found in mixed flocks with wigeons and northern pintails dabbling in intertidal mudflats and sandy nearshore habitats (Angell and Balcomb 1982, Lovvorn and Baldwin 1996). Breeding North American populations of mallards range throughout Canada, and in the western part of this range into Alaska.

Anas americana: Abundant winter residents of the Puget Sound region, American wigeons are commonly found in relatively high densities in freshwater habitats like marshes, rivers, lakes, impoundments and agricultural lands. Dabblers, wigeons are also known to consume terrestrial vegetation including upland grasses and clovers, and agricultural crops (Lovvorn and Baldwin 1996). When feeding in marine habitats, wigeons typically forage in intertidal eelgrass habitats, actively using marine deltas and estuarine channel edges to dabble for food (Angell and Balcomb 1982). American wigeons breed in central and northern Canada as well as in Alaska.

Anas acuta: Like mallards and wigeons, northern pintails are also abundant winter residents of marine nearshore habitats of Puget Sound, including shallow inland freshwater and intertidal habitats, large shallow wetlands, flooded agricultural habitats, reservoirs, tidal wetlands, bays and estuaries. Northern pintails do at times prey on small mollusks and crustaceans, but when in marine habitats tend to prefer plant matter as a source of food (Angell and Balcomb 1982, Lovvorn and Baldwin 1996). North American breeding pintails range from southern Canada and the northern Great Plaines of the United States, as far north as Alaska and northeastern Canada.

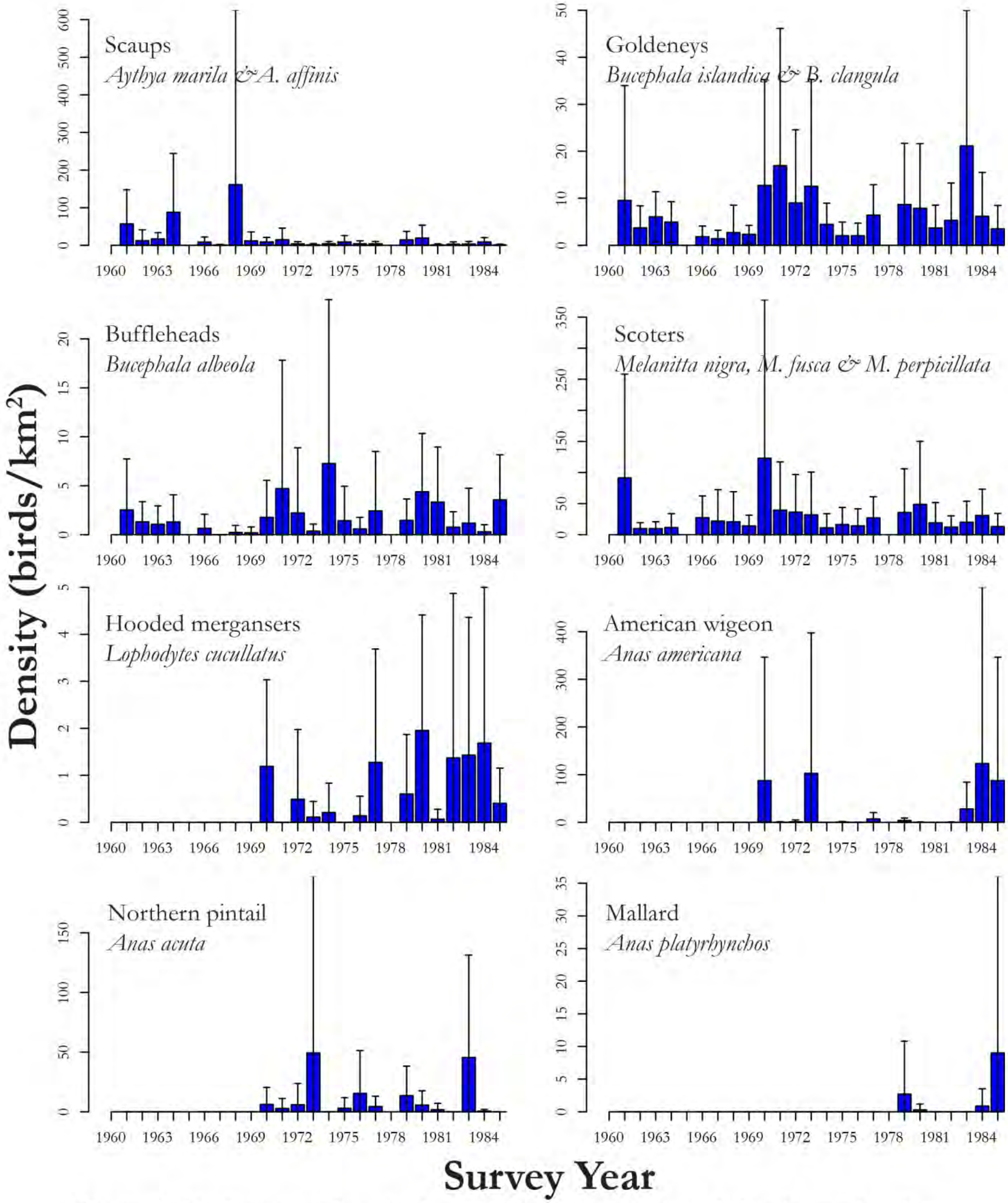


Figure 4. Yearly average densities for the eight bird species included in the trend analyses using only HMBAC survey data. Error bars represent standard errors of the mean.

Results and Discussion

Time series for survey-specific annual density estimates are shown in Figures 4 and 5 (HMBAC and PSAMP, respectively), with least square fits of these data illustrated in Figures 6 and 7 (HMBAC and PSAMP, respectively).

Looking only at the early data (Figures 4 and 6), several general patterns are apparent. Scaups experienced a significant decline, although this trend is entirely forced by three outlier values in the 1960s and early 1970s. Hooded mergansers experienced a significant increase in the study area, with the model accounting for 41% of the data variability; however, the actual densities of this species were quite low (0.5 to 2 birds per km2) so this trend may be biologically meaningless. American wigeons and northern pintails had marginally significant increases, but these trends were also forced by a small number of high years late in the dataset. In fact, all of the Anas species displayed similar patterns - the majority of the years were low-to-zero, with 2-5 "irruptive" years. This is suggestive of population concentration - that surveys literally encountered large rafts in some years, and that the birds may have rafted elsewhere (outside of the 9 survey polygons) in most years (hence the zero counts). At the very least, this pattern suggests caution in interpreting a mathematical trend as ecologically real. Goldeneyes and buffleheads displayed noisy and trendless densities during the early years.

The PSAMP data is less noisy, which is not unexpected given the higher annual sample size (survey segments) and more comprehensive coverage of the study area. Scaups showed no trend; however, this species was essentially at zero relative to the early years. The same can be said of hooded mergansers. Goldeneyes and scoters experienced steep declines, returning the counts at the end of the dataset to levels observed in the early years. Within the study area, goldeneyes decreased at ~2.1% per year. Goldeneye species densities for Central Puget Sound using all of the PSAMP data for the 1994-2010 time period decreased at a rate of 1.6% per year (Vilchis and Evenson, unpublished PSAMP analyses) and decreased over the entirety of Puget Sound at 0.8% per year (Vilchis and Evenson, unpublished PSAMP analyses). Scoter trends assessed using PSAMP survey data within the Central Puget Sound basin and for Puget Sound in its entirety indicate annual declines of 3.6% and 2.3%, respectively, for the time period between 1994 and 2010 (Vilchis and Evenson, unpublished PSAMP analyses). These trends are mirrored by the PSAMP-specific trends within the Tulalip Point to Brown's Point study area (Figure 7)

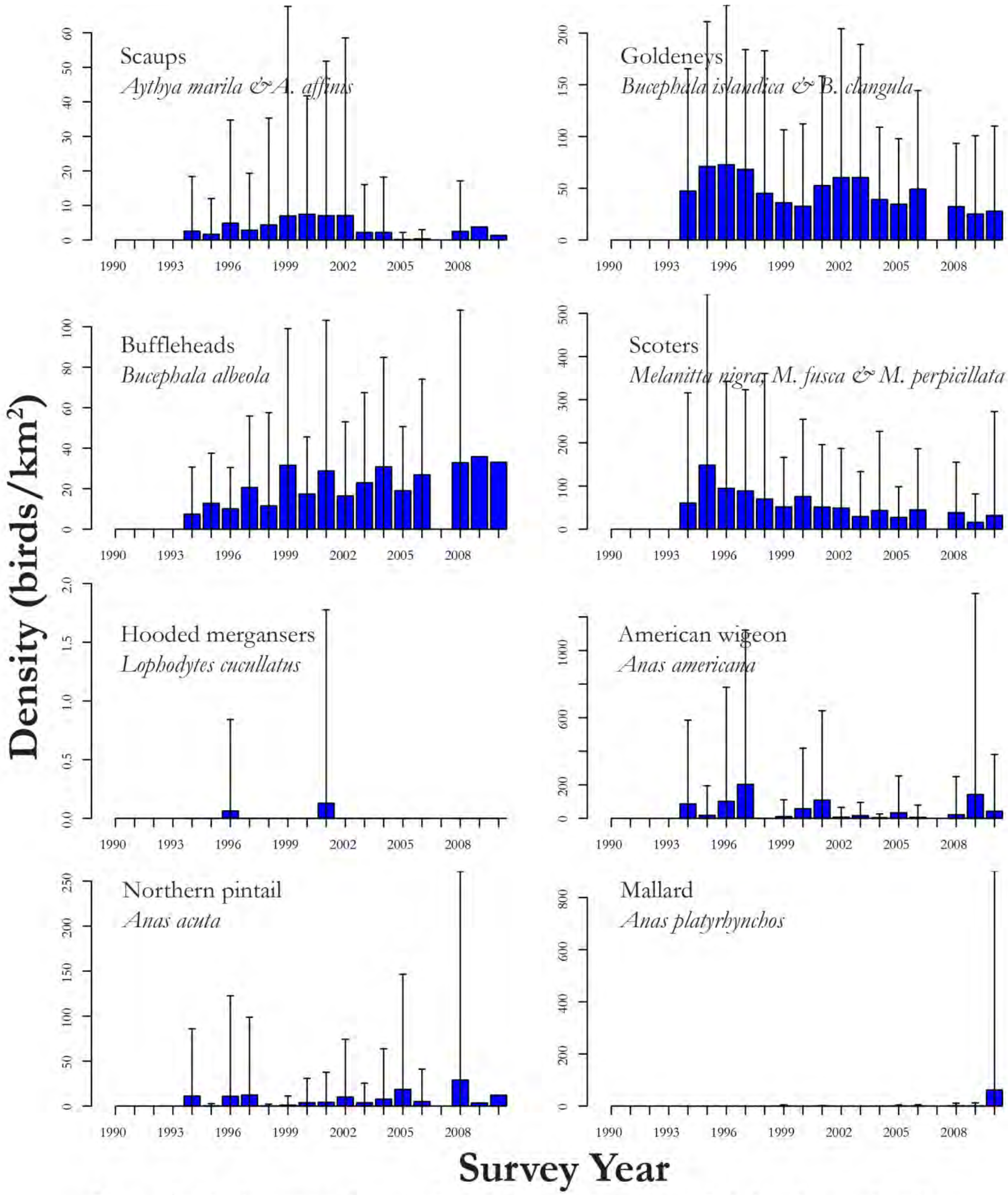


Figure 5. Yearly average densities for the eight bird species included in the trend analyses using only PSAMP survey data. Error bars represent standard errors of the mean.

where all scoters species densities combined decreased at a rate of 4.9% per year. By contrast, buffleheads experienced a sharp increase in numbers. Mallards, wigeons, and pintails displayed no significant trends, although the number of irruptive years was relatively higher in this dataset (with the exception of northern pintails) relative to the earlier years. This may indicate that the PSAMP sampling effort more adequately capturing rafting, and/or that more of these species rafted in the study area in the later years.

As Figures 4 and 5 clearly show, variability in the annual Tulalip Point to Brown's Point average density estimates derived from HMBAC and PSAMP surveys were different. This is likely the result of the different surveying methodology, sample size differences, the relative spatial scale of each type of sampling unit, and the absolute spatial coverage within the study area of each survey type – a good clue that comparisons amongst these two survey types might not be as robust as desired. Nevertheless, only three species and/or species groups displayed significant long-term trends (Table 5): scaup species, goldeneye species and buffleheads. HMBAC – PSAMP combined and transformed time series for all eight marine waterfowl taxon groups are shown in Figure 8, and normalised trends of the same are shown in Figure 9.

Because of the wider spatial coverage within the study area and the aggregative nature of marine birds, PSAMP sampling units had many more zeros. In order to make sure that the weight of the zero-inflated PSAMP sampling units was not distorting the observed results, we also ran the same 49-year trend analysis using only PSAMP segments that were within the HBMAC polygons, reducing the PSAMP sample size from 2,680 to 190. These results, while not as robust because of the decrease in sample size, are similar to what is reported in Table 5 and are shown in Table 6.

Once more prevalent in the study area, scaups appear to have declined in number essentially to zero (or at least the limits of detectability) at the present time. Previous studies comparing 1978-79 MESA and 1992-99 PSAMP data have reported significant decreases in scaup densities in Puget Sound (Nysewander et al. 2005, Anderson et al. 2009). Similar long-term trends have also been reported for scaup surveyed in within their northern breeding range within western Canada (Afton and Anderson 2001).

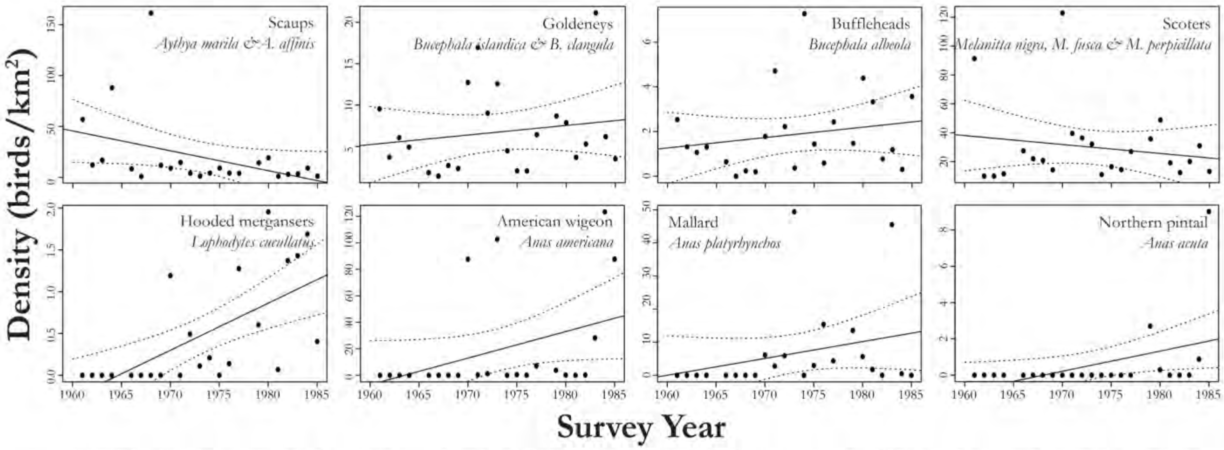


Figure 6. Least-square fits of yearly mean densities (black dots) as function of year for each of the eight marine bird species included in trend analyses using only HMBAC survey data. Solid curve represents best fit lines and dashed lines are the 95% confidence intervals from the least-square fit. Corresponding statistics are shown in Table 5.

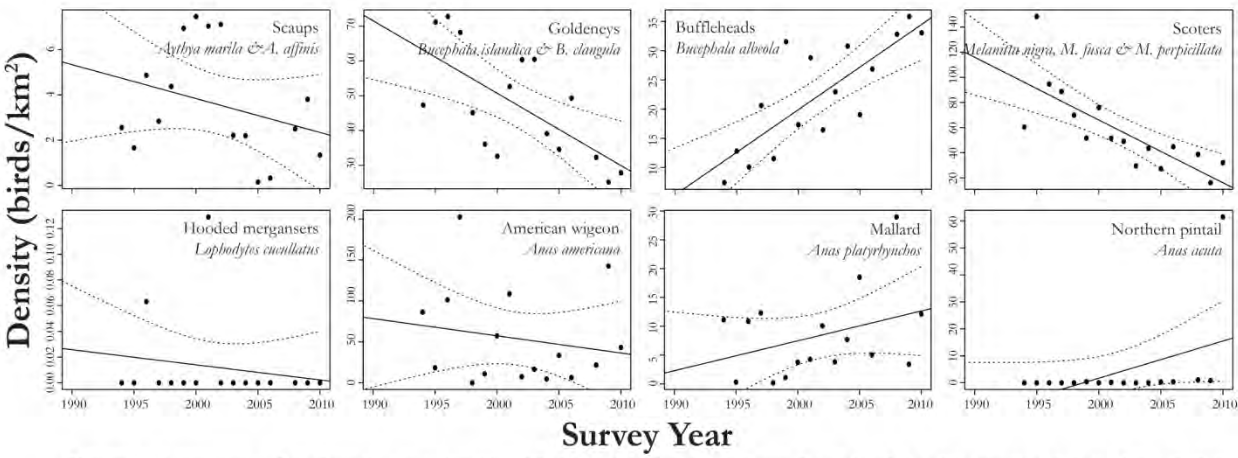


Figure 7. Least-square fits of yearly mean densities (black dots) as function of year for each of the eight marine bird species included in trend analyses using only PSAMP survey data. Solid curve represents best fit lines and dashed lines are the 95% confidence intervals from the least-square fit. Corresponding statistics are shown in Table 5.

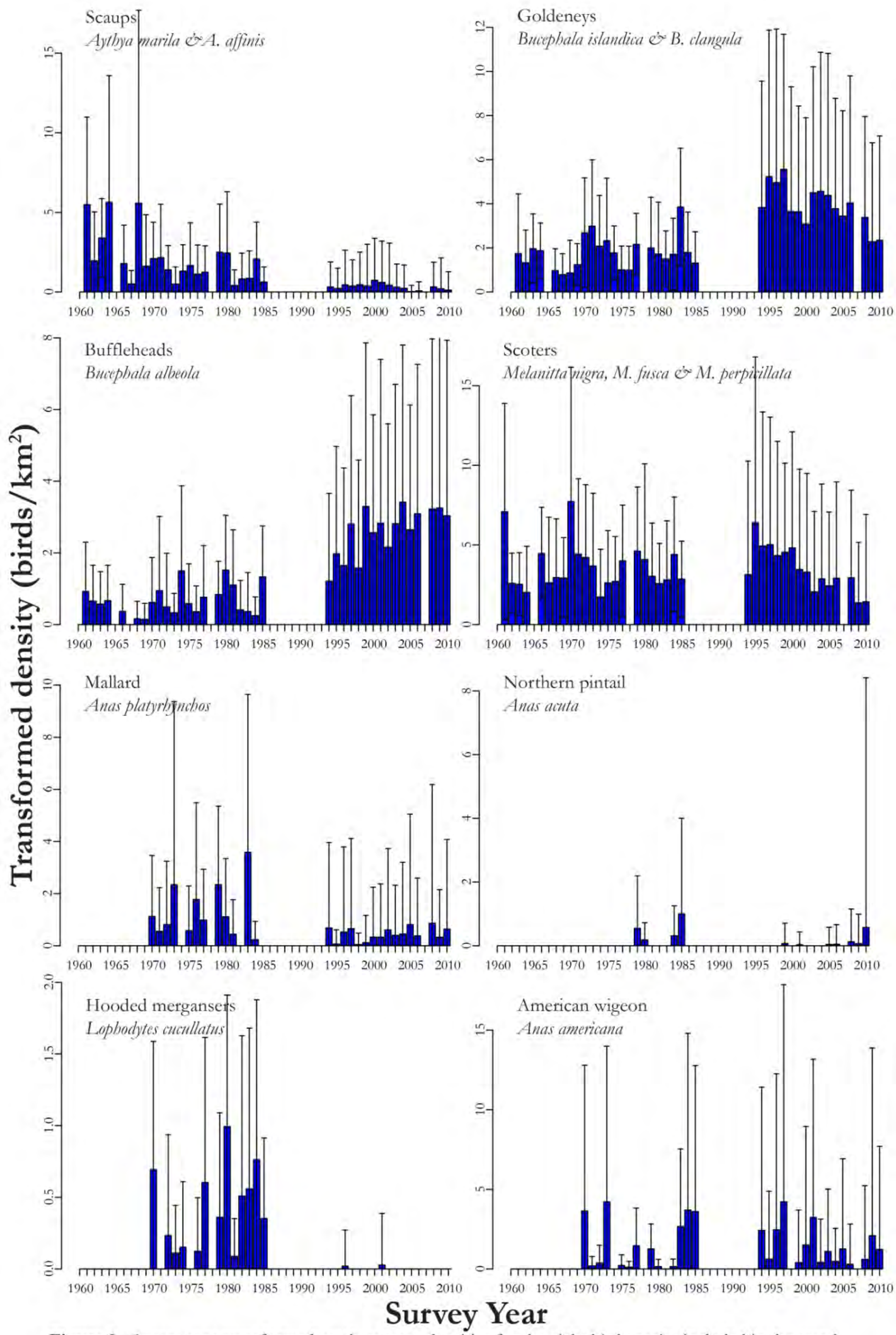


Figure 8. Square root transformed yearly average densities for the eight bird species included in the trend analyses. Error bars represent standard errors of the mean.

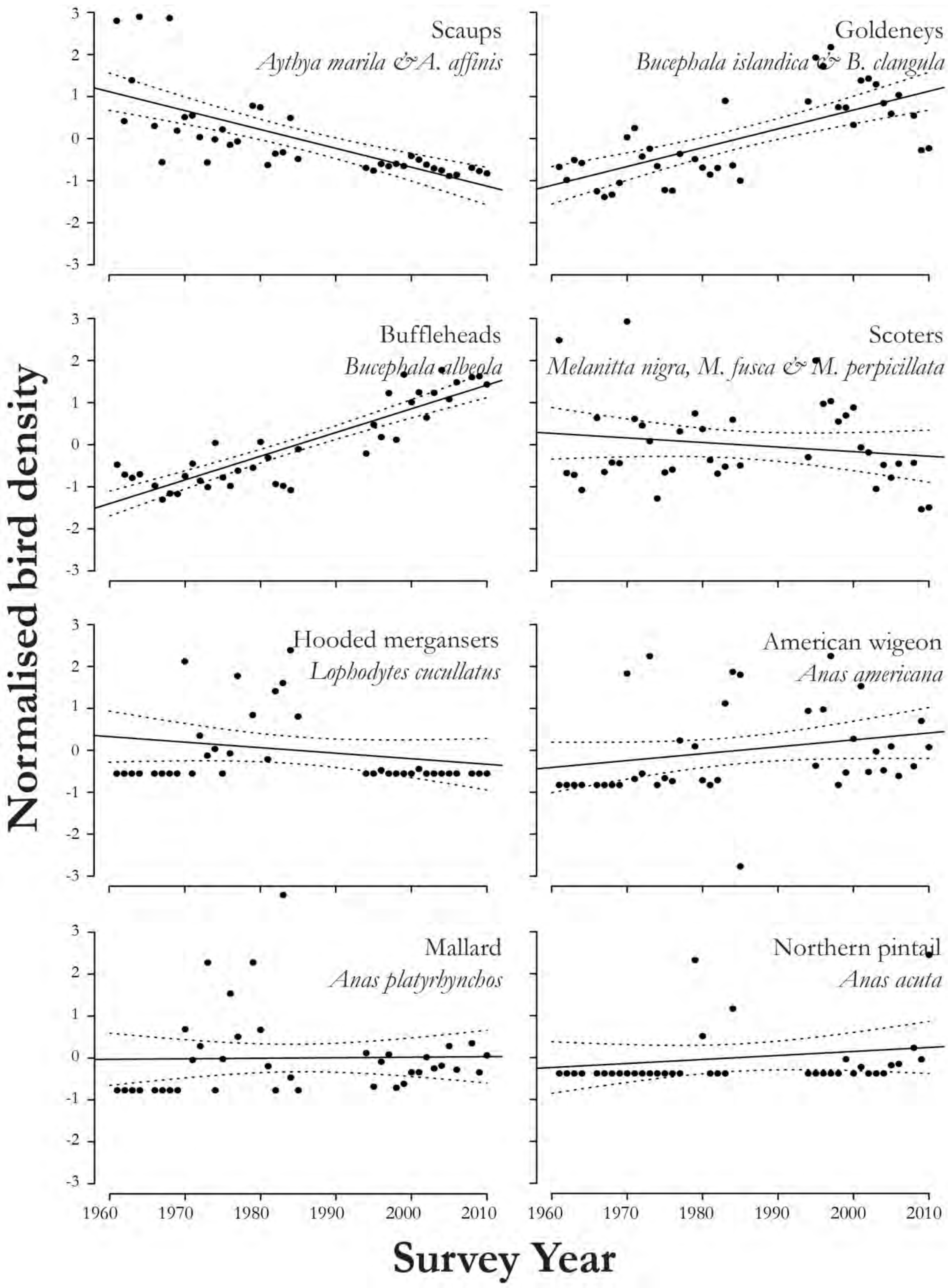


Figure 9. Normalised (centered and divided by the standard deviation) density time series and trend analyses. Solid curve represents best fit lines using least squares and dashed lines are the 95% confidence intervals from those fits. Corresponding statistics for the least-squares fits are shown in Table 5.

Table 5. Results from least-square fits of annual mean densities for HMBAC and PSAMP surveys, and normalised densities for both surveys combined. Degrees of feed om for all species' fits with HMBAC, PSAMP, and HMBAC & PSAMP combined were 21, 14 and 37 respectively and all levels of significance were set at 95%. Note that trends for HMBAC & PSAMP combined are normalised (centered and divided by the standard deviation - see text).

	1961-1985 (HMBAC)			1994-2010 (PSAMP)			1961-2010 (HMBAC & PSAMP)		
Species or taxa group	rate	r^2	p-value	rate	r^2	p-value	rate	r^2	p-value
Scaup species	-1.95	0.16	0.06	-0.15	0.09	0.25	-0.04	0.49	0.00
Goldeneye species	0.12	0.03	0.44	-2.08	0.44	0.00	0.04	0.49	0.00
Buffleheads	0.05	0.04	0.38	1.46	0.63	0.00	0.06	0.78	0.00
Scoter species	-0.62	0.03	0.44	-4.99	0.59	0.00	-0.01	0.03	0.30
Hooded mergansers	0.06	0.41	0.00	0.00	0.03	0.53	-0.01	0.04	0.21
American wigeons	2.00	0.15	0.07	-2.10	0.03	0.51	0.02	0.07	0.11
Mallards	0.51	0.08	0.20	0.52	0.12	0.19	0.00	0.00	0.91
Northern pintails	0.11	0.18	0.07	1.38	0.21	0.08	0.01	0.02	0.36

Over the combined 49-year time series, hooded mergansers displayed a unique pattern –rising from essentially zero to a noisy maximum in the 1970s and 1980s, only to return to the limits of detectability from the 1990s onward. Although one interpretation is that early observers may not have targeted this species sufficiently (such that the 1960s numbers were artificially low), it is also true that other species, most obviously mallards and to a lesser degree American wigeons and northern pintails, also showed relatively higher numbers during the same time period. Without process studies it is impossible to nail down potential source(s) of this pattern, except to say that it is suggestive of two different forcing factors: a depressive factor early in the time series that was effectively released by the 1970s, and a second depressive factor that became prevalent later in the time series. Because the Anas species do tend to form mixed species rafts, one interpretation of the data is that the chance of encountering larger rafts has declined from the 1970s-1980s to present.

Surprisingly, scoter species did not show long-term decreasing trends with the HMBAC-PSAMP combined time series – as other studies quantifying long-term temporal trends for scoters in Puget Sound have found drastic decreases in all three scoter species (Anderson et al. 2009, Bower 2009). Both of these studies used densities estimated from the 1978/1979 Marine Ecosystems Analysis surveys (Wahl et al. 1987) as baselines to compare contemporary density estimates - almost 20 years after the initiation of the HMBAC surveys. Additionally, both Anderson et al. (2009) and Bower (2009) focused on areas within the northern limits of Puget Sound. As with the Anas species and hooded mergansers, there may well be a more recent forcing factor driving study area, and broader Puget Sound, declines.

Goldeneye species trend analysis using HMBAC-PSAMP combined time series indicated an increasing rate in densities for this species group, despite the steep decline in the more recent (PSAMP) data. On average, goldeneye density estimates were an order of magnitude less during the HMBAC versus PSAMP surveys. Because the HMBAC specific goldeneye densities trends were stable while PSAMP-specific trends were negative, caution must be applied when interpreting a linear model. Two tentative conclusions can be reached. First, current goldeneye densities are lower than they have been in 20 years, and the decline to this value has been steady within the study area. Second, current goldeneye densities are above the lowest annual recorded values during the historical surveys, suggesting that over the half century encompassed by both surveys, goldeneyes are still slightly positive. Given the similarity in pattern between the goldeneyes and the scoters (a flat early period, a maximum value early in the PSAMP series followed by a steady decline to or below early period averages), a likely interpretation is that there is a current forcing factor depressing abundance of these species in the study area that was not significant prior to the 1990s.

Table 6. Results from least-square fits of annual mean densities for HMBAC and PSAMP surveys, and normalised densities for both surveys combined - using only PSAMP segments that fell within HMBAC polygons. Degrees of freedom for all species' fits with PSAMP, and HMBAC & PSAMP combined were 14 and 37 respectively, and all levels of significance were set at 95%. HMBAC & PSAMP combined are normalised (centerd and divided by the starndard deviation - see text).

	1994-2010 (PSAMP)			1961-2010 (HMBAC & PSAMP)		
Species or taxa group	rate	r^2	p-value	rate	r^2	p-value
Scaup species	-0.03	0.17	0.11	-0.05	0.50	0.00
Goldeneye species	-0.13	0.15	0.13	0.04	0.39	0.00
Buffleheads	0.16	0.40	0.01	0.05	0.73	0.00
Scoter species	-0.27	0.25	0.05	0.01	0.01	0.56
Hooded mergansers	0.00	0.09	0.26	-0.01	0.04	0.24
American wigeons	0.02	0.00	0.83	0.02	0.07	0.09
Mallards	0.03	0.06	0.38	0.00	0.00	0.84
Northern pintails	0.00	NA	NA	0.00	0.00	0.82

Of the eight species groups analyzed for long-term trends, only the buffleheads displayed a clear increase in abundance within the study area (Figures 8 and 9), driven by the increasing rate of 1.46% per year in the PSAMP surveys (Table 5) as well as the overall higher numbers in the PSAMP versus the HMBAC surveys. Clearly, survey differences, and specifically the larger, louder plane used by PSAMP, did not influence bufflehead counts. PSAMP Puget Sound region-wide trend analyses do indicate bufflehead long-term trends as decreasing at a rate of 1% per year for the 1994 – 2010 time period (Vilchis and Evenson, unpublished PSAMP analyses). However, this decline is mostly driven by declining trends in Admiralty Inlet and the East Juan de Fuca basins. The Central Puget Sound basin is stable according to the PSAMP Puget Sound region wide trend analyses (Vilchis and Evenson, unpublished PSAMP analyses).

In interpreting these trends we shouldn't discard the possibility of trends being non-linear, as within the 50 years, more than two generations of these waterfowl species would have been completed. Furthermore, all of these specie are presently hunted (WDFW 2011), but at what level each species is targeted and whether these levels have changed over time is unclear. Hunting however, has been hypothesized to be one of the several possible drivers of decline for certain species of waterfowl. For example, in 2010 the Washington Fish and Wildlife Commission changed the daily bag limits for scoters, long-tailed ducks, and goldeneyes from 4 per day for scoter and long-tailed ducks and 7 per day for goldeneyes, to 2 per day for these thee species groups. Hunting alone is probably not the main driver for observed trends in scaups and scoters, the fact that densities estimated from PSAMP surveys are so different from those from HMBAC surveys may be the result of the much larger human presence in the region now versus during the 1960s and 1970s. As the habitat assessment completed by DNR (Tables 2 – 4) show, there have been significant modifications of the study area's habitat for anthropogenic use that likely occurred during the last 30 years.

In summary, over the half century encompassed by the HMBAC-PSAMP combined time series of select marine waterfowl nearshore abundance in the Tulalip Point to Brown's Point study area, almost all species have shown declines from historical numbers; the exception being buffleheads. The pattern of decline is different. Scaups declined first, entirely within the HMBAC survey period. Goldeneyes and scoters displayed no trend within the early years, peaked at the beginning of the PSAMP surveys and declined thereafter. Hooded mergansers and the Anas species were variably absent in the beginning of the HMBAC survey period, showed variable irruptive patterns in the latter portion of this survey period, and are less to much less present in the study area during the PSAMP survey period.

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Appendix D

Permit Data Summaries

1. Evaluation (Permits from Query): Summary data from permits that were identified during query. Includes permits that were not evaluated.

2. Evaluation (2007-2011): Summary of comparison of Washington State, Puget Sound and the study area for 2007-2011

3. Evaluation (SA 2002-2011): Summary data for permits that were evaluated

4. Year_permit: Complete permit data for permits that were evaluated

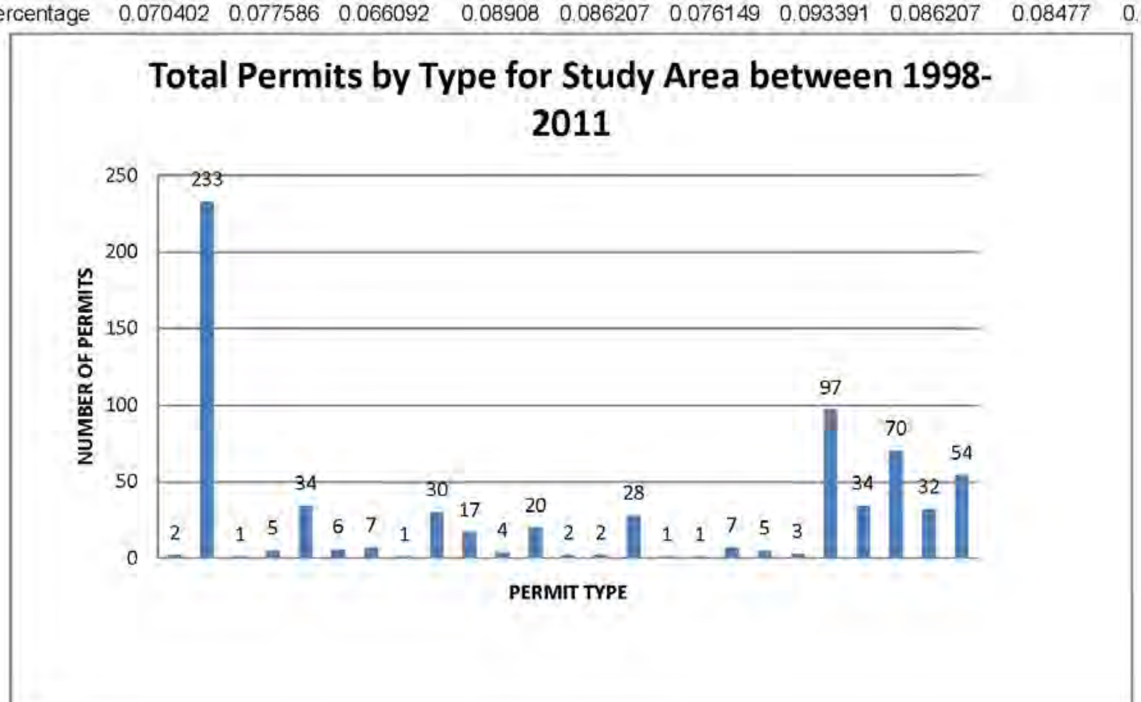
*Complete permit data for Puget Sound and Washington State are available upon request because of the size of information.

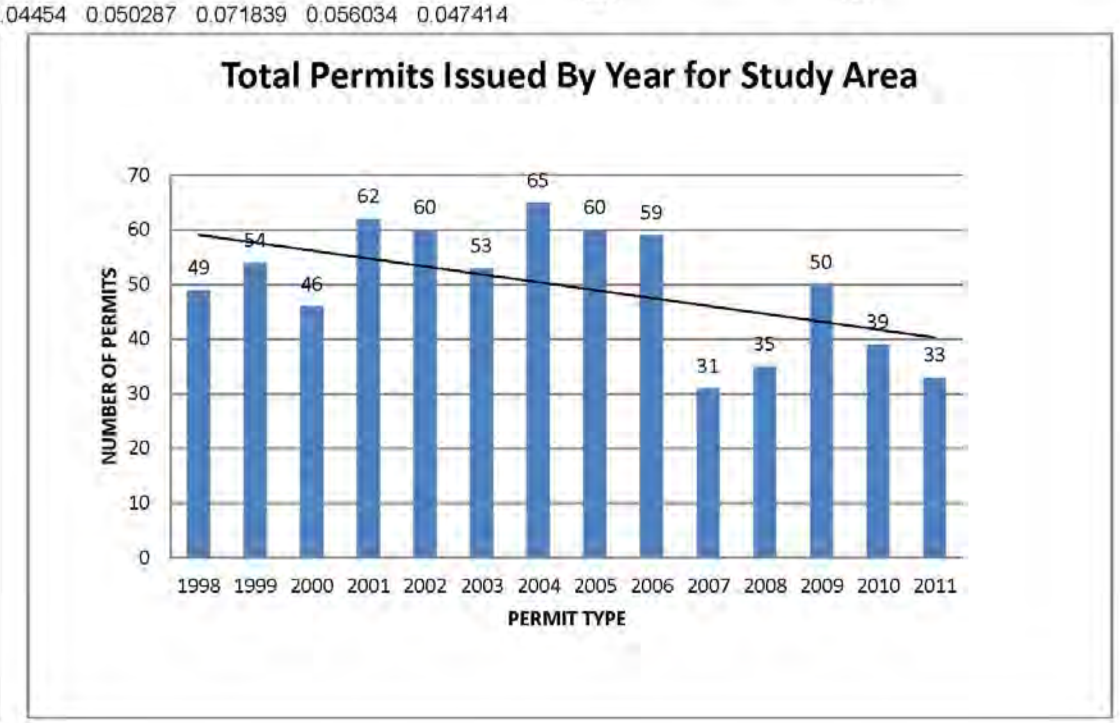
*Complete permit data for all permits from the query is also available upon request.

Evaluation (Permits from Query)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total	Total Percent	Study Area total 2007-2011
NWP 1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2	0.29%	0
NWP 3	16	21	16	22	23	11	16	17	22	12	10	12	25	10	233	33.48%	69
NWP 4	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.14%	0
NWP 5	0	0	0	0	0	1	0	0	0	0	1	1	2	0	5	0.72%	4
NWP 6	2	0	0	5	4	4	3	3	3	2	2	1	0	5	34	4.89%	10
NWP 7	0	0	0	1	0	2	1	1	1	0	0	0	0	0	6	0.86%	0
NWP 10	0	0	0	0	1	0	3	1	1	1	0	0	0	0	7	1.01%	1
NWP 11	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0.14%	0
NWP 12	1	0	1	3	3	2	4	1	2	3	1	4	3	2	30	4.31%	13
NWP 13	0	2	2	0	1	1	1	2	1	1	3	1	0	2	17	2.44%	7
NWP 14	0	0	0	0	0	0	1	0	1	1	1	0	0	0	4	0.57%	2
NWP 18	2	2	2	0	0	3	0	0	3	0	2	3	1	2	20	2.87%	8
NWP 23	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0.29%	0
NWP 26	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0.29%	0
NWP 27	1	1	0	3	1	1	5	5	1	1	1	6	2	0	28	4.02%	10
NWP 28	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0.14%	0
NWP 29	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0.14%	1
NWP 33	1	1	0	0	0	0	2	1	1	0	0	0	0	1	7	1.01%	1
NWP 38	1	1	0	0	1	0	0	0	1	1	0	0	0	0	5	0.72%	1
NWP 39	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3	0.43%	2
IP	10	9	5	7	8	12	9	8	5	4	9	6	2	3	97	13.94%	24
LOP	5	3	1	1	5	0	3	3	3	0	3	2	2	3	34	4.89%	10
UNNWP	5	7	9	5	3	3	10	4	4	4	1	9	1	5	70	10.06%	20
NPR	0	1	2	0	5	7	2	7	6	1	0	0	1	0	32	4.60%	2
UNAUTHACT	4	5	8	15	3	5	5	4	2	0	1	2	0	0	54	7.76%	3
Total	49	54	46	62	60	53	65	60	59	31	35	50	39	33	696		188
Total Percentage	0.070402	0.077586	0.066092	0.08908	0.086207	0.076149	0.093391	0.086207	0.08477	0.04454	0.050287	0.071839	0.056034	0.047414			

Percent of Total	
NWP	0.688218
IP	0.139368
LOP	0.048851
Percent	0.077586
NPR	0.045977
UNWP	0.100575



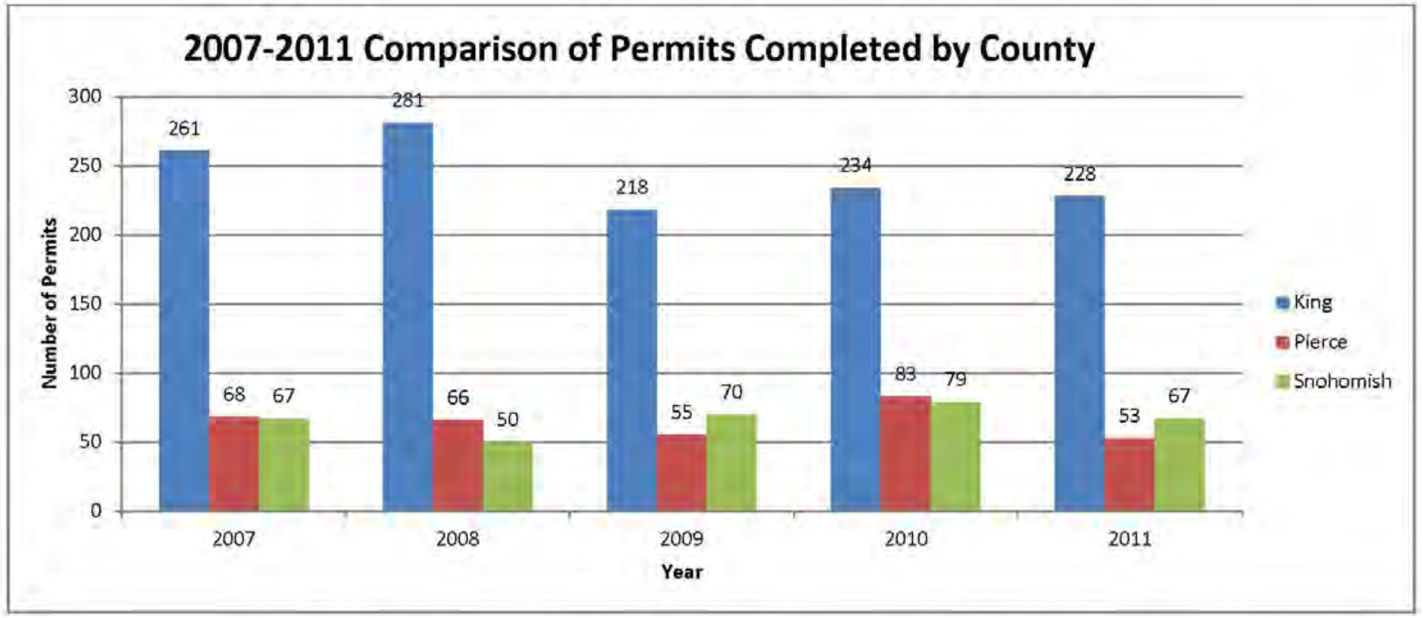


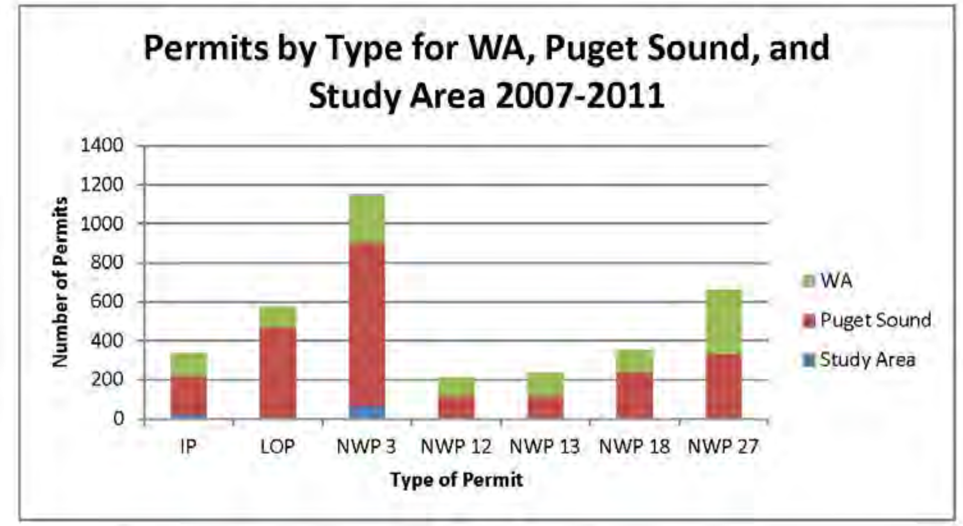
EVALUATION (2007-2011 Data)

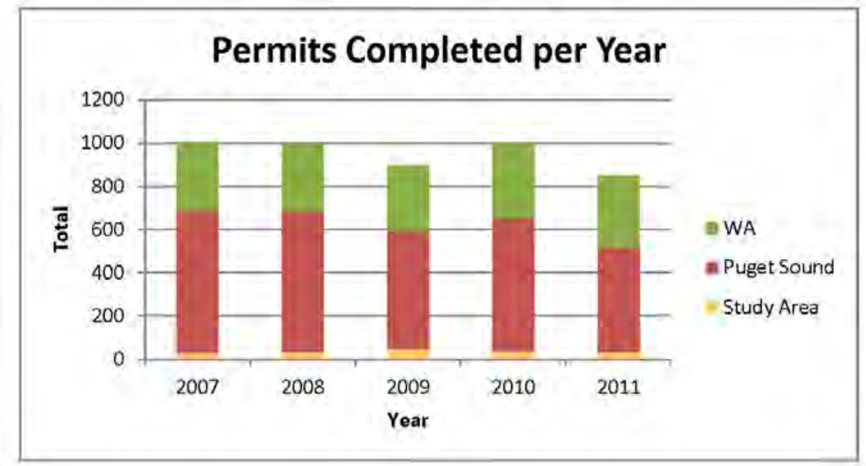
EVAL

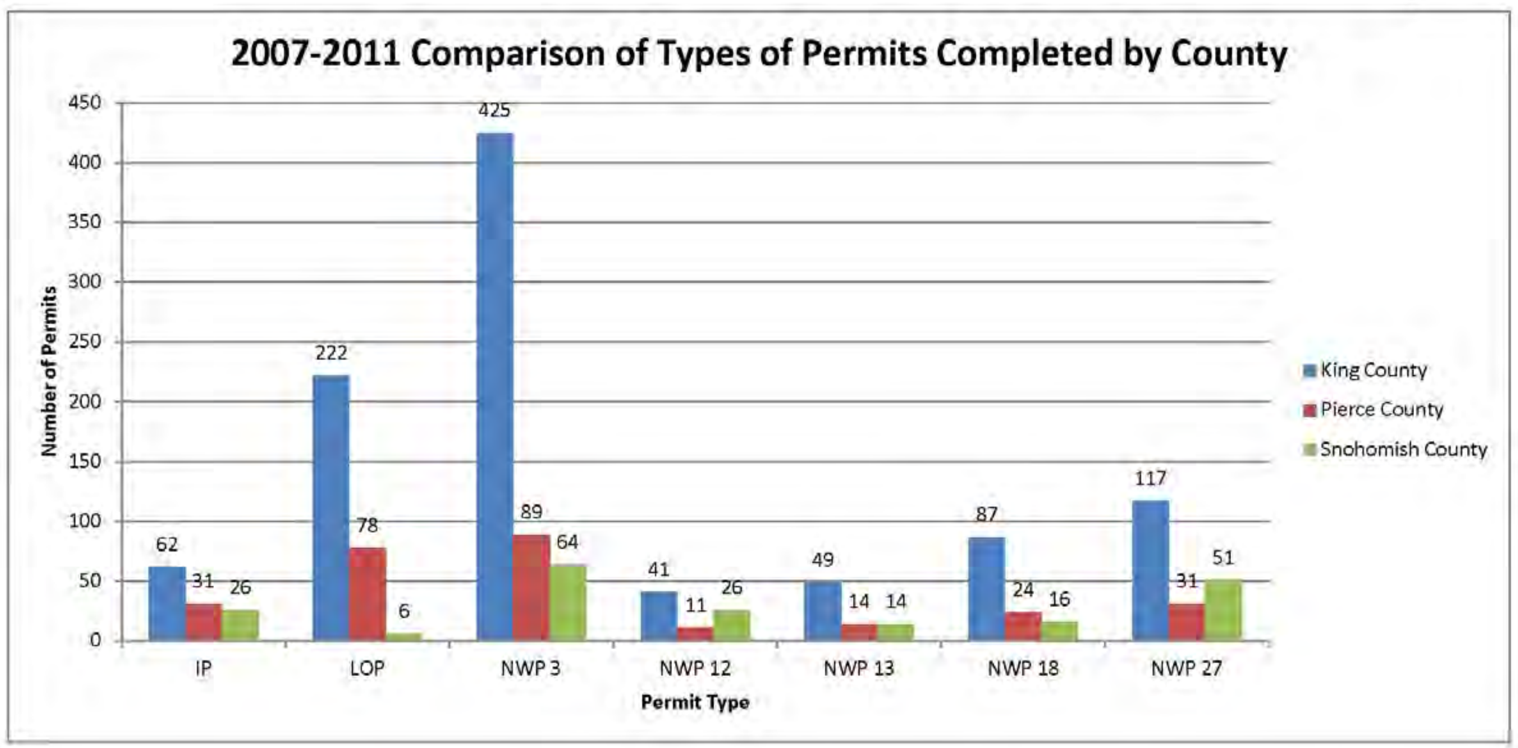
	ALL WA	Pierce County	King County	Snohomish County	Puget Sound	Study Area
IP	339	31	62	26	219	24
LOP	573	78	222	6	471	10
NWP 1	17	1	4	0	12	0
NWP 2	11	0	1	0	11	0
NWP 3	1152	89	425	64	903	69
NWP 4	16	0	3	1	9	0
NWP 5	71	1	9	4	34	4
NWP 6	110	14	21	7	73	10
NWP 7	45	4	9	0	26	0
NWP 9	1	0	0	0	1	0
NWP 10	267	6	25	1	167	1
NWP 11	6	3	1	0	4	0
NWP 12	213	11	41	26	119	13
NWP 13	238	14	49	14	119	7
NWP 14	328	16	80	67	190	2
NWP 15	3	0	0	0	3	0
NWP 17	1	0	0	0	0	0
NWP 18	352	24	87	16	242	8
NWP 19	9	0	1	0	3	0
NWP 20	3	0	0	0	2	0
NWP 22	5	0	1	0	1	0
NWP 23	122	2	19	10	60	0
NWP 25	8	3	0	2	6	0
NWP 27	662	31	117	51	335	10
NWP 28	3	1	0	0	2	0
NWP 29	103	6	24	17	75	1
NWP 31	4	0	1	0	3	0
NWP 32	9	2	1	0	6	0
NWP 33	166	11	57	8	107	1
NWP 35	5	0	0	0	2	0
NWP 36	22	1	0	0	13	0
NWP 38	27	2	4	2	17	1
NWP 39	112	2	18	23	74	2
NWP 41	4	0	1	0	2	0
NWP 43	21	2	5	0	9	0
NWP 45	5	0	1	2	4	0
NWP 46	1	0	0	0	0	0
NWP 48	170	6	0	0	76	0

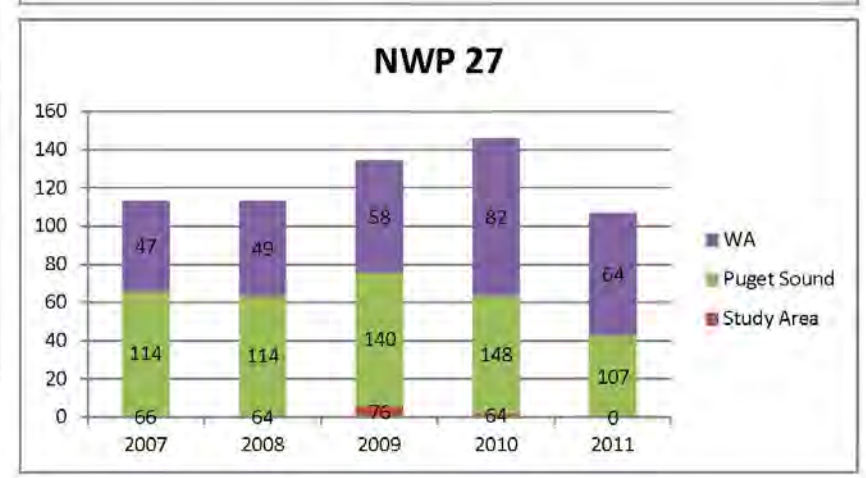
EVALUATION (2007-2011 Data)











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EVALUATION (2007-2011 Data)

	Study Area	Adjusted for Calculations: Puget Sound	WA	Puget Sound	WA
2007	31	659	320	690	1010
2008	35	650	311	685	996
2009	50	545	304	595	899
2010	39	615	346	654	1000
2011	33	489	331	522	853

	SA/PS	SA/WA	PS/WA
2007	4.49%	3.07%	68.32%
2008	5.11%	3.51%	68.78%
2009	8.40%	5.56%	66.18%
2010	5.96%	3.90%	65.40%
2011	6.32%	3.87%	61.20%
avg %	6.06%	3.98%	65.97%

	Study Area	Adjusted for Calculations: Puget Sound	WA	Puget Sound	WA
IP	24	195	120	219	339
LOP	10	461	102	471	573
NWP 3	69	834	249	903	1152
NWP 12	13	106	94	119	213
NWP 13	7	112	119	119	238
NWP 18	8	234	110	242	352
NWP 27	10	325	327	335	662

	SA/PS	SA/WA	PS/WA
IP	10.96%	7.08%	64.60%
LOP	2.12%	1.75%	82.20%
NWP 3	7.64%	5.99%	78.39%
NWP 12	10.92%	6.10%	55.87%
NWP 13	5.88%	2.94%	50.00%
NWP 18	3.31%	2.27%	68.75%
NWP 27	2.99%	1.51%	50.60%

	WA	Puget Sound	Study Area
All NWP	4292	2710	129
All IP and LOP	912	690	34
NWP/ (IP+LOP)	21.25%	25.46%	26.36%

	Pierce County	King County	Snohomish County	ALL WA
IP	31	62	26	339
LOP	78	222	6	573
NWP 3	89	425	64	1152
NWP 12	11	41	26	213
NWP 13	14	49	14	238
NWP 18	24	87	16	352
NWP 27	31	117	51	662
Total	278	1003	203	

	Pierce/WA	King/WA	Snohomish/WA
IP	9.14%	18.29%	7.67%
LOP	13.61%	38.74%	1.05%
NWP 3	7.73%	36.89%	5.56%
NWP 12	5.16%	19.25%	12.21%
NWP 13	5.88%	20.59%	5.88%
NWP 18	6.82%	24.72%	4.55%
NWP 27	4.68%	17.67%	7.70%

	Pierce County	King County	Snohomish County
IP	11.15%	6.18%	12.81%
LOP	28.06%	22.13%	2.96%
NWP 3	32.01%	42.37%	31.53%
NWP 12	3.96%	4.09%	12.81%
NWP 13	5.04%	4.89%	6.90%
NWP 18	8.63%	8.67%	7.88%
NWP 27	11.15%	11.67%	25.12%

	King	Pierce	Snohomish	ALL WA
2007	261	68	67	1010
2008	281	66	50	996
2009	218	55	70	899
2010	234	83	79	1000
2011	228	53	67	853
Total 2007-2011	1222	325	333	4758

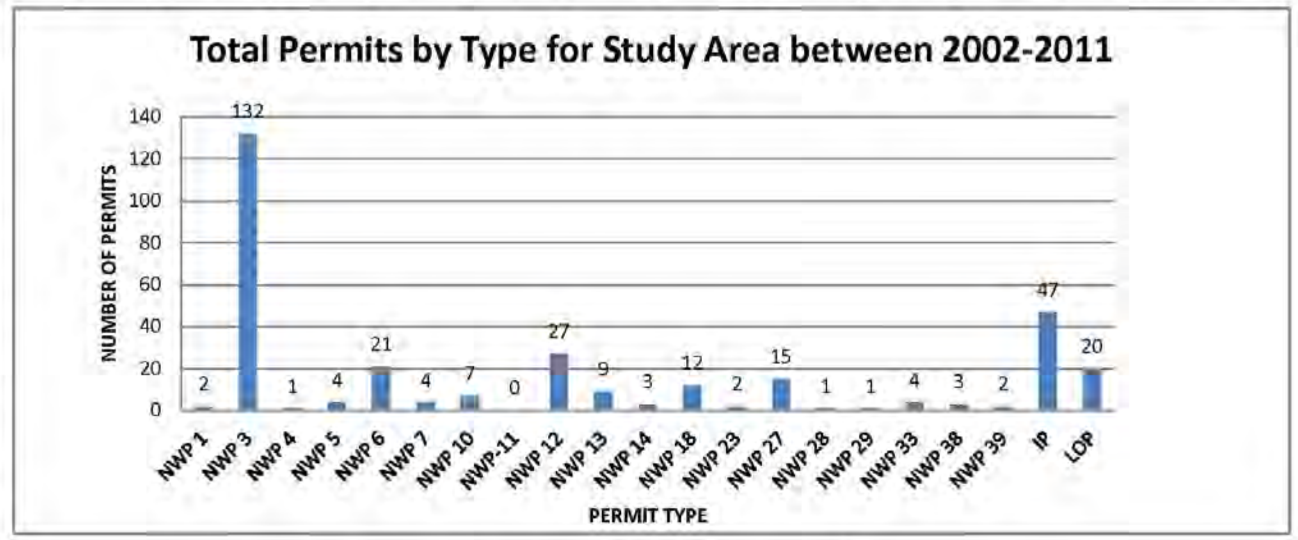
NWP 27	Study Area	Adjusted for Calculations: Puget Sound	WA	Puget Sound	WA
2007	1	65	47	66	114
2008	1	63	49	64	114
2009	6	70	58	76	140
2010	2	62	82	64	148
2011	0	43	64	43	107

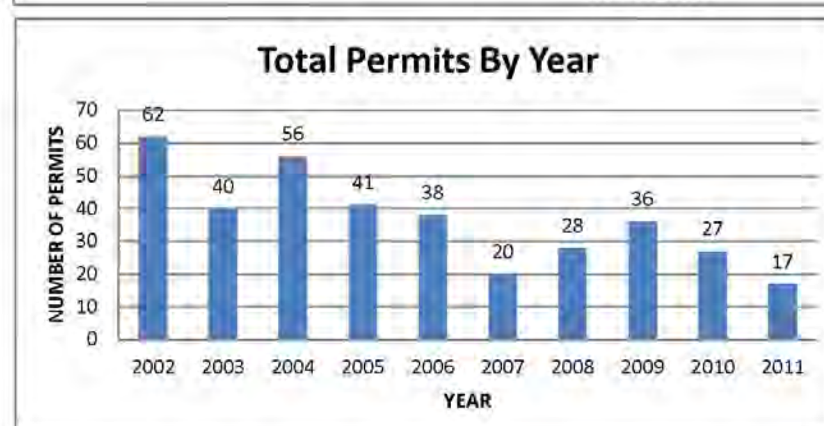
NWP 27	SA/WA	SA/PS	PS/WA
2007	0.88%	1.52%	57.89%
2008	0.88%	1.56%	56.14%
2009	4.29%	7.89%	54.29%
2010	1.35%	3.13%	43.24%
2011	0.00%	0.00%	40.19%

Evaluation (SA 2002-2011)

	NWP 1	NWP 3	NWP 4	NWP 5	NWP 6	NWP 7	NWP 10	NWP-11	NWP 12	NWP 13	NWP 14	NWP 18	NWP 23	NWP 27	NWP 28	NWP 29	NWP 33	NWP 38	NWP 39	IP	LOP		
	1	3	4	5	6	7	10	11	12	13	14	18	23	27	28	29	33	38	39	SP	LOP	Total permits per year	No action
2002	1	23	0	0	4	0	1	0	3	1	0	1	0	2	1	0	0	1	0	12	4	62	8
2003	1	8	0	1	4	1	0	0	2	0	0	1	0	2	0	0	0	0	0	8	0	40	12
2004	0	18	0	0	3	1	3	0	5	0	1	2	0	4	0	0	1	0	0	6	3	56	9
2005	0	14	0	0	0	1	1	0	1	1	0	1	2	1	0	0	2	0	0	4	3	41	10
2006	0	20	1	0	2	1	1	0	2	1	1	0	0	1	0	0	0	1	0	2	2	38	3
2007	0	8	0	0	2	0	1	0	2	0	0	1	0	1	0	0	0	1	0	2	0	20	2
2008	0	8	0	1	1	0	0	0	1	3	1	2	0	1	0	0	0	0	0	8	2	28	0
2009	0	11	0	1	1	0	0	0	7	1	0	3	0	1	0	1	0	0	2	4	2	36	2
2010	0	15	0	1	0	0	0	0	4	0	0	0	0	2	0	0	1	0	0	1	2	27	1
2011	0	7	0	0	4	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	2	17	1
Total	2	132	1	4	21	4	7	0	27	9	3	12	2	15	1	1	4	3	2	47	20	365	48
2007-2011	0	49	0	3	8	0	1	0	14	6	1	7	0	5	0	1	1	1	2	15	8	128	6

	Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq.ft.)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening ft.		Mitigation sq.ft
2011	0	0	45	10,850	0	0	0		0
2010	0	0	95	2,028	10,192	69,200	85		400
2009	42,851	14,018	1,000	0	55,250	138,600	0		128,673
2008	4,658	0	1,450	0	36,780	27,443	725		2,894
2007	32	0	0	115	20,000	52,272	0		0
2006	933	19,733	430	8,973	5,000	0	0		0
2005	1,861	9,500	15,000	0	0	0	0		0
2004	3,107	18,731	3,269	14,810	31,400	284,011	0		16,988
2003	244,318	80,375	0	0	361,930	396,396	0		191,664
2002	99,273	52,882	3	0	89,620	10,019	0		58,370





ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Fill Area (sq m)	Length (meter)	YEAR	Latitude/ Longitude	Karah's Notes	Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq.ft.)	Dredging	dredging sq. ft	Linear Ft of Shore hardening ft.	Mitigation sq.ft
NWP	3	NWS-2011-00075	Structure	Harbor/Ocean	bulkhead repair	19-Jan-11	1-Feb-11	0	0	2011	47.45755/ -122.3697	Repair Rock								
NWP	3	NWS-2011-00130	Structure	Lake	replacement of existing roof and floats in three (3) mooring bays	10-Feb-11	11-Mar-11	0	0	2011	47.56916/ -122.3494	Maintenance of Existing, no fill								
NWP	3	NWS-2011-00138	Work	Harbor/Ocean	Repair spalled concrete in underdeck of pier. Remove existing damaged fender piles and replace with new timber piling. Repair damaged pile connections and support walers.	10-Feb-11	9-Jun-11	0	0	2011	47.98421/ -122.2287	Maintenance of Existing, no fill								
NWP	3	NWS-2011-00205	Structure	Lake	repair an existing approximately 850-foot timber supported wooden wharf by repairing timber fender piles, realign timber pile caps, install steel brackets, plates and straps between existing wood piles;deck timber beams; and concrete seawall under the deck, and repair deteriorated areas of the corbel along the existing concrete seawall.	17-Mar-11	27-Jun-11	0	0	2011	47 34'29.2"/ -122 21' 26.8"	Maintenance of Existing, no fill								
NWP	3	NWS-2011-00242-DOT	Structure	Harbor/Ocean	Replace an angled batter pile at the Colman Dock ferry terminal	17-Mar-11	12-May-11	0	0	2011	47.6026/ 122.3395	Rod installed								
NWP	3	NWS-2011-00319	Excavation involving discharge of dredged or fill material	Harbor/Ocean	x	13-Apr-11	8-Jul-11	1007.998		2011										
NWP	3	NWS-2011-00322	Work	Lake	pile repair	14-Apr-11	9-May-11			2011	47 35'56"/ -122 19'52"	Repair to existing								
NWP	6	NWS-2011-00603	Work	River/Stream	sediment sampling	5-Jul-11	15-Jul-11	0	0	2011	45.5117/ -122.303	Sampling								
NWP	6	NWS-2011-00611	Work	Harbor/Ocean	geotechnical borings	7-Jul-11	3-Aug-11	0	0	2011		Observing								
NWP	6	NWS-2011-00676	Other (directional boring, crossings)	River/Stream	Take two core samples in Snohomish River	28-Jul-11	17-Aug-11	0	0	2011		Bore Hole								

2011_Permits

ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Fill Area (sq m)	Length (meter)	YEAR	Latitude/ Longitude	Karah's Notes	Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq.ft.)	Dredging	dredging sq. ft	Linear Ft of Shore hardening ft.	Mitigation sq.ft
NWP	6	NWS-2011-00776	Work	River/Stream	collect 27 surficial sediment samples and 27 core sediment samples	17-Aug-11	15-Sep-11	0	0	2011	47.52/ -122.3056									
NWP	13	NWS-2011-00631	Discharge of fill material	Harbor/Ocean	install a replacement bulkhead along 60 feet of shoreline in Burien	7-Jul-11	6-Oct-11		18.288	2011	Gravel	35 c/y of excavations			35.0					
NWP	13	NWS-2011-00910	Excavation involving discharge of dredged or fill material	River/Stream	construct flood fencing and install LWD on emergency basis	3-Oct-11	7-Oct-11	4046.86		2011										
NWP	18	NWS-2011-00631	Ecological restoration	Harbor/Ocean	install a replacement bulkhead along 60 feet of shoreline in Burien	7-Jul-11	6-Oct-11	0	0	2011										
NWP	none	NWS-2011-00781	Discharge of fill material		x	19-Aug-11	21-Oct-11	0	0	2011		No Fill/ No permit required								
LOP		NWS-2011-00319	Structure	Harbor/Ocean	x	8-Apr-11	8-Jul-11			2011		10 c/y removed from 10,850 sq ft			10.0	10850.0				
LOP		NWS-2011-00341	Structure	Harbor/Ocean	Install a temporary flexi-float security barrier comprised of twenty 10- by 40-foot floats.	15-Apr-11	16-May-11	0	0	2011		Temp bouy								
													0.0	0.0	45.0	10850.0	0.0	0.0	0.0	0.0

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Fill Area (sq m)	Length (meter)	YEAR	Latitude/Longitude	Karah's Notes	Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq.ft.)	Dredging	dredging sq. ft	Linear Ft of Shore hardening	Mitigation sq ft
NWP	3	NWS-2010-00038-DOT	Structure	Harbor/Ocean	replace three mooring dolphins	7-Jan-10	20-May-11	0	0	2010	47 48'47"/ 122 23'04"	Replacement of existing structure								
NWP	3	NWS-2010-00088	Work	Stream/River /Ocean	Repair levee blowout	21-Jan-10	21-Jan-10	0	0	2010	48.01403/ - 122.1394	Maintenance								
NWP	3	NWS-2010-00281	Structure	Stream/River /Ocean	remove three 16-inch diameter steel sleveed 14-inch diameter timber creosote piles and install three 16-inch diameter steel piles in the same footprint	9-Feb-10	29-Apr-10	0	0	2010		Replaced Existing								
NWP	3	NWS-2010-00358	Work	Stream/River /Ocean	repair 28 piles	2-Mar-10	16-Apr-10	0	0	2010										
NWP	3	NWS-2010-00365	Structure	River/Stream	replaced 82 decking timbers on Pier E	25-Mar-10	28-Jan-11	0	0	2010	47.98024/ - 122.21475	Repair of existing								
NWP	3	NWS-2010-00646	Structure	Stream/River /Ocean	x	7-May-10	19-Jul-10			2010	47 40'07"/ 122 24'29"	Replace Existing								
NWP	3	NWS-2010-00846	Work	Other	Installation of galvanic cathodic protection system on piling to prevent corrosion	28-Jun-10	1-Nov-10	0	0	2010	47 58'51"/ 122 13'16"	Pier Maintenance								
NWP	3	NWS-2010-00884	Removal	Stream/River /Ocean	Excavation of riverine sediments	7-Jul-10	12-Aug-10			2010	47.595/ - 122.10409	25c/y removed from 1014 sq ft			25.0	1014.0				
NWP	3	NWS-2010-00886	Removal	Stream/River /Ocean	Excavation of riverine sediments	7-Jul-10	12-Aug-10			2010	47.94754/ - 122.35179	25c/y removed from 1014 sq ft			25.0	1014.0				
NWP	3	NWS-2010-00961	Work	Stream/River /Ocean	Replacement of a 3 pile wood dolphin with a single steel pile dolphin	12-Aug-10	4-Oct-10			2010	47.57138/ - 122.35179	Replacment of Piling								
NWP	3	NWS-2010-00966	Work	Other	Brightwater Fender Piling Replacement	5-Aug-10	7-Sep-10			2010	47.78111/ 122.39806	Replacment of Piling								

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Fill Area (sq m)	Length (meter)	YEAR	Latitude/Longitude	Karah's Notes	Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq.ft.)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening	Mitigation sq ft
NWP	3	NWS-2010-00998	Structure	Harbor/Ocean	replace bulkhead, add gravel and cobbles to beach	4-Aug-10	28-Apr-11			2010	47.555139/ -122.400780	Repair 85' of 210' of bulkhead. Miitigation: Shoreline							85.0	
NWP	3	NWS-2010-01066	Structure	River/Stream	x	15-Apr-11	10-May-11			2010	47.95/ -122.16	Replacing culvert and tide gate.								
NWP	3	NWS-2010-01115	Structure	Other	Replacement of timber piles, rub boards, steel pile hoops; 16 piles will be removed and 7	3-Sep-10	5-Oct-10			2010	47 59'57"/ 122 13'10"	Replacing piling								
NWP	3	NWS-2010-01361	Work	Harbor/Ocean	Fender Pile Replacement	13-Dec-10	20-Jul-11	0	0	2010	47 58'39"/ 122 13'24"	Replacing piling								
NWP	5	NWS-2010-00434	Structure	Harbor/Ocean	Install wave energy buoy	17-Mar-10	8-Feb-11	0	0	2010	47 39'35"/ 122 26'20"	Bouy Placement								
NWP	12	NWS-2010-00056	Dredging	Harbor/Ocean	The project consists of rehabilitating and upgrading an existing below-grade sewer line. Work will consist of the construction of two new pump stations to intercept gravity sewer lines that service adjacent and upslope communities	1-Feb-10	10-Dec-10	283 c/y of material excavated	3000 linear feet	2010										
NWP	12	NWS-2010-00056	Work	Harbor/Ocean	The project consists of rehabilitating and upgrading an existing below-grade sewer line. Work will consist of the construction of two new pump stations to intercept gravity sewer lines that service adjacent and upslope communities	30-Sep-11	11-Oct-11	0	0	2010	47.490/ -122.365									
NWP	12	NWS-2010-00363	Work	Stream/River /Ocean	Replace Snohomish ¿ Everett #2 utility line	9-Mar-10	1-Apr-10	0	0	2010		Repair of existing								
NWP	12	NWS-2010-00609	Work	Stream/River /Ocean	Install bypass pipe, relocate outfall, modify weir, stabilize banks, remove sediment, remove	12-May-10	8-Sep-10		0	2010	47.84158/ -122.34546	42-47 c/y of sediment removed			45.0					
NWP	27	NWS-2010-00609	Ecological restoration	Other	Install bypass pipe, relocate outfall, modify weir, stabilize banks, remove sediment, remove	12-May-10	8-Sep-10			2010		Permanent impact to 164 ft squared, resore wetland								400

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Fill Area (sq m)	Length (meter)	YEAR	Latitude/Longitude	Karah's Notes	Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq.ft.)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening	Mitigation sq ft
NWP	27	NWS-2010-00609	Work	Other	Install bypass pipe, relocate outfall, modify weir, stabilize banks, remove sediment, remove	12-May-10	8-Sep-10		91.44	2010										
NWP	33	NWS-2010-01385	Other (directional boring, crossings)	River/Stream	X	4-Jan-11	7-Apr-11	0	0	2010		Installation of pipes. No fill								
NPR	none	NWS-2010-01354	Work	Harbor/Ocean	Repair of an existing seawall by replacing failed boulders, repositioning boulders to stabilize the wall, and replacing 1-2 cubic-yards of crushed rock landward of the seawall.	7-Dec-10	7-Dec-10	0	0	2010		Replacing 1-2 c/y of gravel								
LOP		NWS-2010-00545	Structure	Other	replacement boathouse	25-May-10	3-Nov-10			2010	47.99451/-122.2274	Float Assembly								
LOP		NWS-2010-00553	Ecological restoration	River/Stream	install swimmer detection net panel that is 6-foot by 7-	4-May-10	28-Jan-11			2010	47.9833/-122.2274									
SP		NWS-2010-00872	Dredging	Harbor/Ocean	Dredging for navigation purposes.	24-Feb-11	22-Sep-11			2010	47.58/ 122.13	Dredging 10,192 c/y from an area of 69200 ft squared					10192.0	69200.0		
													0.0	0.0	95.0	2028.0	10192.0	69200.0	85.0	400.0

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening	Mitigation sq ft
SP		NWS-2009-00022-DOT	Dredging	Stream/River/Ocean	SR 529 Ebey Slough Bridge Replacement, replacing the swing-span bridge with a fixed-span bridge	5-Jan-09	28-Apr-10			2009		11654		1000					50878.08
SP		NWS-2009-00022-DOT	Discharge of fill material	Tidal Wetland	SR 529 Ebey Slough Bridge Replacement, replacing the swing-span bridge with a fixed-span bridge	5-Jan-09	28-Apr-10	930.7778		2009									
LOP		NWS-2009-00047	Structure	Other	install kayak platform, replace ramp, floats, and piling, and modify the footprint of an existing pier, ramp, and float structure.	12-Jan-09	8-Sep-09	0	0	2009	Replace Piling								
NWP	39	NWS-2009-00154	Discharge of fill material	Non-Tidal Wetland	Retain fill of 0.39 acres of wetland and 0.008 acres of drainage ditch	2-Jul-09	12-Aug-09	1610.65		2009									
UNAUTHACT	none	NWS-2009-00154	Discharge of fill material	Non-Tidal Wetland	Retain fill of 0.39 acres of wetland and 0.008 acres of drainage ditch	11-Dec-08	2-Jul-09			2009	.386 acre of fill		0.386						
NWP	3	NWS-2009-00162	Discharge of fill material	Stream/River/Ocean	repair 85 feet of an existing rip rap bulkhead	9-Feb-09	24-Jul-09	47.38055		2009	100 cy of spawning gravel, 100 cy backfill, old bulkhead replaced	200							
NWP	27	NWS-2009-00162	Discharge of fill material	Stream/River/Ocean	repair 85 feet of an existing rip rap bulkhead	9-Feb-09	24-Jul-09	47.38055		2009	100 cy of spawning gravel, 100 cy backfill, old bulkhead replaced	200							
NWP	39	NWS-2009-00207	Discharge of fill material	Non-Tidal Wetland	Unauthorized fill	24-Jul-09	12-Aug-09	1562.088		2009									
UNAUTHACT	none	NWS-2009-00207	Discharge of fill material	Non-Tidal Wetland	Unauthorized fill	11-Dec-08	24-Jul-09			2009									
NWP	12	NWS-2009-00237	Discharge of fill material	Non-Tidal Wetland	reconstruct sewer system under and along 1st and 2nd Streets	1-Jun-09	18-Feb-10	526.0918		2009		3052	12196.8						74052
NWP	12	NWS-2009-00237	Discharge of fill material	Non-Tidal Wetland	reconstruct sewer system under and along 1st and 2nd Streets	1-Jun-09	18-Feb-10	121.4058		2009									
NWP	17	NWS-2009-00237	Discharge of fill material	Non-Tidal Wetland	reconstruct sewer system under and along 1st and 2nd Streets	1-Jun-09	18-Feb-10	121.4058		2009									

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening	Mitigation sq ft
NWP	18	NWS-2009-00237	Discharge of fill material	Non-Tidal Wetland	reconstruct sewer system under and along 1st and 2nd Streets	1-Jun-09	18-Feb-10	121.4058		2009									
NWP	3	NWS-2009-00246	Discharge of fill material	Stream/River /Ocean	recap bulkhead, install hinged staircase and boat boom, and resurface boat ramp	19-Mar-09	18-May-09	40.4686	30.48	2009	Existing structures repaired								
NWP	3	NWS-2009-00275-WRD	Discharge of fill material	Stream/River /Ocean	Repair seawall support structures	11-Mar-09	30-Apr-09			2009		13							
NWP	18	NWS-2009-00288-WRD	Discharge of fill material	Non-Tidal Wetland	Wetland fill	17-Mar-09	23-Apr-09			2009		22	871.2						
NWP	3	NWS-2009-00354	Structure	Other	Repair 8 steel piles and 10 concrete piles supporting Pier 3.	31-Mar-09	29-Apr-09	16.72255		2009	Piling repairs								
NWP	29	NWS-2009-00447	Discharge of fill material	Non-Tidal Wetland	placement of fill for weir and sewer line installation	29-Apr-09	14-Mar-11	88.25789		2009		1875	950						2000
NWP	5	NWS-2009-00508	Structure	Stream/River /Ocean	install a geotechnical boring through an existing pier	18-May-09	27-May-09	18.58061		2009									
NWP	6	NWS-2009-00524	Dredging	Stream/River /Ocean	partial sediment characterization	1-Jun-09	9-Jun-09			2009	less than 1 c/y	1							
NWP	13	NWS-2009-00585	Discharge of fill material	Stream/River /Ocean	repair 182 linear feet of an existing rip rap bulkhead	8-Jun-09	5-Mar-10			2009	158 c/y of rock to replace	158							
NWP	3	NWS-2009-00595	Structure	Stream/River /Ocean	removal of an 18 pile wood dolphin and installation of a replacement dolphin consisting of five 16-inch diameter steel piles; removal of four steel I beam piles and installation of replacement 12-inch diameter steel piles; replacement of four	11-Jun-09	15-Dec-09			2009	replacement of existing beams								
NWP	3	NWS-2009-00777	Work	Other	Removal of accumulated sediments from concrete boat ramps at low tide	23-Jul-09	14-Aug-09			2009	25 cy removed								
NWP	12	NWS-2009-00844	Structure	Stream/River /Ocean	Ebey Slough to I-5 Fiber Optic Line - Snohomish River Crossing	27-Jul-09	14-Aug-09			2009	replace wires								
NWP	3	NWS-2009-00932	Work	Stream/River /Ocean	repair up to seventy two deteriorated support piling and overwater structures on pier 70	6-Aug-09	20-Nov-09			2009	Replace existing								

ACTION_ TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE _TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening	Mitigation sq ft
NWP	3	NWS-2009-00932	Work	Harbor/Ocean	repair up to seventy two deteriorated support piling and overwater structures on pier 70	1-Jun-11	9-Jun-11			2009	Replace existing								
NWP	12	NWS-2009-01155	Dredging	Harbor/Ocean	repair existing pump station	20-Nov-09	14-Dec-10			2009									
NWP	12	NWS-2009-01155	Work	Harbor/Ocean	repair existing pump station	22-Sep-11			0	2009									
NWP	3	NWS-2009-01169	Structure	Stream/River /Ocean	replace three dolphins	28-Sep-09	23-Dec-09			2009	maintenance of existing								
SP		NWS-2009-01245	Dredging	Stream/River /Ocean	Dredging and open-water disposal	10-Nov-09	21-Jan-10			2009	32,000 cy 138,600 sqft					32000	138600		
NWP	3	NWS-2009-01342	Work	Other	Maintenance of pier/wharf	9-Nov-09	28-Jan-10			2009	Replace existing								
NWP	12	NWS-2009-01408	Other (directional boring, crossings)	Stream/River /Ocean	string fiber optic cable on existing poles across navigable waters at three crossings	16-Nov-09	5-Feb-10		60.96	2009	Replace existing								
NWP	12	NWS-2009-01443	Structure	Stream/River /Ocean	replace weighted 241-foot, 36-inch diameter marine wastewater outfall diffuser pipe in slightly different alignment than existing pipe; remove old pipe; overhead placement and removal would be accomplished using a large marine, barge-mounted crane.	23-Nov-09	17-Feb-10			2009	Replace existing								
LOP		NWS-2009-01538	Structure	Stream/River /Ocean	install a new 240sf float and 96sf grated ramp with 4 new steel piles	14-Dec-09	7-Sep-10			2009	Mitigation of 1,743 sq ft								1743
NWP	3	NWS-2009-01545	Structure	Stream/River /Ocean	X	14-Dec-09	5-Feb-10			2009	Replace existing								
NWP	18	NWS-2009-01586-DOT	Discharge of fill material	River/Stream	Replace the South Park Bridge aka 16th Avenue soutrh Bridge	22-Dec-09	22-Oct-10	0		2009									
SP		NWS-2009-01586-DOT	Excavation involving discharge of dredged or fill material	River/Stream	Replace the South Park Bridge aka 16th Avenue soutrh Bridge	22-Oct-10	25-Mar-11	890.3092		2009		25676				23250			
												42851	14018.39	1000	0	55250	138600	0	128673.1

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ACTION_ TYPE	NWP Type	DA_NUMBER	IMPACT_TYP E	RESOURCE _TYPE	FOLDER_DESCRIP TION	PERMIT_ST ART_DATE	PERMIT_E ND_DATE	Authorize d Fill Area (sq m)	Authorize d Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening ft.	Mitigation sq ft
SP		NWS-2008-00320	Dredging	Stream/River /Ocean	dredging	5-Mar-08	10-Feb-09	1173.589		2008	.33 acres, 32,170 c/y over 10 yr 1000 c/y clean oyster shell	1000.0				32170.0	14374.8		
NWP	3	NWS-2008-00465	Structure	Harbor/Ocea n	Drive 10 and stub 16 wood pile replacemets at the Colman Dock	16-Apr-08	30-May-08			2008	No Fill								
SP		NWS-2008-00498	Dredging	Other	conduct maintenance dredging and replace an existing breakwater	14-Apr-08	27-Apr-09			2008	700 c/y .3 acre					700.0	13068.0		
SP		NWS-2008-00629-NO	Discharge of fill material	Other	Install fifteen piles of large rock with a diameter of 21 feet and a height of 7 feet after settlement, twelve 40-foot long pre-cast concrete piling placed across the piles of large rock, six 80-foot long pre-cast concrete piling placed across the piles of large rock, two 23-foot wide by 120-foot long by 1.5-feet high low-profile crushed quarry rock berms extending from elevation -30 feet MLLW to elevation -11 feet MLLW, 42 simulated bull kelp plants consisting of a 16-inch by 8-inch by 16-inch concrete anchor block, an 8-foot to 10-foot long polypropylene line	8-May-08	10-Sep-08	8093.72		2008	1400 c/y of rock, concrete, artificial kelp	1400.0							
NWP	3	NWS-2008-00666	Discharge of fill material	Other	bulkhead	12-May-08	7-Aug-08		16.764	2008	20 c/y of fill	20.0							
NWP	14	NWS-2008-00673-NO	Discharge of fill material	Tidal Wetland	restore intertidal riparian shoreline; fill 160 feet of ditch for road crossing to industrial site; re-construct remainder of ditch (500 feet) to receive stormwater runoff	9-May-08	4-Mar-09			2008	rehabilitate .24 acre, 500 lf of woody debris								

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft of Shore hardening ft.	Mitigation sq ft
NWP	27	NWS-2008-00673-NO	Discharge of fill material	Tidal Wetland	restore intertidal riparian shoreline; fill 160 feet of ditch for road crossing to industrial site; re-construct remainder of ditch (500 feet) to receive stormwater runoff	9-May-08	4-Mar-09			2008	rehabilitate .24 acre, 500 lf of woody debris								
NWP	12	NWS-2008-00713	Discharge of fill material	Other	placement of 115 cubic yards of rip rap at outfall F, placement of 50 cubic yards of rip rap at outfall G, add nine feet of 10-inch pipe to outfall G	15-May-08	19-Sep-08	116.3146		2008	165 c/y of riprap	165.0							
SP		NWS-2008-00825	Structure	Stream/River/Ocean	construct industrial pier and repair bulkheads	16-Jun-08	26-Mar-10			2008	No Fill								
SP		NWS-2008-00825	Discharge of fill material	Stream/River/Ocean	construct industrial pier and repair bulkheads	16-Jun-08	26-Mar-10	40.4686		2008	5,620 sf of fill removed. Mitigation: 740 c/y of sandy gravel, 10,400 sqft of riparian planting								
NWP	3	NWS-2008-00881	Structure	Stream/River/Ocean	replace 12 existing piling with 12 20-inch steel piling in the same footprint on an existing pier	23-Jun-08	27-Oct-08	134.7094		2008	No Fill								
NWP	3	NWS-2008-00939	Structure	Stream/River/Ocean	replace sixty 12-inch diameter piling with 18 steel piling	9-Jul-08	5-Nov-08	930.7778		2008	No Fill								
NWP	3	NWS-2008-00953-SO	Discharge of fill material	Stream/River/Ocean	repair public access trail lost during a storm event	14-Jul-08	11-Sep-08		30.48	2008	200 sqft affected 4 c/y of fill								

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SP		NWS-2008-00956	Dredging	Stream/River/Ocean	The City of Des Moines is replacing a portion of the marina's existing creosote-treated timber bulkhead, repairing existing structures, and completing some of the improvements identified in their updated Master Plan (udpated 06/14/07).	15-Jul-08	14-Jul-09			2008	Replace 725 w/ 784 bulkhead, dredge 3,900c/y fill up to 1,500 c/y of gravel. Mitigation: 280 c/y of fish gravel, move bulkhead back 15 ft, remove 8,219 sq ft of overwater coverage	1500.0				3900.0		725.0	280.0
SP		NWS-2008-00956	Structure	Stream/River/Ocean	The City of Des Moines is replacing a portion of the marina's existing creosote-treated timber bulkhead, repairing existing structures, and completing some of the improvements identified in their updated Master Plan (udpated 06/14/07).	15-Jul-08	14-Jul-09	311.5968		2008									
NWP	3	NWS-2008-00964-NO	Structure	Other	Access ramp replacement with possible installation of flotation modules, if necessary.	16-Jul-08	4-Feb-09	0	0	2008	no Fill, replace structure								
NWP	3	NWS-2008-01044	Structure	Stream/River/Ocean	Removal of existing creosote piling and installation of new steel pipe piling	6-Aug-08	5-Nov-08	0	0	2008	replace piling, no Fill								
NWP	3	NWS-2008-01071	Work	Stream/River/Ocean	Repair/replace timber piling, support, cribbing and caps on an existing pier	11-Aug-08	27-Oct-08	0	0	2008	replace piling, no Fill								
LOP		NWS-2008-01076	Structure	Other	installation of a 75-foot long by 13-foot wide concrete cap on an existing rip rap bulkhead	12-Aug-08	29-Jan-09	61.31601		2008	Stablize bulkhead								
NWP	13	NWS-2008-01162	Structure	Other	Bulkhead Repair	8-Sep-08	21-May-09			2008	Repair 63ft of existing bulkhead								

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft of Shore hardening ft.	Mitigation sq ft
NWP	13	NWS-2008-01163	Discharge of fill material	Stream/River /Ocean	Bulkhead Repair	8-Sep-08	21-May-09		11.2776	2008	Repair 37ft of existing bulkhead								
LOP		NWS-2008-01212	Other (directional boring, crossings)	Other	Installation of submerged pontoon in underwater dive park and marine preserve.	3-Dec-08	13-Apr-09	185.8061	30.48	2008	No Fill								
NWP		NWS-2008-01221	Discharge of fill material	Other	installation of a new bulkhead	16-Sep-08	7-Apr-09			2008	No permit aquired yet, No work completed								
NWP	13	NWS-2008-01234	Discharge of fill material	River/Stream	Repair 50 linear feet of dike before flood season in the Snohomish River.	6-Oct-08	31-Aug-10	40.4686	15.24	2008	With footprint: 200 c/y excavated, refilled with 300 c/y reprap and 200 c/y of gravel .007 acre								
SP		NWS-2008-01308-NO	Discharge of fill material	Stream/River /Ocean	Excavate 900 linear feet of streambed 1 to 4 feet deep (remove 1,450 cubic yards of gravel); construct a 120-foot low flow channel within the excavated stream channel; stabilize 315 linear feet of stream bank; reconstruct a portion of the channel; install two log structures, including placement of up to 300 cubic yards of angular rock; install one bank log, including excavation and backfill of 3 cubic yards of native bank material; place 0.02 acre of fill into Wetland A; install a temporary steam diversion pipeline, in one or more segments, re-grade up to 200 linear feet	8-Oct-08	18-May-10		274.32	2008		550.0		1450.0					2613.6
NWP	18	NWS-2008-01376	Discharge of fill material	Stream/River /Ocean	Dredge up to 10 cubic yards from a concrete pond used for hatchery salmon	27-Oct-08	27-Oct-08			2008	10 c/y dredge of sediment\					10.0			

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq.ft.)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening ft.	Mitigation sq ft
NWP	6	NWS-2008-01410-DOT	Discharge of fill material	Stream/River /Ocean	Geotech boring for bridge replacement	5-Dec-08	13-Jan-09	0.404686		2008	Fill of 23.3 c/y	23.3							
NWP	18	NWS-2008-01410-DOT	Discharge of fill material	Stream/River /Ocean	Geotech boring for bridge replacement	13-Jul-09	7-Oct-09	116.7791		2008									
NWP	5	NWS-2008-01491	Structure	Stream/River /Ocean	scientific measuring device (buoy)	24-Nov-08	19-May-09	0.185806		2008	No Fill								
												4658.3	0.0	1450.0	0.0	36780.0	27442.8	725.0	2893.6

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft of Shore hardening ft.	Mitigation sq ft
NWP	none	NWS-2007-00232	Historical Undertermined	Other	Bulkhead repair	15-Feb-07	21-Feb-07	0	0	2007	No Permit Required, No fill								
NWP	6	NWS-2007-00274	Historical Undertermined	Other		1-Mar-07	2-Mar-07	80937.2	0	2007	25 4inch diameter core samples								
NWP	18	NWS-2007-00356	Structure	Stream/River/Ocean	reconfigure existing facility	5-Feb-09	6-Feb-09	40468.6		2007	Excavate 115 c/y of bank material and stablaize with 70 Lf of sheet pile				115.0				
NWP	none	NWS-2007-00378	Discharge of fill material	Stream/River/Ocean	fish habitat enhancement, dewatering	19-Jun-07	27-Jun-07		91.44	2007	Place 30 c.y of fish gravel per year and 6 sandbags	30.0							
NWP	3	NWS-2007-00384	Historical Undertermined	Other	Replace boat house	29-Mar-07	5-Apr-07	40.4686	0	2007	No Fill, remove 25 Cresosote Piling								
NWP	3	NWS-2007-00409	Historical Undertermined	Other	Piling Replacement	2-Apr-07	17-Sep-07	40.4686	0	2007									
NWP	38	NWS-2007-00446	Historical Undertermined	Other	clean and cap contaminated sediment	12-Apr-07	17-Aug-07	0	0	2007	1.2 Acre dredge 20,000 c.y of contaminated soil and replace with clean sand and habitat enhancing material					20000.0	52272.0		
NWP	3	NWS-2007-00516	Structure	Other	Piling Replacement, Float replacement, bulkhead repair	20-May-09	3-Jun-09	0		2007	No Fill								
NWP	3	NWS-2007-00530	Historical Undertermined	Other	Remove & Replace decking, double grinders, and cap beams	23-Apr-07	29-May-07	0		2007	No Fill								
NWP	3	NWS-2007-00737	Structure	Other	piling replacement	31-May-07	20-Aug-07			2007	No Fill								
NWP	10	NWS-2007-01053-NO	Structure	Other	mooring buoy for private boat moorage	20-Jul-07	29-Aug-07	0.836127		2007	No Fill								

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft of Shore hardening ft.	Mitigation sq ft
NWP	3	NWS-2007-01123-DOT	Structure	Other	A permanent dolphin will be constructed in three phases. During the first phase the remaining timber pile stubs will be removed using a clamshell bucket. Use of a clamshell bucket is necessary because the piles have all broken off below the waterline and are therefore unreachable through other methods. Any	23-Jul-07	30-Aug-07			2007	No Fill								
NWP	12	NWS-2007-01733	Discharge of fill material	Stream/River/Ocean	remove a sewer line from underneath an existing stream	6-Sep-07	31-Jul-09		1371.6	2007	Permanent loss of .21 acres wetland temporary loss of .34 acres of wetland. Excavated soil will be used for bank resotration 1,057 c.y. Restore portion of stream with 3,077 c.y of woody debris								
SP		NWS-2007-01761-NO	Discharge of fill material	Other	Repair and replace 500 lineal feet of shore protection	10-Sep-07	6-Aug-08	121.4058		2007	Demolish existing concreat launch and install floating dock. No fill								
SP		NWS-2007-01762-NO	Dredging	Other	dredge 9000 cy	13-Sep-07	18-Jul-08			2007	City of Des Moines Marina, marina maintenance								
NWP	3	NWS-2007-01866	Discharge of fill material	Other	bulkhead	15-Oct-07	4-Dec-07	9.290304		2007	1.5 c.y waterward	1.5							
RGP	6	NWS-2007-01930-NO	Structure	Other	pier, ramp, and float	1-Nov-07	28-Nov-07			2007	No Fill								

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening ft.	Mitigation sq ft
NWP	27	NWS-2007-01973-NO	Excavation involving discharge of dredged or fill material	Tidal Wetland	restore wetland; riparian and estuarine habitat for salmonids	21-Nov-07	4-Feb-09		213.36	2007									
NWP	3	NWS-2007-01994-NO	Discharge of fill material	Other	repair tide gates	14-Nov-07	1-Jul-08	37.16122		2007	No Fill								
NWP	12	NWS-2007-02043-NO	Discharge of fill material	Tidal Wetland	excavate 2-foot deep by 1.5-foot wide trench; temporarily sidecast excavated material (4 feet wide by 2 feet high); install 4-inch waterline; backfill trench, remove excess material;	29-Nov-07	2-Jul-08		289.56	2007	All Excavation will be refilled with similar material								
												31.5	0.0	0.0	115.0	20000.0	52272.0	0.0	0.0

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft of Shore hardening ft.	Mitigation sq ft
NWP	3	NWS-2006-00024	Historical Undertermined	Other	Replace Piling	27-Oct-06	17-Nov-06	0	0	2006	No Fill								
NPR		NWS-2006-00026	Historical Undertermined	Other	No permit aquired	9-Jan-06	8-Mar-06	0	0	2006	No Fill								
LOP		NWS-2006-00054-CRC	Historical Undertermined	Other	Replace existing net pen system	12-Jan-06	21-Jul-06	0	0	2006	No Fill								
NWP	14	NWS-2006-00111	Historical Undertermined	Other		31-Mar-06	31-Mar-06	1821.087	0	2006	008+.003+.25+.07+.05 acres of fill								
NWP	38	NWS-2006-00223-NO	Discharge of fill material	Stream/River/Ocean	excavate contaminated material from stream (ditch), backfill with clean substrate, plant riparian edges of ditch	10-Feb-06	2-Jul-08	0	152.4	2006	500lf 735 c/y of fill .45 acre, 400 c/y of excavation .206	735.0	19602.0	400.0	8973.4				
NWP	27	NWS-2006-00356	Historical Undertermined	Other	Create new stream channel	27-Mar-06	20-Dec-06	0	0	2006	160 ft of new stream 25c/y of gravel 15c/y of manround river boulders	40.0							
NWP	3	NWS-2006-00407	Structure	Other	replace 18 piling	5-Apr-06	4-Jan-08			2006	No Fill								
NWP	3	NWS-2006-00411	Historical Undertermined	Other	Maintenance of existing structures.	6-Apr-06	9-Jun-06	0	0	2006	No Fill								
NWP	3	NWS-2006-00418	Historical Undertermined	Other	Repair existing bulkhead	7-Apr-06	17-Jul-07	0	0	2006	90 c/y of fill	90.0							
NWP	3	NWS-2006-00419	Historical Undertermined	Other	70 linear feet of bulkhead and 10 linear feet of beach access stairs in Puget Sound at Seattle, Washington	7-Apr-06	8-Jun-07	0	0	2006	No Fill								
NWP	12	NWS-2006-00432	Historical Undertermined	Other		13-Apr-06	20-Dec-06	0	0	2006	No Fill								
NWP	3	NWS-2006-00463-NO	Historical Undertermined	Other	Repair existing marine bulkhead structures, stairs and boat ramp at Brace Point.	19-Apr-06	21-May-07	0	0	2006									
NWP	3	NWS-2006-00463-NO	Work	Harbor/Ocean	Repair existing marine bulkhead structures, stairs and boat ramp at Brace Point.	21-Jul-09	15-Mar-11		137.16	2006									

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft of Shore hardening ft.	Mitigation sq ft
NWP	3	NWS-2006-00464	Historical Undertermined	Other	replace 18 piling	14-Nov-06	12-Jan-07	0	0	2006	No Fill								
NWP	7	NWS-2006-00465	Historical Undertermined	Other		19-Apr-06	24-May-06	0	0	2006	No Fill								
NWP	13	NWS-2006-00551	Historical Undertermined	Other	excavate a toe trench approximately 1 feet waterward from the top of the existing bank, filling the trench with rip rap rock and placing rip rap along the surface of the existing bank and removal of approximately 30 cubic yards of material in the Duwamish Waterway	11-May-06	1-Oct-07	0	0	2006	Remove 30 c/y and place 50 c/y of riprap	50.0		30.0					
UNAUTHACT		NWS-2006-00555	Historical Undertermined	Other	unauthorized fill in Duwamish River	4-Apr-06	30-Mar-09	0	0	2006	Problem resolved								
NWP	6	NWS-2006-00603	Historical Undertermined	Other	Core samples	24-May-06	28-Jun-06	0	0	2006	No Fill								
NPR		NWS-2006-00687	Historical Undertermined	Other		20-Sep-06	20-Sep-06	0	0	2006	1 c/y of fill	1.0							
NWP	3	NWS-2006-00695	Historical Undertermined	Other	Replace 8 creosote dolphins	13-Jun-06	6-Nov-06	0	0	2006	No Fill								
SP		NWS-2006-00722-WRD	Historical Undertermined	Other	Dredge 930 c/y of sand, fill 285 c/y of sand and 22 c/y of 3-6in quarry spall	16-Jun-06	4-Dec-06	0	0	2006									
NWP	3	NWS-2006-00821	Historical Undertermined	Other	sewer line maintenance	11-Jul-06	22-Aug-07	0	0	2006									
NWP	3	NWS-2006-00821	Discharge of fill material	Other	sewer line maintenance	11-Jul-06	22-Aug-07	27.87091		2006	17c/y .003 acre	17.0	130.7						
NWP	10	NWS-2006-00822	Historical Undertermined	Other	Install bouy for personal moorage	11-Jul-06	31-Jul-06	0	0	2006	No Fill								
NWP	3	NWS-2006-00862	Historical Undertermined	Other	Replace existing boathouse	19-Jul-06	26-Jul-06	0	0	2006	No Fill								
NWP	3	NWS-2006-00882	Historical Undertermined	Other	Replace 18 Piling	25-Jul-06	27-Oct-06	0	0	2006	No Fill								
NWP	6	NWS-2006-00955	Historical Undertermined	Other	Exploratory bore in Ebey Slough	11-Aug-06	22-Sep-06	0	0	2006	No Fill								

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft of Shore hardening ft.	Mitigation sq ft
NWP	3	NWS-2006-00956	Historical Undertermined	Other	Replace Fender piles	11-Aug-06	8-Sep-06	0	0	2006	No Fill								
NWP	3	NWS-2006-00957	Historical Undertermined	Other	Replace Fender piles	11-Aug-06	8-Sep-06	0	0	2006	No Fill								
NWP	3	NWS-2006-00958	Historical Undertermined	Other	Replace 10 fender piles	11-Aug-06	8-Sep-06	0	0	2006	No Fill								
NWP	4	NWS-2006-00987	Historical Undertermined	Other	Request for reauthorization for pilings labeled AI, J, N and AU only. The work is to take place in the Snohomish River at Everett in Snohomish County, Washington. Nest Pile S is replacing the Mast piling and is being reviewed as a separate project	18-Aug-06	15-Nov-06	0	0	2006	No Fill								
NWP	none	NWS-2006-01026	Historical Undertermined	Other	Application not required	25-Aug-06	30-Oct-06	0	0	2006									
NPR	none	NWS-2006-01056	Historical Undertermined	Other	repair bulkhead landward of MHHW	2-Oct-06	16-Oct-06	0	0	2006	No Fill								
NWP	none	NWS-2006-01074	Historical Undertermined	Other	No permit aquired	8-Sep-06	28-Sep-06	0	0	2006									
NWP	3	NWS-2006-01106	Historical Undertermined	Other	Replace existing boathouse	13-Sep-06	27-Oct-06	0	0	2006	In footprint								
NWP	3	NWS-2006-01179	Historical Undertermined	Other	Replace existing boathouse	29-Sep-06	26-Oct-06	0	0	2006	No Fill								
NWP	3	NWS-2006-01253	Structure	Other	maintenance	16-Oct-06	22-Aug-07	0	0	2006	No Fill								
NWP	3	NWS-2006-01267	Historical Undertermined	Other	Replace bulkhead	20-Oct-06	6-Nov-06	0	0	2006	In footprint, No fill								
NWP	12	NWS-2006-01338	Historical Undertermined	Other	Installing new underground powerlines	17-Nov-06	27-Dec-06	0	0	2006	No Fill								

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft of Shore hardening ft.	Mitigation sq ft
SP		NWS-2006-01403	Structure	Other	replacement of walkways and opens slips for South Marina docks I through O, replacement of South Marina docks P and Q and associated floats and pilings, maintenance dredging of 5,000 cubic yards beneath docks P, Q and beneath walkways west of dock I, and the disposal of 5,000 cubic yards of dredged material at the Point Gardner disposal site	27-Nov-06	24-Oct-07	4046.86	0	2006	Dredge 5,000 c/y					5000.0			
LOP		NWS-2006-01414	Historical Undertermined	Other	Floating Piers	1-Dec-06	26-Feb-07	0	0	2006	No Fill								
												933.0	19732.7	430.0	8973.4	5000.0	0.0	0.0	0.0

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ACTION_ TYPE	NWP Type	DA_NUMBER	IMPACT_TYP E	RESOURCE _TYPE	FOLDER_DESCRIP TION	PERMIT_ST ART_DATE	PERMIT_E ND_DATE	PERMIT_ AUTHORI TY	Authorize d Fill Area (sq m)	Authorize d Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening ft	Mitigation sq ft
NWP	3	NWS-2005-00031	Historical Undertermined	Other	Replace deteriorated piling	6-Jan-05	23-Feb-05		0	0	2005	No Fill								
NWP	3	NWS-2005-00047	Historical Undertermined	Other	Repair or replace fender piling	11-Jan-05	24-Mar-05		0	0	2005	No fill								
NWP	3	NWS-2005-00922	Historical Undertermined	Other	replace existing boathouse	4-Aug-05	9-Sep-05		0	0	2005	No Fill								
NWP	3	NWS-2005-00560	Historical Undertermined	Other	Replace 47 Creosote piling	13-May-05	14-Sep-05		0	0	2005	No Fill								
NWP	3	NWS-2005-00014	Historical Undertermined	Other	Replace failing bulkheadm repair pier & reconfigure to allow safe moorage	12-Sep-05	16-Sep-05		0	0	2005	No Fill								
NWP	3	NWS-2005-00993	Historical Undertermined	Other	Repair bulkhead, bank stabilization	22-Aug-05	16-Sep-05		0	0	2005	25 c/y of fill	25.0							
NWP	3	NWS-2005-01091	Historical Undertermined	Other	Replace an existing boathouse	12-Sep-05	2-Nov-05		0	0	2005	No Fill								
NWP	3	NWS-2005-00641	Historical Undertermined	Other	Remove 26 creosote, realign or repair 13 piles	7-Jun-05	22-Nov-05		0	0	2005	no fill								
NWP	3	NWS-2005-01211	Historical Undertermined	Other	Boat ramp repair, No Permit required	19-Oct-05	9-Dec-05		0	0	2005	No Fill								
NWP	3	NWS-2005-00738	Historical Undertermined	Other	Replace 18 fender piles with 18 steel pipes	27-Jun-05	19-Dec-05		0	0	2005	No Fill								
NWP	3	NWS-2005-01198	Historical Undertermined	Other	Replace piling	17-Oct-05	5-Jan-06		0	0	2005	No Fill								
NWP	3	NWS-2005-01226	Historical Undertermined	Other		24-Oct-05	16-Mar-06		0	0	2005									
NWP	3	NWS-2005-01219	Historical Undertermined	Other	Replace 35 pile dolphin	24-Oct-05	18-Apr-06		0	0	2005	No Fill								
NWP	3	NWS-2005-00398	Historical Undertermined	Other	repair and replace bulkhead section	8-Nov-07	3-Jan-08		0	0	2005	50 c/y of fill	50.0							
NWP	7	NWS-2005-01004	Historical Undertermined	Other	repair and replace a sewer outfall pipe in Poverty Bay, Puget Sound at Des Moines, Washington	24-Aug-05	22-Feb-07		0	0	2005									
NWP	10	NWS-2005-01055	Historical Undertermined	Other	Mooring bouy	2-Sep-05	11-Jan-06		0	0	2005	No Fill								

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ACTION_ TYPE	NWP Type	DA_NUMBER	IMPACT_TYP E	RESOURCE _TYPE	FOLDER_DESCRIP TION	PERMIT_ST ART_DATE	PERMIT_E ND_DATE	PERMIT_ AUTHORI TY	Authorize d Fill Area (sq m)	Authorize d Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening ft	Mitigation sq ft
NWP	12	NWS-2005-00921	Historical Undertermined	Other	Piple Line installed	4-Aug-05	10-Jan-06		768.9034	2793.49	2005	1,240 c/y will be excavated and then used as backfill								
NWP	13	NWS-2005-00014	Historical Undertermined	Other	Replace failing bulkheadm repair pier & reconfigure to allow safe moorage	12-Sep-05	16-Sep-05		0	0	2005	No Fill								
NWP	18	NWS-2005-00488	Historical Undertermined	Other	replace temporary pipe culvert with bottomless box, move 400ft of pedestrian trail	22-Nov-06	29-Dec-06		0	0	2005	No fill								
NWP	23	NWS-2005-00143	Historical Undertermined	Other	Riprap placed around footings at pier 8	1-Feb-05	9-Mar-05		0	0	2005	1,411 c/y riprap covering 9,500 sqft	1411.0	9500.0						
NWP	23	NWS-2005-00370	Historical Undertermined	Other	Seismic retrofit	11-Apr-05	11-Apr-05		0	0	2005	No fill								
NWP	27	NWS-2005-01031	Historical Undertermined	Other	Restoration project	31-Aug-05	18-Apr-06		2832.802	0	2005	Parcel AR: 12,000 c/y of fill removed and 375 c/y of gravel added and 740 ft of shoreline restored Parcel B: 3,000 c/y removed of contaminated soil 1.9 acres restored	375.0		15000.0					
NWP	33	NWS-2005-00488	Historical Undertermined	Other	replace temporary pipe culvert with bottomless box, move 400ft of pedestrian trail	22-Nov-06	29-Dec-06		0	0	2005	No fill								
NWP	33	NWS-2005-01004	Historical Undertermined	Other	repair and replace a sewer outfall pipe in Poverty Bay, Puget Sound at Des Moines, Washington	24-Aug-05	22-Feb-07		0	0	2005									
NPR	none	NWS-2005-00735	Historical Undertermined	Other		28-Jun-05	2-Sep-05		0	0	2005									
Duplicate	none	NWS-2005-00630	Historical Undertermined	Other	File is duplicate of 2005-00735	2-Jun-05	13-Sep-05		0	0	2005									

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	PERMIT_AUTHORITY	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq.ft.)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening ft	Mitigation sq.ft
No Permit Required	none	NWS-2005-01180	Historical Undertermined	Other	No permit was issued, awaiting violation to be resolved	12-Oct-05	25-Oct-05		0	0	2005	No Fill								
NWP	none	NWS-2005-01203	Historical Undertermined	Other	No permit aquired, work was done above MHHW	17-Oct-05	18-Nov-05		0	0	2005	No Fill								
Cancelled operation	none	NWS-2005-00598	Historical Undertermined	Other	Cancelled operations	19-May-05	14-Dec-05		0	0	2005									
Cancelled app	none	NWS-2005-00635	Historical Undertermined	Other	Cancelled application, Already taken care of in applications 2005-01453 and 2004-01462	6-Jun-05	14-Dec-05		0	0	2005									
Cancelled Report	none	NWS-2005-01320	Historical Undertermined	Other		18-Nov-05	5-Jan-06		0	0	2005									
NPR	none	NWS-2005-01431	Historical Undertermined	Other		21-Dec-05	26-Jan-06		0	0	2005									
UNAUTHACT	none	NWS-2005-00891	Historical Undertermined	Other	Performed unauthorized logging	2-Aug-05	1-Jan-07		0	0	2005	No fill								
UNAUTHACT	none	NWS-2005-00425	Historical Undertermined	Other	No action	11-Apr-05	7-Jun-07		0	0	2005	No fill								
LOP		NWS-2005-00537	Historical Undertermined	Other	Replace 4 floating piers	19-May-05	1-Jul-05		0	0	2005	No Fill								
UNAUTHACT		NWS-2005-00001	Historical Undertermined	Other	Boat ramp has been in place since 1992	3-Jan-05	12-Aug-05		0	0	2005	No Fill								
LOP		NWS-2005-00316	Historical Undertermined	Other	replace & repair existing floats, piling replacement, etc	10-Mar-05	16-Sep-05		0	0	2005	No fill								
LOP		NWS-2005-00644	Historical Undertermined	Other	Install a new pier & boat ramp	7-Jun-05	16-Sep-05		0	0	2005	no fill								
SP		NWS-2005-00744	Historical Undertermined	Other		28-Jun-05	21-Nov-05		0	0	2005									
SP		NWS-2005-01087	Historical Undertermined	Other		13-Sep-05	7-Dec-06		0	0	2005									
SP		NWS-2005-00779	Historical Undertermined	Other	277 replaced piling	7-Jul-05	18-Jan-07		0	0	2005	No fill								
SP		NWS-2005-00376	Historical Undertermined	Other	Construct boat launch	28-Mar-05	15-May-07		0	0	2005	No fill								
													1861.0	9500.0	15000.0	0.0	0.0	0.0	0.0	0.0

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft of Shore hardening ft.	Mitigation sq ft
NWP	3	NWS-2004-00070	Historical Undertermined	Other	Pier 70 Violation, replacment of old piling	23-Feb-04	23-Feb-04	0	0	2004	No Fill								
NWP	3	NWS-2004-00064	Historical Undertermined	Other	Pier work replacing piling	20-Jan-04	2-Mar-04	0	0	2004	No Fill								
NWP	3	NWS-2004-00551	Historical Undertermined	Other		11-May-04	3-Aug-04	0	0	2004									
NWP	3	NWS-2004-00552	Historical Undertermined	Other		11-May-04	6-Aug-04	0	0	2004									
NWP	3	NWS-2004-00711	Historical Undertermined	Other		8-Sep-04	8-Sep-04	0	0	2004									
NWP	3	NWS-2004-00981	Historical Undertermined	Other		16-Aug-04	13-Sep-04	0	0	2004									
NWP	3	NWS-2004-00895	Historical Undertermined	Other		21-Sep-04	21-Sep-04	0	0	2004									
NWP	3	NWS-2004-01228	Historical Undertermined	Other		4-Oct-04	22-Oct-04	0	0	2004									
NWP	3	NWS-2004-01007	Historical Undertermined	Other		18-Aug-04	3-Nov-04	0	0	2004									
NWP	3	NWS-2004-00911	Historical Undertermined	Other		2-Aug-04	16-Nov-04	0	0	2004									
NWP	3	NWS-2004-01322	Historical Undertermined	Other		22-Oct-04	7-Dec-04	0	0	2004									
NWP	3	NWS-2004-00278	Historical Undertermined	Other		17-Mar-04	20-Dec-04	0	0	2004		36							
NWP	3	NWS-2004-01006	Historical Undertermined	Other		18-Aug-04	27-Dec-04	0	0	2004									
NWP	3	NWS-2004-00592	Historical Undertermined	Other	Repair and rehabilitate the marina and to relocate a deteriorated outfall	19-May-04	1-Apr-05	0	0	2004						400			
NWP	3	NWS-2004-00811	Historical Undertermined	Other		12-Jul-04	14-Apr-05	14609.16	0	2004									
NWP	3	NWS-2004-01459	Historical Undertermined	Other		28-Oct-05	8-Nov-05	0	0	2004		10.5							
NWP	3	NWS-2004-00002	Historical Undertermined	Other	Replace Water transmission lines	1-Nov-07	30-Jan-08	0	0	2004	No Fill								

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NWP	3	NWS-2004-00869-WRD	Historical Undertermined	Other	Replace up to 10 fender piles, Terminal 5, West Waterway, Seattle, King County, Washington	23-Oct-09	17-Dec-09	0	0	2004									
NWP	6	NWS-2004-00100	Historical Undertermined	Other	Withdrawn application-covered by 2003 Permit	29-Jan-04	1-Mar-04	0	0	2004	No Fill								
NWP	6	NWS-2004-00903	Historical Undertermined	Other		23-Jul-04	11-Aug-04	0	0	2004									
NWP	6	NWS-2004-01180	Historical Undertermined	Other		7-Sep-04	12-Oct-04	0	0	2004									
NWP	7	NWS-2004-00112	Historical Undertermined	Other	Outfall repair	3-Feb-04	14-Apr-05	0	0	2004	Temporary Excavation, then filled in trench								
NWP	10	NWS-2004-00503	Historical Undertermined	Other		4-May-04	13-Aug-04	0	0	2004									
NWP	10	NWS-2004-01333	Historical Undertermined	Other		27-Oct-04	18-Nov-04	0	0	2004									
NWP	10	NWS-2004-01035	Historical Undertermined	Other		16-Aug-04	22-Dec-04	0	0	2004									
NWP	12	NWS-2004-00062	Historical Undertermined	Other	Replace two sections of a pipeline	26-Jan-04	16-Aug-04	0	0	2004	All fill and excavation is temporary								
NWP	12	NWS-2004-00666	Historical Undertermined	Other		8-Jun-04	24-Nov-04	0	0	2004									
NWP	12	NWS-2004-01440	Historical Undertermined	Other		23-Nov-04	15-Jun-05	0	0	2004									
NWP	12	NWS-2004-01486	Historical Undertermined	Other		13-Dec-04	9-May-06	3723.111	0	2004									
NWP	12	NWS-2004-00002	Historical Undertermined	Other	Replace Water transmission lines	1-Nov-07	30-Jan-08	0	0	2004	No Fill								
NWP	14	NWS-2004-00811	Historical Undertermined	Other		12-Jul-04	14-Apr-05	14609.16	0	2004									
NWP	18	NWS-2004-01217	Historical Undertermined	Other	Track improvements required by Burlington Northnern-Santa Fe Railway near Golden Gardens.	3-Nov-06	8-Nov-06	728.4348	0	2004			3920.4						16988.4
NWP	18	NWS-2004-01448	Historical Undertermined	Other		5-Mar-08	17-Mar-08	242.8116	0	2004									

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NWP	27	NWS-2004-00137	Historical Undertermined	Other	Eelgrass transplant	9-Feb-04	8-Apr-04	0	0	2004									
NWP	27	NWS-2004-00260	Historical Undertermined	Other		10-Apr-04	18-May-04	0	0	2004		3060	14810.4	3269	14810.4				
NWP	27	NWS-2004-00738	Historical Undertermined	Other		1-Jan-05	28-Jan-05	0	0	2004									
NWP	27	NWS-2004-00811	Historical Undertermined	Other		12-Jul-04	14-Apr-05	14609.16	0	2004									
NWP	33	NWS-2004-00711	Historical Undertermined	Other		8-Sep-04	8-Sep-04	0	0	2004									
Permit not required	none	NWS-2004-00021	Historical Undertermined	Other		14-Jan-04	20-Jan-04	0	0	2004	DA Permit not required								
Application withdrawn	none	NWS-2004-00067	Historical Undertermined	Other	Application withdrawn	26-Jan-04	1-Mar-04	0	0	2004									
Cancelled app	none	NWS-2004-00557	Historical Undertermined	Other		7-Jun-04	2-Sep-04	0	0	2004									
UNAUTHACT	none	NWS-2004-00968	Historical Undertermined	Other		16-Aug-04	21-Sep-04	0	0	2004									
UNAUTHACT	none	NWS-2004-00996	Historical Undertermined	Other		18-Aug-04	21-Sep-04	0	0	2004									
Cancelled app	none	NWS-2004-00508	Historical Undertermined	Other		5-May-04	28-Sep-04	0	0	2004									
Never issued	none	NWS-2004-01105	Historical Undertermined	Other		10-Sep-04	29-Sep-04	0	0	2004									
UNAUTHACT	none	NWS-2004-01259	Historical Undertermined	Other		12-Oct-04	28-Jan-05	0	0	2004									
UNAUTHACT	none	NWS-2004-01248	Historical Undertermined	Other		7-Oct-04	9-Sep-05	0	0	2004									
SP		NWS-2004-00129	Historical Undertermined	Other	Corp did not authorize permit	6-Feb-04	24-Feb-04	0	0	2004									
LOP		NWS-2004-00383	Historical Undertermined	Other		8-Apr-04	8-Jul-04	0	0	2004									
LOP		NWS-2004-00961	Historical Undertermined	Other		12-Aug-04	9-Sep-04	0	0	2004									
SP		NWS-2004-00302	Historical Undertermined	Other		22-Mar-04	10-Oct-04	0	0	2004									
SP		NWS-2004-00190	Historical Undertermined	Other		25-Feb-04	10-Dec-04	0	0	2004						27000	243936		

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SP		NWS-2004-00240	Historical Undertermined	Other		10-Mar-04	10-Dec-04	0	0	2004									
SP		NWS-2004-00167	Historical Undertermined	Other		20-Feb-04	16-Dec-04	0	0	2004									
LOP		NWS-2004-01216	Historical Undertermined	Other		29-Sep-04	3-Jan-05	0	0	2004									
SP		NWS-2004-01533	Historical Undertermined	Other		29-Dec-04	1-Oct-05	0	0	2004						4000	40075.2		
												3106.5	18730.8	3269	14810.4	31400	284011.2	0	16988.4

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR		Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening ft.	Mitigation sq ft
NWP	1	NWS-2003-00252	Historical Undertermined	Other	Install two lighted bouys	1-Oct-03	21-Oct-03	0	0	2003									
NWP	3	NWS-2003-00784	Historical Undertermined	Other	Replace 18 piling to resore structure.	22-Jul-03	8-Aug-03	0	0	2003									
NWP	3	NWS-2003-00743	Historical Undertermined	Other	Repair to concrete wave baffles	11-Jul-03	4-Nov-03	0	0	2003									
NWP	3	NWS-2003-01191	Historical Undertermined	Other	18 creosote pilings replaced	30-Oct-03	14-Nov-03	0	0	2003									
NWP	3	NWS-2003-00828	Historical Undertermined	Other	Replace 19- pile dolphin. Place 3 c/y of clean sand.	31-Jul-03	14-Jan-04	0	0	2003		3							
NWP	3	NWS-2003-01058	Historical Undertermined	Other	Replace Timber Piling	30-Sep-03	19-Apr-04	0	0	2003									
NWP	3	NWS-2003-00512	Historical Undertermined	Other	Replace wood piling	15-May-03	27-Apr-04	0	0	2003									
NWP	3	NWS-2003-00926	Historical Undertermined	Other	Removal of 38 treated piling. Install 16 steel to replace portion or pier.	4-Sep-03	20-Jul-04	0	0	2003									
NWP	3	NWS-2003-00866	Historical Undertermined	Other	Replace or repair 220 wood piling	18-Aug-03	17-Sep-04	0	0	2003									
NWP	5	NWS-2003-00495	Historical Undertermined	Other	Temporary Bouy	7-May-03	11-Jul-03	0	0	2003									
NWP	6	NWS-2003-00163	Historical Undertermined	Other	Dig test pits and take samples. Holes were backfilled	23-Jan-03	27-Feb-03	0	0	2003									
NWP	6	NWS-2003-00254	Historical Undertermined	Other		6-Mar-03	12-May-03	0	0	2003									
NWP	6	NWS-2003-00121	Historical Undertermined	Other	Sample soil borings on land and in water	27-Jan-03	3-Jul-03	0	0	2003	No Fill								
NWP	6	NWS-2003-01202	Historical Undertermined	Other	Technical survey	31-Oct-03	30-Jan-04	0	0	2003									
NWP	7	NWS-2003-01143	Historical Undertermined	Other	Install diffuser on existing outfall	27-Oct-03	20-May-05	0	0	2003									
NWP	12	NWS-2003-00142	Historical Undertermined	Other	Construction of a fiber optic cable 2.4 mi in marine water, partially buried	3-Feb-03	5-Jan-04	0	0	2003									
NWP	12	NWS-2003-00464	Historical Undertermined	Other	Extend and replace partially colapsed outfal pipe.	2-May-03	19-Apr-04	0	0	2003	No Fill								
NWP	18	NWS-2003-01246	Historical Undertermined	Other	Place fill in 225 sqft of wetland	13-Nov-03	11-Feb-04	20.2343	0	2003			225						

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NWP	27	NWS-2003-00957	Historical Undertermined	Other	Prevent upstream propagation of the severe erosion	12-Sep-03	19-Sep-03	0	0	2003	200 c.y of boulders and 10 pieces of woody debris.	200							
NWP	27	NWS-2003-01234-CRC	Historical Undertermined	Other	Construction of pier	1-Oct-04	14-Oct-04	0	0	2003									
NWP	none	NWS-2003-00129	Historical Undertermined	Other	DA Permit not required. Landward work.	29-Jan-03	1-Apr-03	0	0	2003									
NPR	none	NWS-2003-00244	Historical Undertermined	Other	No permit required	1-May-03	5-May-03	0	0	2003									
UNAUTHACT	none	NWS-2003-00417	Historical Undertermined	Other	No action. Landward work.	21-Apr-03	15-May-03	0	0	2003									
NPR	none	NWS-2003-00810	Historical Undertermined	Other	No permit required	28-Jul-03	1-Aug-03	0	0	2003									
NWP	none	NWS-2003-00469	Historical Undertermined	Other	Landward work. No permit	2-May-03	11-Aug-03	0	0	2003									
NWP	none	NWS-2003-00839	Historical Undertermined	Other	Cancelled	5-Aug-03	30-Dec-03	0	0	2003									
NPR	none	NWS-2003-01383	Historical Undertermined	Other	Corp does not manage this permit	29-Dec-03	30-Dec-03	0	0	2003									
UNAUTHACT	none	NWS-2003-01034	Historical Undertermined	Other	No Action	23-Sep-03	2-Feb-04	0	0	2003									
UNAUTHACT	none	NWS-2003-00418	Historical Undertermined	Other		21-Apr-03	19-Feb-04	0	0	2003									
UNAUTHACT	none	NWS-2003-01037	Historical Undertermined	Other	No Action	30-Sep-03	13-May-04	0	0	2003									
NWP	none	NWS-2003-01248	Historical Undertermined	Other	Replace Steel Laddder	24-May-04	27-Jul-04	0	0	2003									
UNAUTHACT	none	NWS-2003-01031	Historical Undertermined	Other	No Action	18-Aug-03	12-Aug-04	0	0	2003									
SP		NWS-2003-00518	Historical Undertermined	Other	Dispose of up to 455,000 c.y from St Paul Waterway	15-May-03	23-Sep-03	0	0	2003									
SP		NWS-2003-00074	Historical Undertermined	Other	115c.y of clean snd for capping, 28,800 c.y of dredging place 17,800 into Elliott Bay PSDDA	22-Jan-03	26-Sep-03	0	0	2003		115				28800			
SP		NWS-2003-00011	Historical Undertermined	Other	Cancelled	7-Jan-03	4-Nov-03	0	0	2003									

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SP		NWS-2003-00333	Historical Undertermined	Other	Dredge 33,130 c.y of material. 9,640 c.y will be disposed of at Elliott Bay PSDDA. The rest is upland disposal	28-Mar-03	16-Dec-03	0	0	2003						33130			
SP		NWS-2003-00586	Historical Undertermined	Other	Construction of an aggregate overflow storage, filling 1.84 acres of wetland. Restoration of 2.3 acres and enhancement of 2.1 acres with native plants. Total 244,000 c.y of fill	3-Jun-03	1-Sep-04	7284.348	0	2003		244000	80150.4						191664
SP		NWS-2003-00907	Historical Undertermined	Other	Installations of two cables for Gondola from house to beach.	18-Sep-03	23-Feb-05	0	0	2003									
SP		NWS-2003-01269	Historical Undertermined	Other	Create sattelite rail/barge with 430 concrete pilings	20-Nov-03	9-Aug-05	0	0	2003									
SP		NWS-2003-01007	Historical Undertermined	Other	construct marina	23-Sep-03	1-Sep-05	0	0	2003	9.1 acres dredged. 300,000 c.y disposed at PSDDA Port Gardner					300000	396396		
												244318	80375.4	0	0	361930	396396	0	191664

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR	Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening ft.	Mitigation sq.ft
NWP	1	NWS-2002-00055	Historical Undertermined	Other	Navigational bouy	7-Jan-02	26-Apr-02	0	0	2002								
NWP	3	NWS-2002-00054	Historical Undertermined	Other	Bage Repair	23-Jan-02	30-Jan-02	404.686	0	2002								
NWP	3	NWS-2002-00177	Historical Undertermined	Other	Maintenance work on pilings and floats at pier 69. Less than 1c.y to fill in extracted piles	21-Feb-02	3-Apr-02	0	0	2002	1							
NWP	3	NWS-2002-00520	Historical Undertermined	Other		14-May-02	3-Jun-02	0	0	2002								
NWP	3	NWS-2002-00639	Historical Undertermined	Other	Replace timber pilings	13-Jun-02	27-Jun-02	0	0	2002								
NWP	3	NWS-2002-00043	Historical Undertermined	Other	Remove 68 creosote piles. Place 430c.y of HPA approved substrate. 65 c.y of concrete fill for stabalization of piling	11-Jan-02	2-Jul-02	0	0	2002	495							
NWP	3	NWS-2002-00486	Historical Undertermined	Other		14-May-02	1-Aug-02	0	0	2002								
NWP	3	NWS-2002-00260	Historical Undertermined	Other	Repair a bulkhead for bank stabilization. 3,900ft of seawall, 2,500 c.y of riprap, 2400c.y of habitat substrate	2-Jul-02	10-Sep-02	0	0	2002	4900							
NWP	3	NWS-2002-00323	Historical Undertermined	Other	Replace Bulkhead	1-Apr-02	12-Sep-02	0	9.144	2002								
NWP	3	NWS-2002-00325	Historical Undertermined	Other	Replace Bulkhead	1-Apr-02	12-Sep-02	0	9.144	2002								
NWP	3	NWS-2002-00625	Historical Undertermined	Other	Remove 7 creosote pilings, repair dolphin	10-Jun-02	30-Oct-02	0	0	2002								
NWP	3	NWS-2002-00111	Historical Undertermined	Other	Replace 6 existing timber dolphins	4-Feb-02	31-Dec-02	0	0	2002								
NWP	3	NWS-2002-00418	Historical Undertermined	Other	Replace up to 18 timber piles with steel	24-Apr-02	7-Jan-03	0	0	2002								
NWP	3	NWS-2002-00906	Historical Undertermined	Other	Remove and replace piling	28-Aug-02	7-Jan-03	0	0	2002								
NWP	3	NWS-2002-00932	Historical Undertermined	Other	Replace 18 fender piles with steel	5-Sep-02	7-Jan-03	0	0	2002								

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NWP	3	NWS-2002-01091	Historical Undertermined	Other		17-Oct-02	17-Jan-03	0	0	2002								
NWP	3	NWS-2002-01253	Historical Undertermined	Other	Cancel	25-Nov-02	22-Jan-03	0	0	2002								
NWP	3	NWS-2002-00931	Historical Undertermined	Other	Replace 12 wooden piles with steel	4-Sep-02	27-Feb-03	0	0	2002								
NWP	3	NWS-2002-00893	Historical Undertermined	Other	Replacing damaged dolphin	23-Aug-02	4-Mar-03	0	0	2002								
NWP	3	NWS-2002-00760	Historical Undertermined	Other	Replace 3 piling	19-Jul-02	12-Mar-03	0	0	2002								
NWP	3	NWS-2002-00585	Historical Undertermined	Other	Repair 1720 ft of timber bulkhead Waterward of MHHW 400c.y/.237 acres of clean gravel/sand habitat mix	3-Jun-02	21-Mar-03	0	0	2002	400	10323.72						
NWP	3	NWS-2002-01327	Historical Undertermined	Other	Reconstruct a 4x29ft pier. 4 cy of pea gravel	24-Apr-03	24-Apr-03	0	0	2002	4							
NWP	3	NWS-2002-00010	Historical Undertermined	Other	Replacing timber piles with steel	2-Jan-02	23-Sep-04	0	0	2002								
NWP	3	NWS-2002-00107	Historical Undertermined	Other	Repair of outfall drain. 100 c.y of rock total. 30c.y below MHHW	7-Oct-02	31-May-05	0	0	2002	30							
NWP	6	NWS-2002-00491	Historical Undertermined	Other		20-May-02	13-Jun-02	0	0	2002			3					
NWP	6	NWS-2002-00811	Historical Undertermined	Other	Geotechnical borings	2-Aug-02	8-Aug-02	0	0	2002								
NWP	6	NWS-2002-00989	Historical Undertermined	Other		23-Aug-02	27-Nov-02	0	0	2002								
NWP	6	NWS-2002-01314	Historical Undertermined	Other	Geotechnical borings	20-Dec-02	3-Jan-03	0	0	2002								
NWP	10	NWS-2002-00942	Historical Undertermined	Other	Boat mooring bouy	10-Sep-02	12-Nov-02	0	0	2002								
NWP	12	NWS-2002-01105	Historical Undertermined	Other		21-Oct-02	28-Mar-03	161.8744	0	2002								
NWP	12	NWS-2002-00396	Historical Undertermined	Other	20,600ft of long pipeline	18-Apr-02	6-Jun-03	404.686	0	2002								
NWP	12	NWS-2002-00078	Historical Undertermined	Other	Replace 689 ft of corrugated metal	28-Jan-02	31-Oct-03	0	0	2002								

ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR	Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft.)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening ft.	Mitigation sq.ft
NWP	13	NWS-2002-00585	Historical Undertermined	Other	Repair 1720 ft of timber bulkhead. Waterward of MHHW 400c.y/ 237 acres of clean gravel/sand habitat mix	3-Jun-02	21-Mar-03	0	0	2002	400	10323.72						
NWP	18	NWS-2002-01327	Historical Undertermined	Other	Reconstruct a 4x29ft pier. 4 cy of pea gravel	24-Apr-03	24-Apr-03	0	0	2002	4							
NWP	27	NWS-2002-00477	Historical Undertermined	Other		15-May-02	16-May-03	20234.3	0	2002								
NWP	27	NWS-2002-00457	Historical Undertermined	Other	Excavate sediments, install gravels, install LWD and bank protection logs	16-Feb-09	17-Mar-09	0	0	2002					1420	10018.8		
NWP	28	NWS-2002-00177	Historical Undertermined	Other	Maintenance work on pilings and floats at pier 69. Less than 1c.y to fill in extracted piles	21-Feb-02	3-Apr-02	0	0	2002	1							
NWP	38	NWS-2002-00548	Historical Undertermined	Other		17-May-02	19-Jun-03	0	0	2002	72000				65000			
NWP	none	NWS-2002-00044	Historical Undertermined	Other		18-Jan-02	25-Jan-02	0	0	2002								
NWP	none	NWS-2002-00156	Historical Undertermined	Other	Application Cancelled	20-Feb-02	17-Apr-02	0	0	2002								
NWP	none	NWS-2002-00233	Historical Undertermined	Other	Application Cancelled	8-Mar-02	3-Jun-02	0	0	2002								
UNAUTHACT	none	NWS-2002-00920	Historical Undertermined	Other	No action	12-Jul-02	23-Aug-02	0	0	2002								
UNAUTHACT	none	NWS-2002-00981	Historical Undertermined	Other		13-Sep-02	23-Oct-02	0	0	2002								
SP	none	NWS-2002-00279	Historical Undertermined	Other	Application Cancelled	21-Mar-02	13-Jan-03	0	0	2002								
UNAUTHACT	none	NWS-2002-01095	Historical Undertermined	Other		1-Oct-02	29-Jul-03	0	0	2002								
SP	none	NWS-2002-00215	Historical Undertermined	Other	Application Cancelled	6-Mar-02	26-Jan-04	0	0	2002								
LOP		NWS-2002-00178	Historical Undertermined	Other	Underwater divers course	21-Feb-02	17-Apr-02	0	0	2002								
LOP		NWS-2002-00557	Historical Undertermined	Other		29-May-02	17-Jul-02	0	0	2002								

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ACTION_TYPE	NWP Type	DA_NUMBER	IMPACT_TYPE	RESOURCE_TYPE	FOLDER_DESCRIPTION	PERMIT_START_DATE	PERMIT_END_DATE	Authorized Fill Area (sq m)	Authorized Fill Length (meter)	YEAR	Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq ft)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening ft.	Mitigation sq.ft
LOP		NWS-2002-00534	Historical Undertermined	Other		24-May-02	17-Sep-02	0	0	2002								
NWP		NWS-2002-00757	Historical Undertermined	Other		19-Jul-02	30-Oct-02	0	0	2002								
LOP		NWS-2002-00762	Historical Undertermined	Other	Boatlaunch safety and operational improvements 38 c.y of crushed rock	18-Jul-02	23-Jan-03	0	0	2002	38							
SP		NWS-2002-00859	Historical Undertermined	Other	Replace halof of Pier 36. 1300 creosote replace by 220 concrete, 12,800 c.y of rock, 1,700 c.y of gravel 23,200 c.y dredged (12,800 PSDDA Elliott Bay and 10,400 c.y upland)	5-Aug-02	3-Apr-03	0	0	2002	14500				23200			
SP		NWS-2002-01120	Historical Undertermined	Other		25-Oct-02	23-Apr-03	0	0	2002								
SP		NWS-2002-00296	Historical Undertermined	Other	Fill & grade .74 of an acre of wetland for building purposed. 6,500 c.y of fill. Mitigation includes creation of .25 acre wetland and enhancement of 1.09 acres of wetland	27-Mar-02	13-May-03	0	0	2002	6500	32234.4						58370.4
SP		NWS-2002-00175	Historical Undertermined	Other	deepen dredging depths for 0.33 acres of area approved	20-Feb-02	21-Nov-03	0	0	2002								
SP		NWS-2002-01318	Historical Undertermined	Other		19-Dec-02	17-Aug-04	0	0	2002								
SP		NWS-2002-00430	Historical Undertermined	Other		30-Apr-02	30-Sep-04	0	0	2002								
SP		NWS-2002-01278	Historical Undertermined	Other		10-Dec-02	7-Jan-05	607.029	0	2002								
SP		NWS-2002-01291	Historical Undertermined	Other	Regional General Permit for Residential Inland Marine Overwater Structures	13-Dec-02	14-Feb-05	0	0	2002								
SP		NWS-2002-00274	Historical Undertermined	Other		20-Mar-02	25-Aug-05	0	0	2002								
SP		NWS-2002-00949	Historical Undertermined	Other	Cancelled	18-Mar-03	17-Jul-06	0	0	2002								

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ACTION_ TYPE	NWP Type	DA_NUMBER	IMPACT_TYP E	RESOURCE _TYPE	FOLDER_DESCRIP TION	PERMIT_ST ART_DATE	PERMIT_E ND_DATE	Authorize d Fill Area (sq m)	Authorize d Fill Length (meter)	YEAR	Amount of fill (c/y)	Amount of Fill (sq. ft)	Amount of excavation (c/y)	Amount of excavation (sq.ft.)	Dredging	dredging sq. ft	Linear Ft. of Shore hardening ft.	Mitigation sq.ft
											99273	52881.84	3	0	89620	10018.8	0	58370.4