Integrating Information Technology and Natural Resource Management

January 16, 2013

Memo

TO: Warren Kellogg, YRCDC
FROM: Tony Thatcher
RE: Russian Olive Data Analysis and CEA Database Integration

Russian olive is considered an invasive species and its presence in the Yellowstone River corridor is fairly recent. As such, its spread can be used as a general indicator of invasive plants within the corridor. It has the added benefit of being easily identified in multi-spectral aerial photography, making it possible to inventory large areas using remote techniques.

In 2011, the Natural Resources Conservation Service (NRCS) in Bozeman, MT conducted an inventory of Russian olive locations in the Yellowstone River watershed. This study utilized the Feature Analyst extension within ArcGIS to interpret 2008 NAIP multi-spectral imagery for the presence of Russian olive. The resulting analysis was converted from raster format to a polygon ESRI shape file for distribution and further analysis within a GIS environment.

This work scope was tasked with integrating the resulting Russian olive inventory into the Yellowstone River Conservation Districts Council (YRCDC) Cumulative Effects Assessment (CEA) GIS and associated reach-based database (CEA Atlas/Reach Narratives). Additionally, analysis of Russian olive within the corridor was conducted to characterize its distribution in throughout the corridor and its association with other corridor data sets.

This tech memo presents the process and results of this work. Summary tables of Russian olive by reach are included at the end of the memo.

Scope of Work

The following tasks were completed:

1. The Russian olive (RO) data provided by the NRCS contains nearly 500,000 individual polygons ranging in size from less than a square meter (likely a GIS data processing error) to around 42 acres. These areas represent groupings of 1-meter square pixels from the imagery analysis that displayed a Russian olive spectral signature. An initial check of the data revealed some geometry errors such as self-intersecting polygons. These errors were repaired prior to any data processing. Additionally, the NRCS data was in a different coordinate system (UTM Zone 13, NAD 83) than the one used by the YRCDC study (Montana State Plane, NAD83, meters). As such, it was reprojected to be consistent with the other data sets.
2. Using ESRI ArcGIS 10.0, the RO data was intersected with the following data sets to attribute it with the attributes necessary for analysis:
    - Reaches – provides reach name, region, and reach type.

- 100-yr Inundation Boundary – provides an indication of the 100-yr flood prone area.
- Channel Migration Zone (CMZ) – indicates whether the RO polygon is in a mapped Channel Migration Zone, Avulsion Hazard Zone, or Restricted Migration Area.
- 1950s Banklines – indicates whether the RO polygon is located in a historic, 1950’s era active bankfull channel. Additional bankfull channel mapping is available for 1976, 2001, and 2011, though they were not used in this study.
- 2001 Fisheries Habitat – The Fisheries Habitat mapping refines the characteristics of the area within the bankfull channel mapping polygons. It, among other fisheries-related habitat units, includes “bar” and “dry channel” areas from the confluence upstream through Reach A15. Additional fisheries habitat mapping is available for 1950s, 1976, and 2001, though they were not used in this study.
- 2001 Riparian Vegetation – Riparian vegetation polygons from 2001 indicating general riparian class (Herbaceous, Shrub, Timber – Open, and Timber – Closed. Additional riparian vegetation mapping is available for 1950s, 1976, and 2001, though they were not used in this study.
- Physical Features – A 2001 Physical Features Inventory defines bank stabilization features for the river (excluding Park County). Additionally, a detailed inventory of physical features for Stillwater, Yellowstone, and Dawson Counties provides temporal information for features.

3. The RO data was assessed in terms of its relation to the input data sets described above. Correlations between the attribute categories were explored to look for significant relationships.
4. The key relationships resulting from the data analysis were formatted and integrated with the CEA Atlas (Reach Narratives) Database.
5. The database reports that produce the CEA Atlas Database Reach Narratives were updated to display the RO data.

Analysis

This analysis only looks at the distribution of Russian olive within a five mile buffer along the 2001 centerline of the Yellowstone River. This buffer area has not been used for analysis for any other work scope, but is the standard for defining the breaks between reaches. This area of study is refined further when looking at specific relationships such as distributions within the 100-yr inundation boundary or the Channel Migration Zone. The results on the reach level may be influenced by populations of Russian olive that follow tributaries, irrigation ditches and canals, or otherwise preferentially occupy areas away from the active river corridor (Figure 1). Where possible, the data were normalized to a common area in each region or reach and reported as percentages, as well as the raw acres.

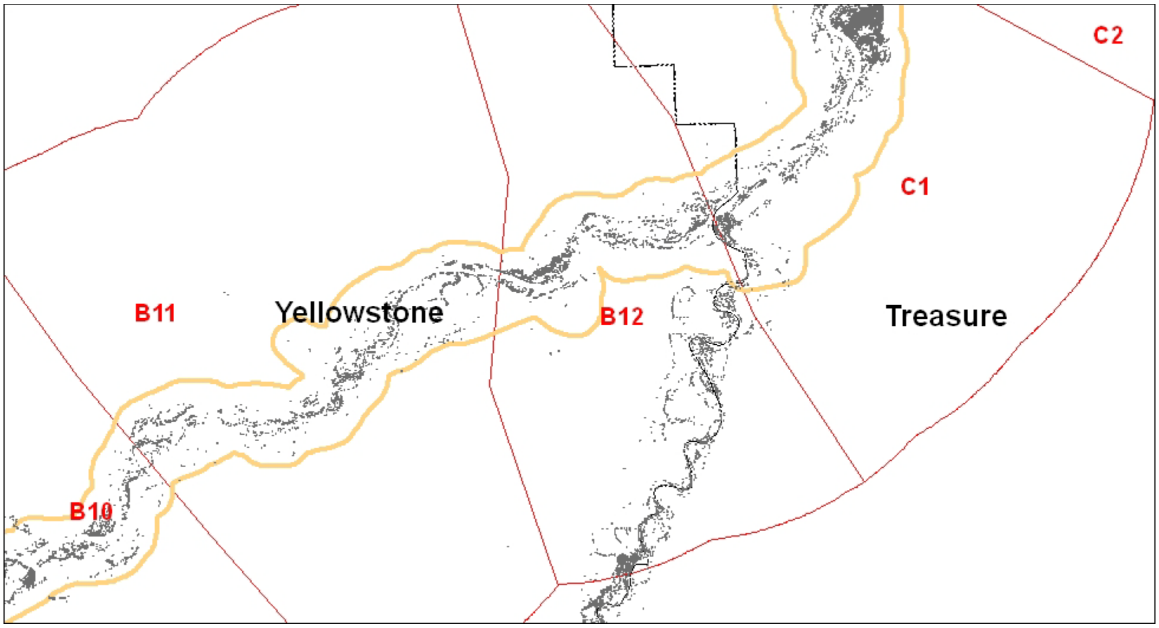

Figure 1. Russian Olive analysis can be skewed at the reach level by RO presence following tributaries, ditches, or other features away from the Yellowstone River.

By raw acres, Region C has the greatest amount of Russian olive (Figure 2). This is partly driven by the consistently wide floodplain and length of the region, though the active corridor is heavily colonized. When evaluated by percentage (Figure 3) of the region occupied by Russian olive, Regions A and B each have higher percentages than Region C. Keep in mind, though, these are very low percentages and are far outweighed by the area of the region as defined by the five mile buffer.

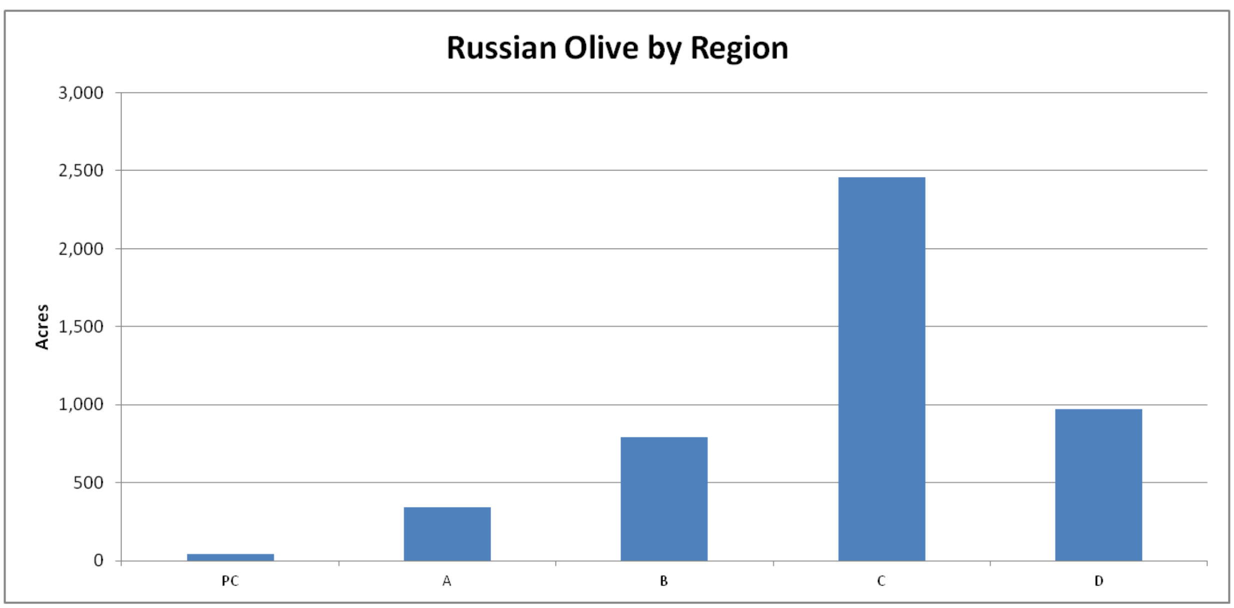

Figure 2. Russian olive acreage by Region.

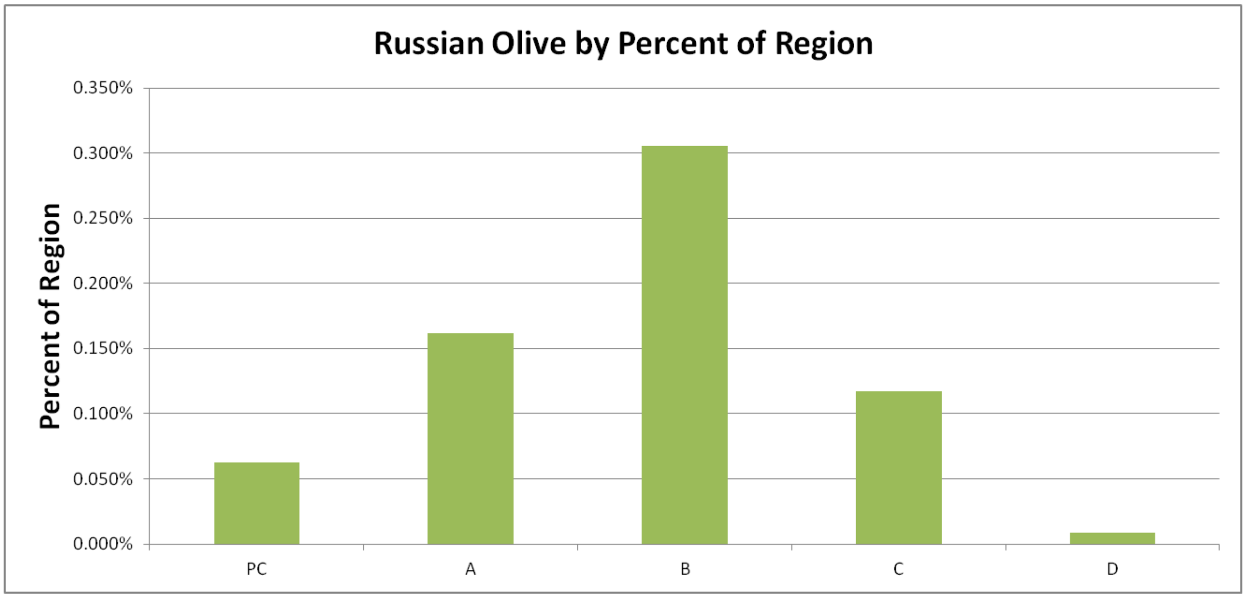

Figure 3. Russian olive as a percentage of the Region's area.

Figure 4 breaks down the raw acreage of Russian olive by reach. It does not make sense to look at the percent of occupation for each reach area due to confounding factors such as tributaries, irrigation ditches, and upland populations of Russian olive (Figure 1). For percent occupation, refer to the analysis in relation to the 100-yr inundation boundary, 1950's channel, or fisheries habitat. The dramatic reduction of Russian olive populations above reach A15 near Park City could be related to several factors such as a narrowing of the river corridor and associated floodplain, reduced seed source above the Clarks Fork of the Yellowstone in A17, or it simply represents the 2008 upper limit of infestation and that a newer survey from the 2011 NAIP imagery may indicate a continued expansion upstream.

Figure 4. Russian olive acreage by reach.

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The distribution of Russian olive in relation to the geomorphic channel type shows no strong correlations when looking at both the raw acreage per channel type (Figure 5), channel type by region (Figure 6), or percent of channel type (Figure 7 and Figure 8). Russian olive densities appear to be more regionally or landscape-based, rather than being driven by geomorphic parameters such as braiding, confinement, and sinuosity.

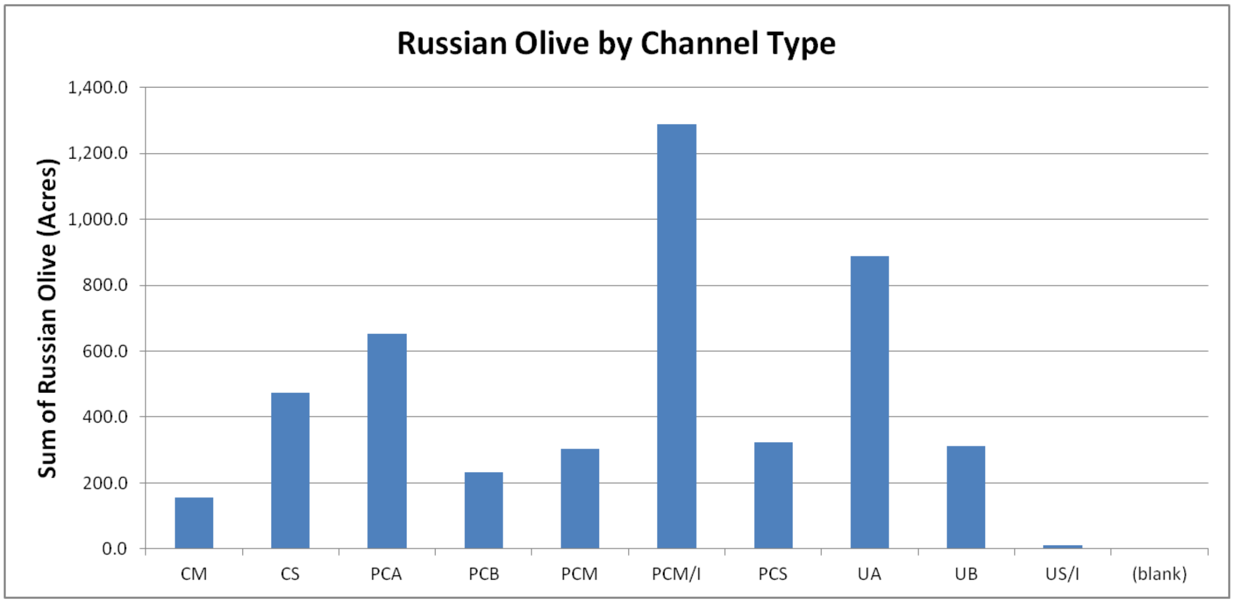

Figure 5. Russian olive acreage by channel type.

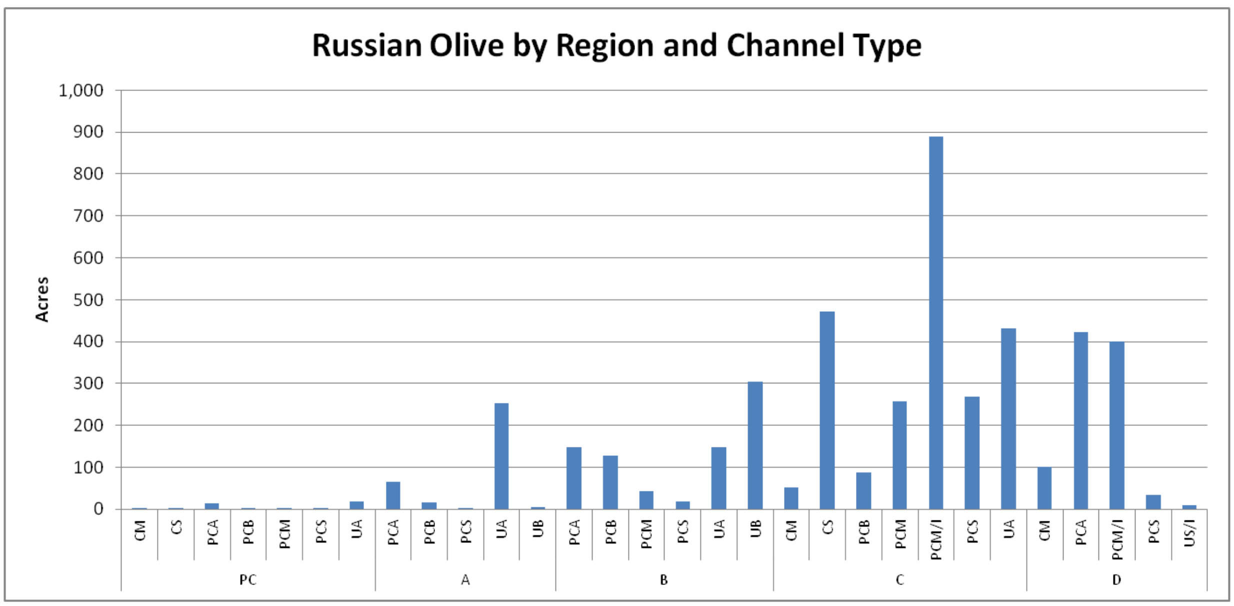

Figure 6. Russian olive acreage by region and channel type.

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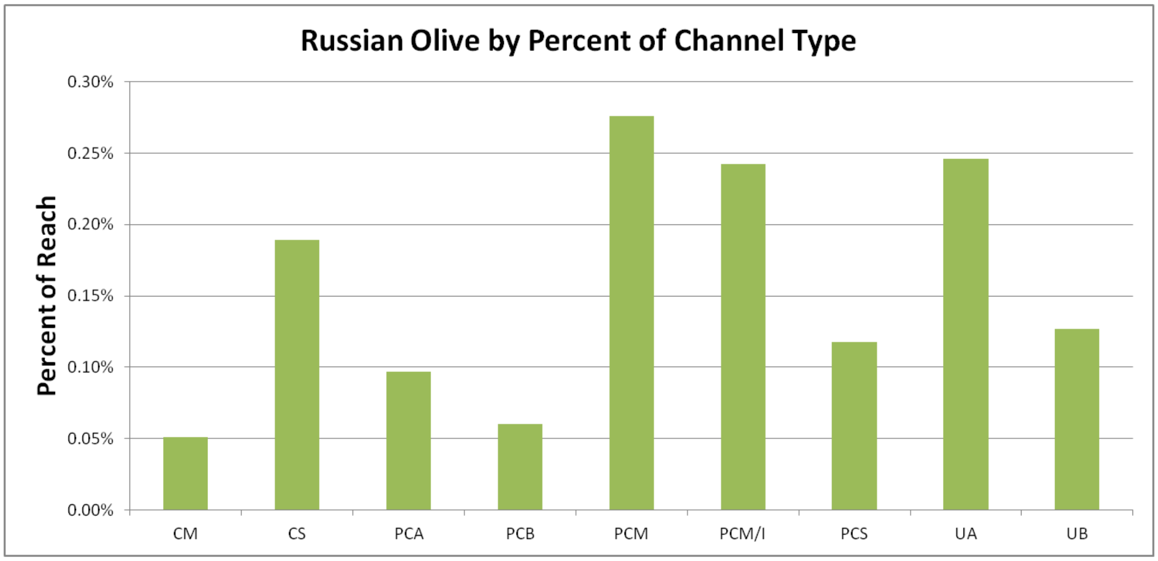

Figure 7. Russian olive occupation as a percentage of channel type.

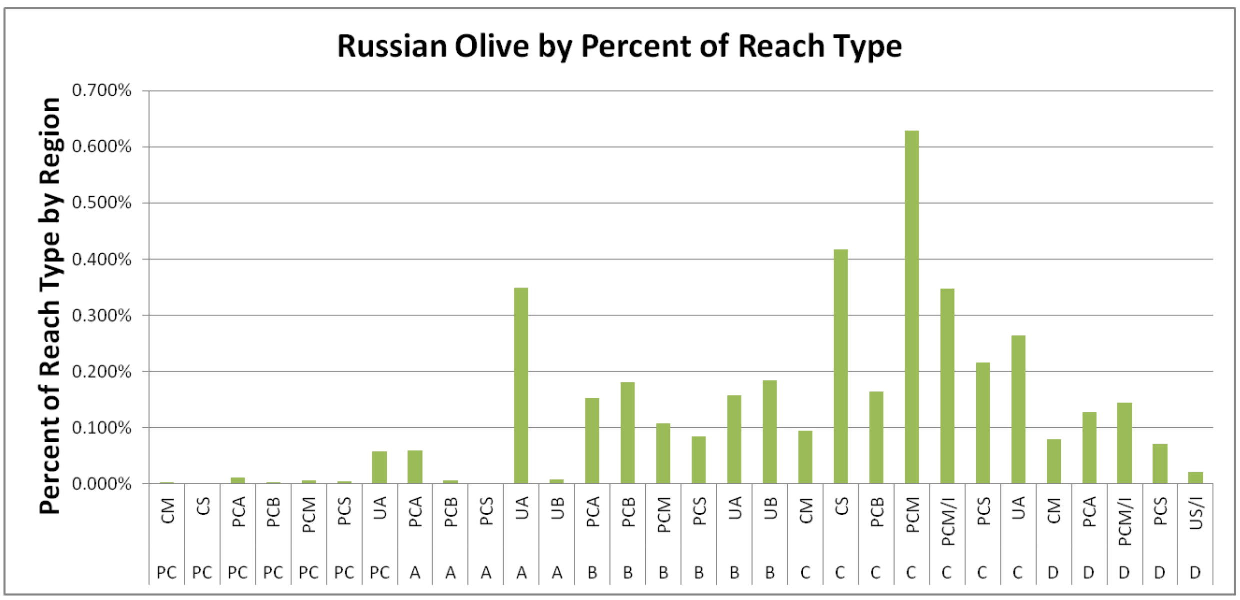

Figure 8. Russian olive as a percentage of channel type by region.

The 100-year inundation boundary provides a good indicator of the floodplain area and has an added benefit that is blind to restrictions to the floodplain such as dikes and levees. It naturally scales in size to reflect the width of the valley bottom and can be used to distinguish between Russian olive within and outside of the flood-prone area of the river corridor. The inundation area can also be used to normalize the acreage calculations from reach to reach and region to region.

Figure 9, Figure 10, and Figure 11 all indicate that the majority of the mapped Russian olive is found within the 100-year inundation boundary. Regions B and C show approximately 1.3% and 1.8% of their inundation areas respectively occupied by Russian olive (Figure 10), significantly more than the other regions. Since the majority of Russian olive is within the inundation boundary, a relatively small area in comparison to the 5-mile buffer representing the overall study area, this indicates a correlation Russian olive with the river's floodplain.

Regions C14 and C15 in Figure 11 show a dramatic drop in both the acreage and percent of Russian olive in the inundation boundary. This correlates with the low total acreage of Russian olive shown in Figure 4. This is interesting as the upstream and downstream reaches of the same reach types all show significantly higher levels of Russian olive. C14 has seen some targeted removal of Russian olive, but this would not account for the overall reductions. C15 is relatively short, but still the percentage of C15's inundation area occupied by Russian olive is low (Figure 11), so this does not appear to be related to reach length. This should be investigated for mapping error or other controlling factors.

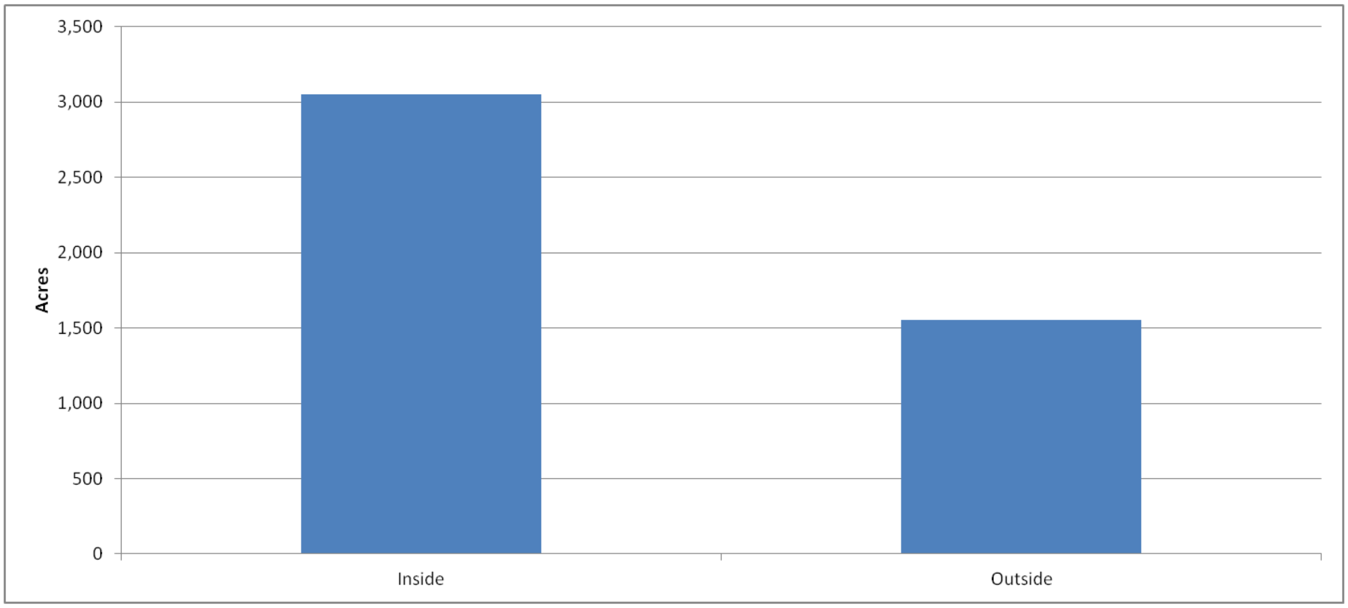

Figure 9. Russian olive acreage inside and outside of the 100-yr inundation boundary.

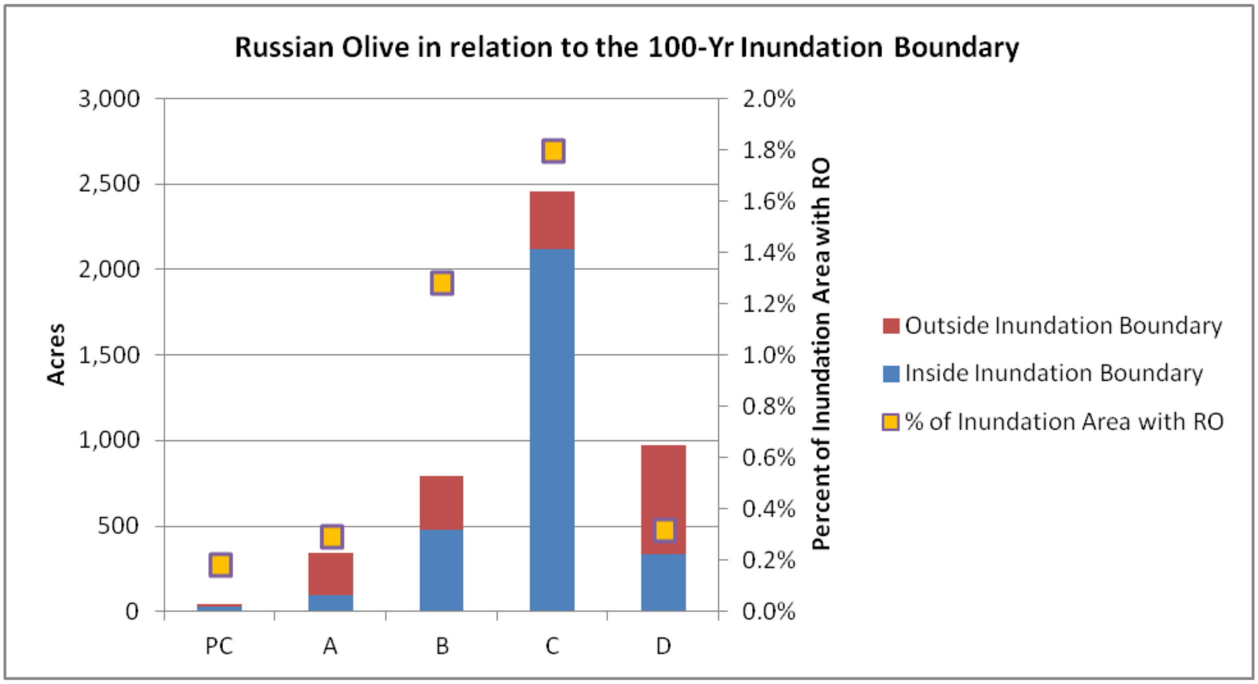

Figure 10. Russian olive acreage in relation to the 100-yr inundation boundary by region. The percent of the inundation boundary occupied by Russian olive is also shown.

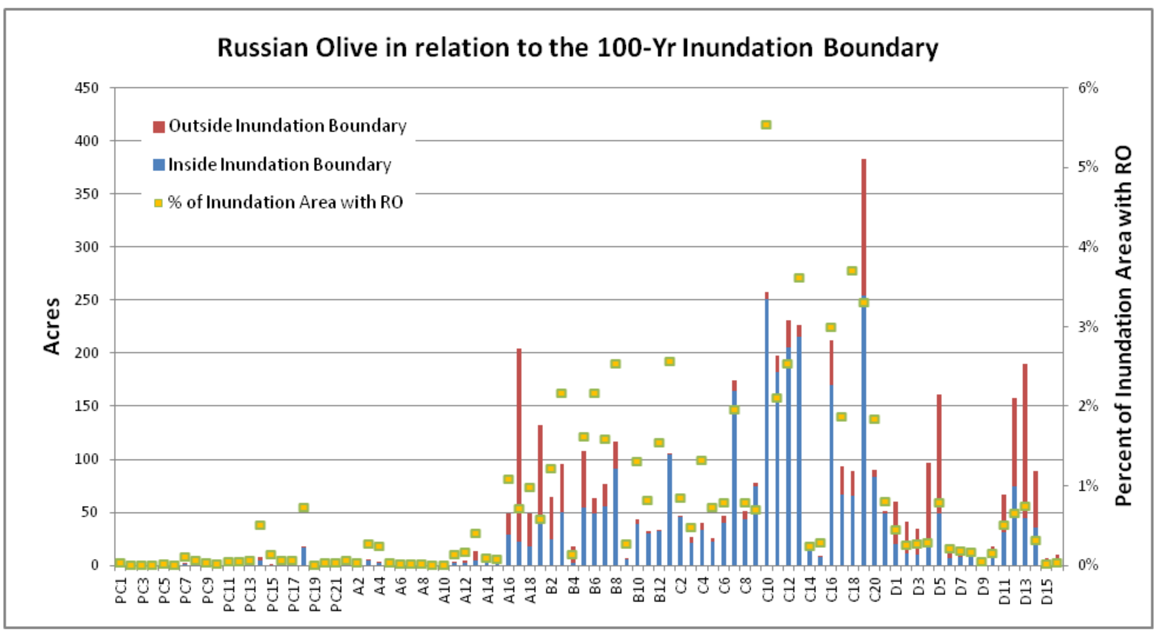

Figure 11. Russian olive acreage in relation to the 100-yr inundation boundary by reach. The percent of the inundation boundary occupied by Russian olive is also shown.

The Channel Migration Zone (CMZ) is another indicator of river process. The CMZ mapping for the Yellowstone River corridor maps the historically active river channel over the past fifty years, along with areas of potential river occupation through channel migration and avulsion. Russian olive distributions within the CMZ mapping types indicate a preference for disturbed areas, historic channels, and areas subject to active river processes (Figure 9 and Figure 10) as indicated in the Historical Migration Zone (HMZ), Alluvium, and Avulsion Hazard Areas (AHZ) (Figure 12 and Figure 13). This, in turn, may reflect a preference for shallow groundwater and more open areas that have less shade.

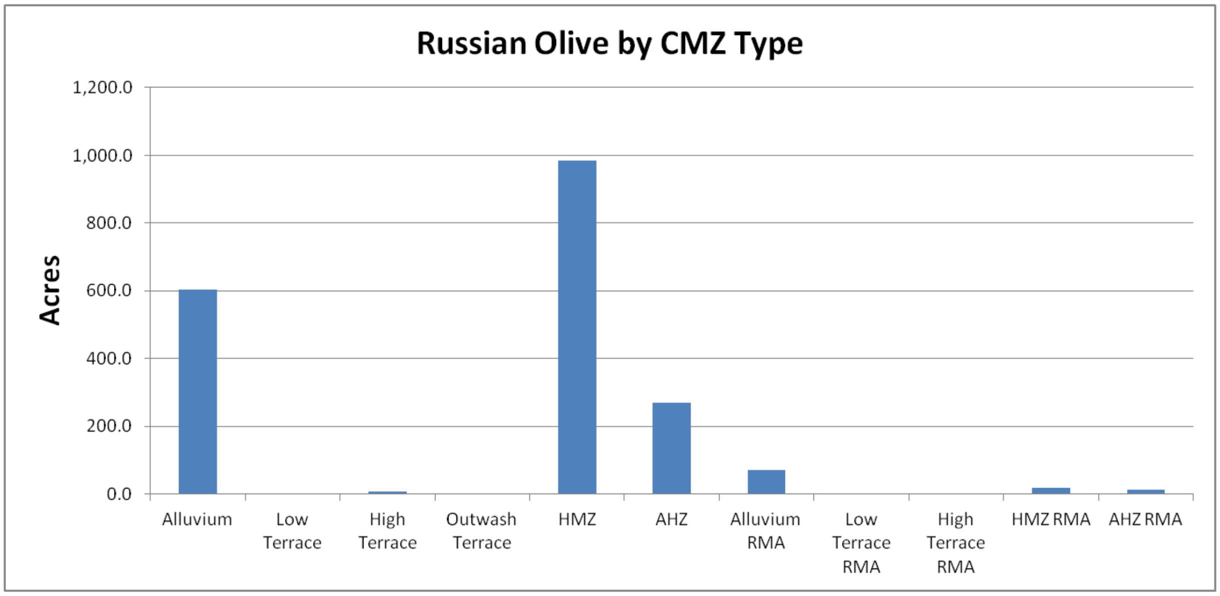

Figure 12. Russian olive acreage within the mapped Channel Migration Zone types.

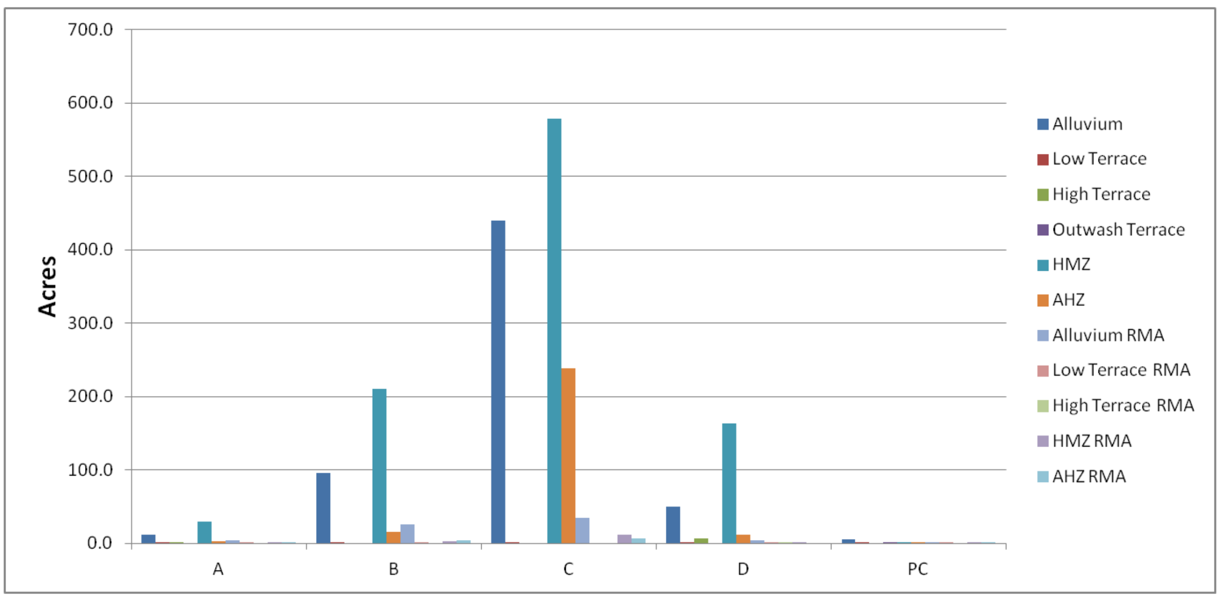

Figure 13. Russian olive acreage within the mapped Channel Migration Zone types by region.

The Channel Migration Zone Mapping also provides a source of information for areas in the river corridor that have been disconnected from natural river processes such as erosion, avulsion, and to some degree flooding by physical features such as rip rap, dikes, and levees. These areas are noted as “Restricted” in the CMZ mapping. Figure 14 and Figure 15 indicate that less acreage of

Restricted CMZ is occupied by Russian olive, though this may reflect that there is less Restricted area in comparison to the Unrestricted area within the CMZ. Figure 16 explores this further by indicating the percent area of each CMZ type occupied by Russian olive by region. This indicates that in Regions B, C, and D, the regions with the greatest amount of Russian olive, the percent of the Restricted Migration Area (RMA) occupied is consistently lower than in the other active mapped areas – CMZ: 100-yr potential channel migration area, HMZ: historic footprint of the channel over the ~50 year period of record, and AHZ: area at risk of avulsion.

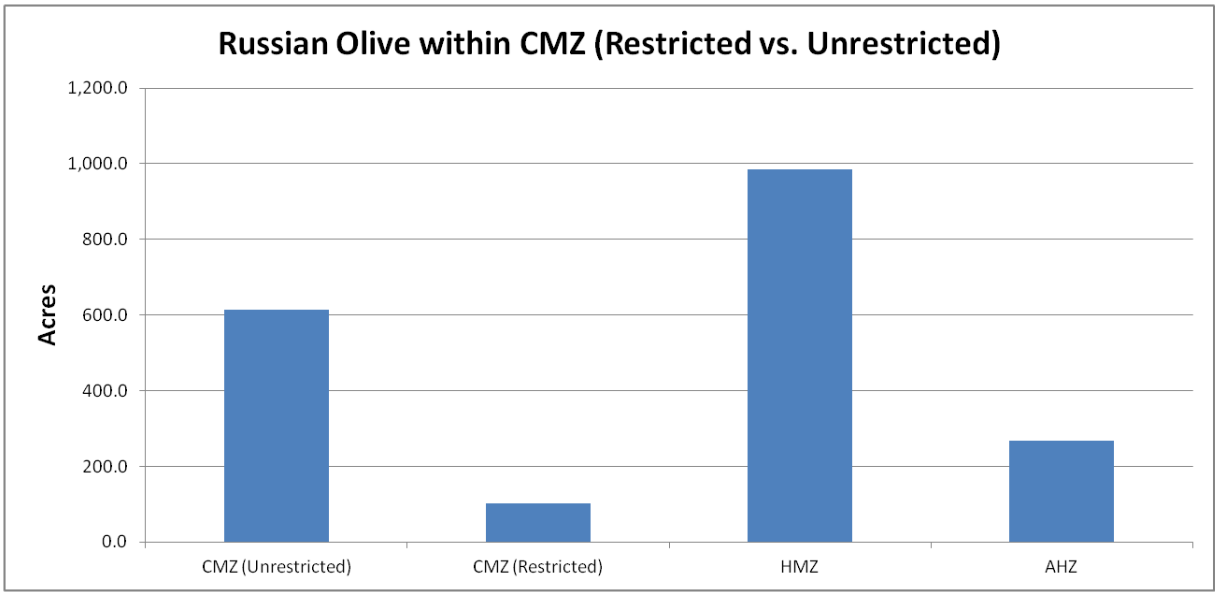

Figure 14. Significantly less "Restricted" CMZ mapping acreage is occupied by Russian olive.

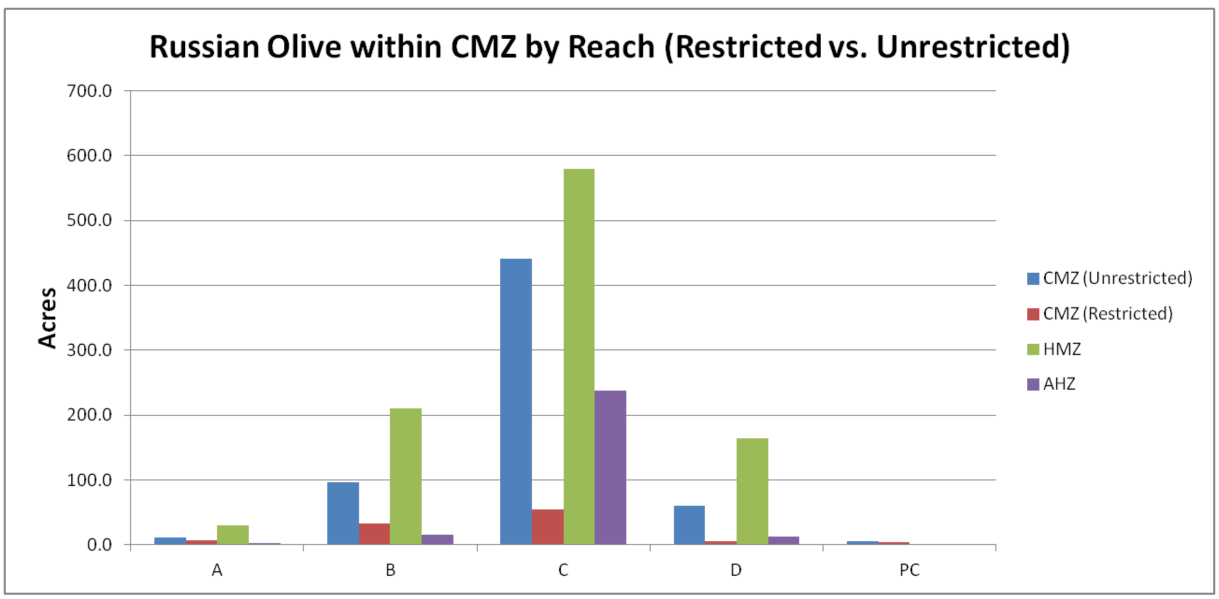

Figure 15. Significantly less "Restricted" CMZ mapping acreage is occupied by Russian olive.

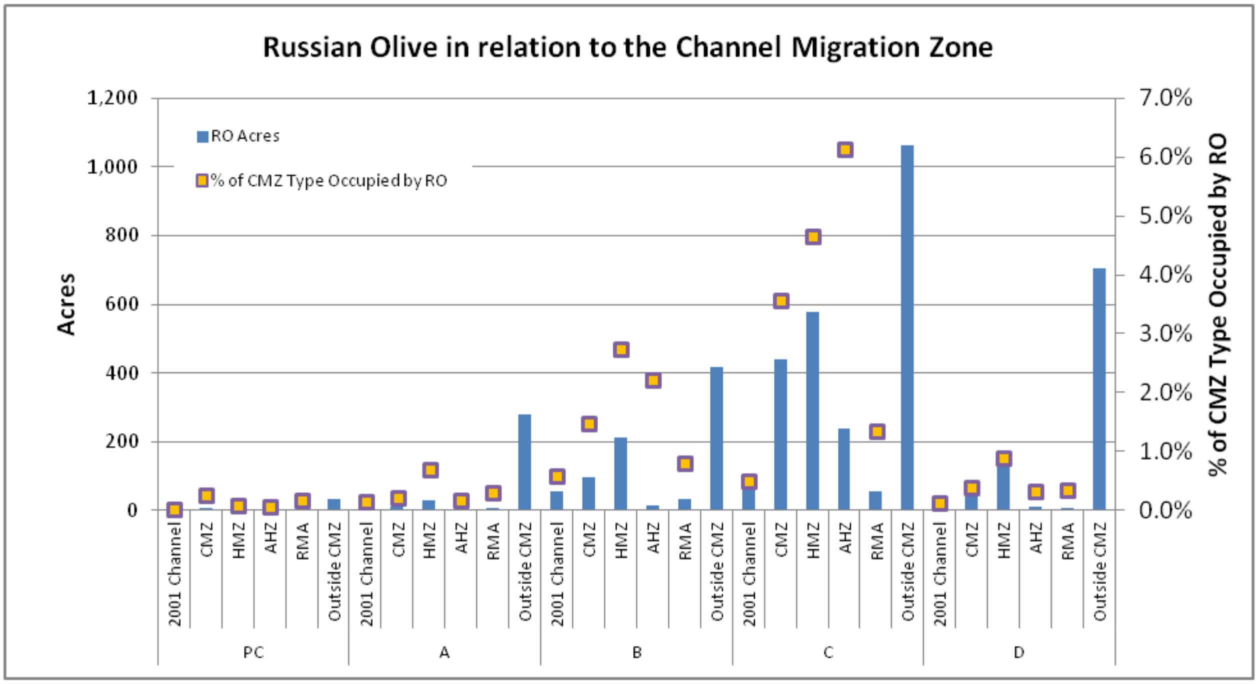

Figure 16. Russian olive acreage within the Channel Migration Zone mapping by CMZ Type indicating the percent of each CMZ Type's area occupied by region.

The 1950s channel boundary provides another indicator of river process and disturbance. In many areas throughout the corridor the river has either migrated, avulsed, or abandoned the mapped 1950s channel. These areas provide sand and gravel bars, high groundwater, and seasonally flooded areas that may be preferred by Russian olive. Figure 17 indicates that a significant area of mapped Russian olive is within the boundaries of the 1950s bankfull channel. In Region C (Figure 18) the percent of the 1950s channel occupied by Russian olive can exceed 10 percent. This figure also indicates areas mapped as islands in the 1950s carry a larger portion of the 2008 Russian olive occupation.

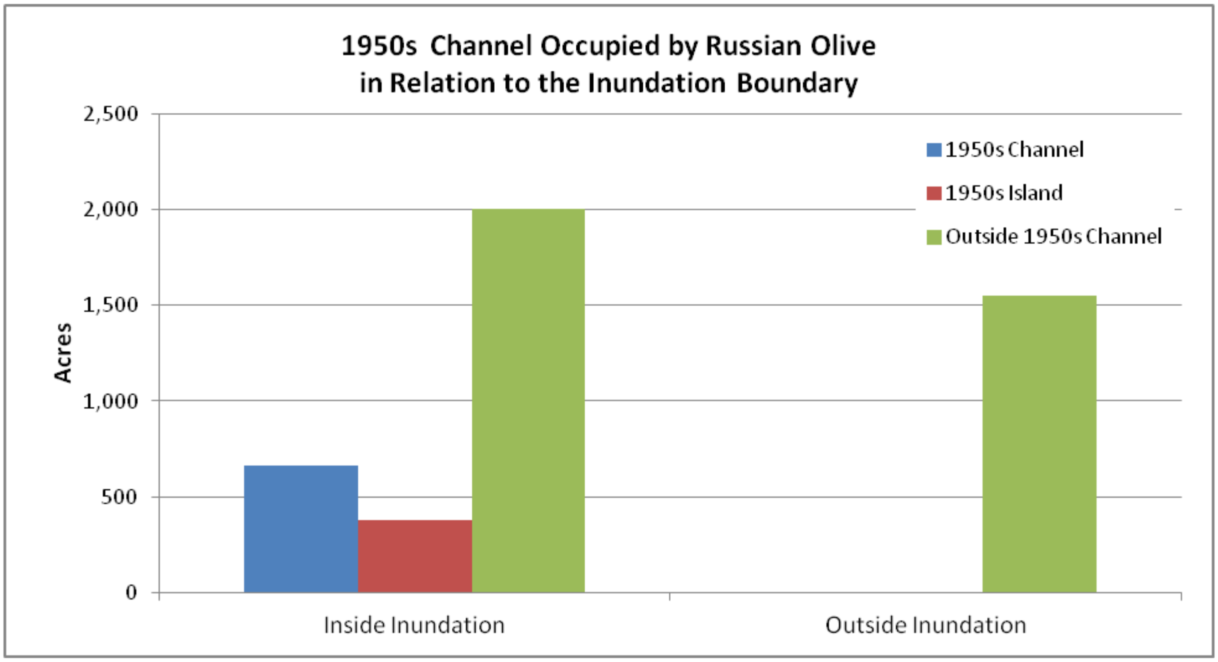

Figure 17. Total of Russian olive acreage for the Yellowstone corridor, indicating the acreage in relation to the 1950s bankfull channel and the 100-year Inundation Boundary.

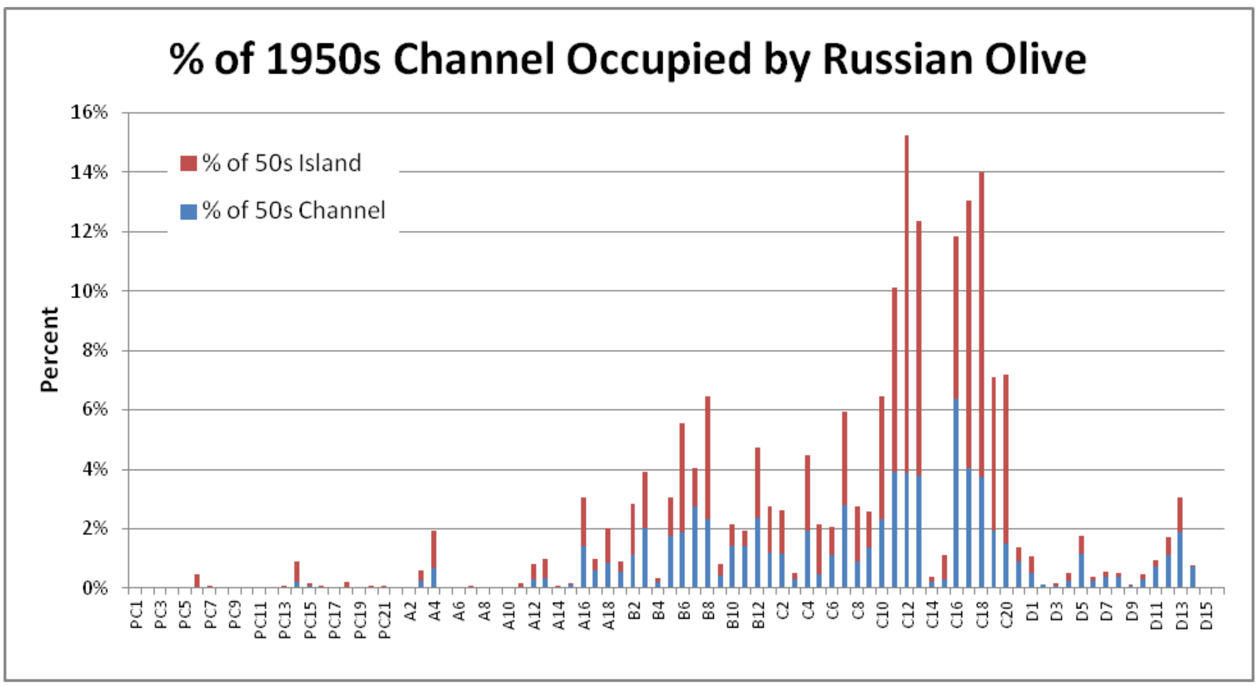

Figure 18. Percent of the 1950s bankfull channel occupied by Russian olive.

The fisheries habitat mapping for the Yellowstone River provides additional mapping detail for the areas within the bankfull channel, including bar areas (point, side, and mid-channel), seasonally inundated and dry channel areas, and secondary channels. These areas have characteristics similar to both the 1950s channels and the active CMZ areas. For example, many

Secondary Seasonal channels as identified in the fisheries habitat mapping are former active channels from the 1950s and are thus captured by the CMZ Historic Migration Zone. They represent seasonally-inundated areas with higher groundwater and disturbance. Figure 19 shows the distribution of Russian olive within the 2001 bankfull channel mapped fisheries habitat (Note that the fisheries habitat mapping does not extend above Reach A15.). Additionally it shows the percent of each habitat area that is occupied in 2008 by Russian olive. While a maximum just over 1% of any fisheries habitat type is shown as occupied by Russian olive, several of the habitat categories show a preference by Russian olive. The statistical significance of this has not been calculated. This figure tends to reinforce the conclusions from the Channel Migration Zone assessment that Russian olive prefers the sand and gravel bars, high groundwater, and seasonally flooded areas defined in the fisheries habitat mapping as Secondary Seasonal, Dry Channel, Point Bars and Side Bars.

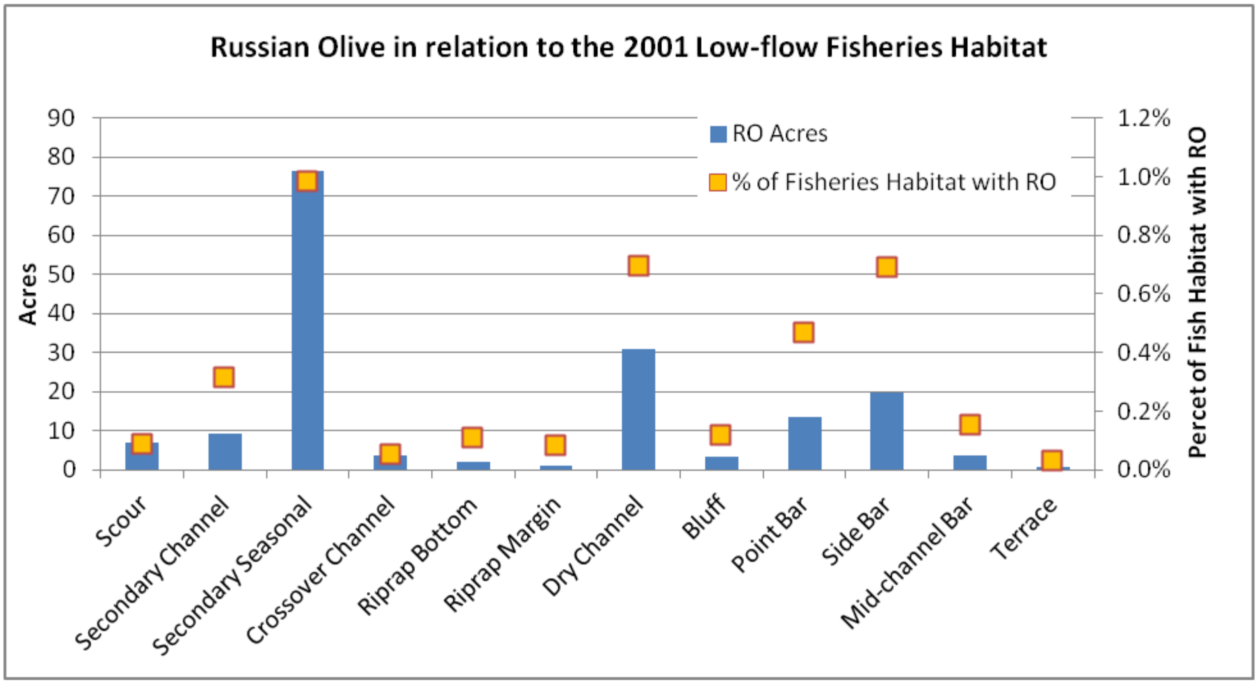

Figure 19. Russian olive acreage within the 2001 bankfull channel showing the mapped fisheries habitat.

Russian olive associations with the 2001 riparin vegetation polygons were evaluted by region (Figure 20) and reach (Figure 21). This follows the same general patterns from the previous analysis with the most Russian olive located in the riparian areas in Region C. There is no riparian mapping for Park County. Reaches C14 and C15 continue to show an unusual droppoff in amount of Russian olive in comparison to the adjacent reaches. Looking at the percentage of each riparian mapping type occupied by Russian olive by reach (Figure 22 to Figure 25) shows extremely high infestations of the riparian area throughout Region C, reaching nearly 30% of the mapped Shrub riparian areas in C10 and C19 (Figure 26). This, though, does not address the fact that likely most all mapped Russian olive is also mapped as Shrub in the riparian mapping, thus they autocorrelate. An important question would be percent of riparian shrub polygons exist because they are Russian olive. (Note: The way the data set for this analysis is constructed does not currently support this next step in the analysis.). Russian olive is distributed throughout the Shurb, Open Timber and Closed Timber riparian categories. The Herbaceous category also shows high occupations of Russian Olive, but the overall mapped area in Herbaceous tends to be higher and extends further from the river. Throughout the middle sections of Region C the percenent area of 2001 riparian mapping occupied by Russian olive is consistently higher than the rest of the corridor (Figure 27).

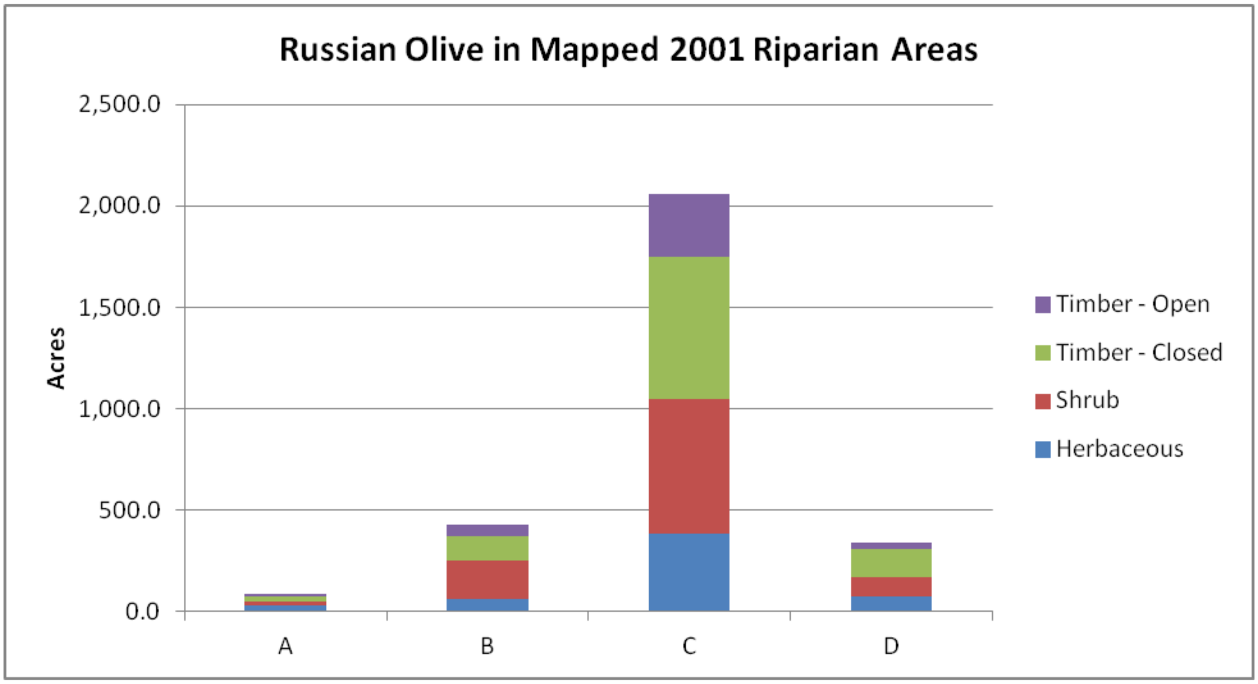

Figure 20. Russian olive distributions in mapped 2001 riparian areas by region.

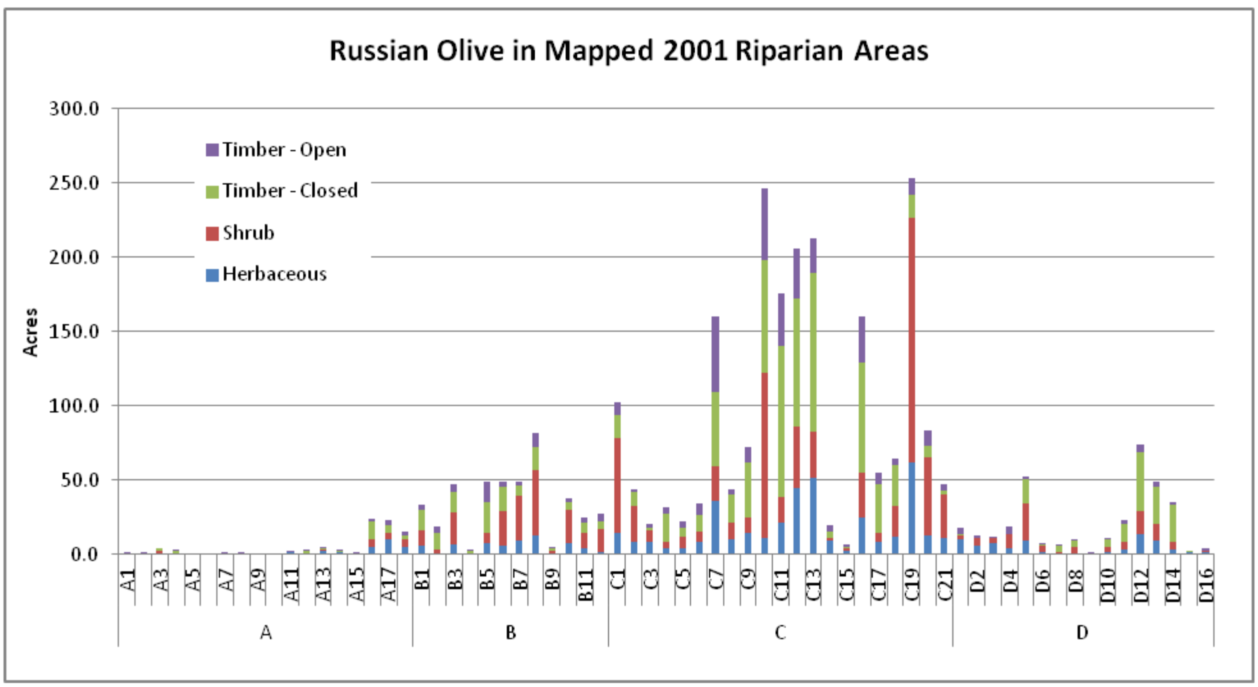

Figure 21. Russian olive distributions in mapped 2001 riparian areas by reach.

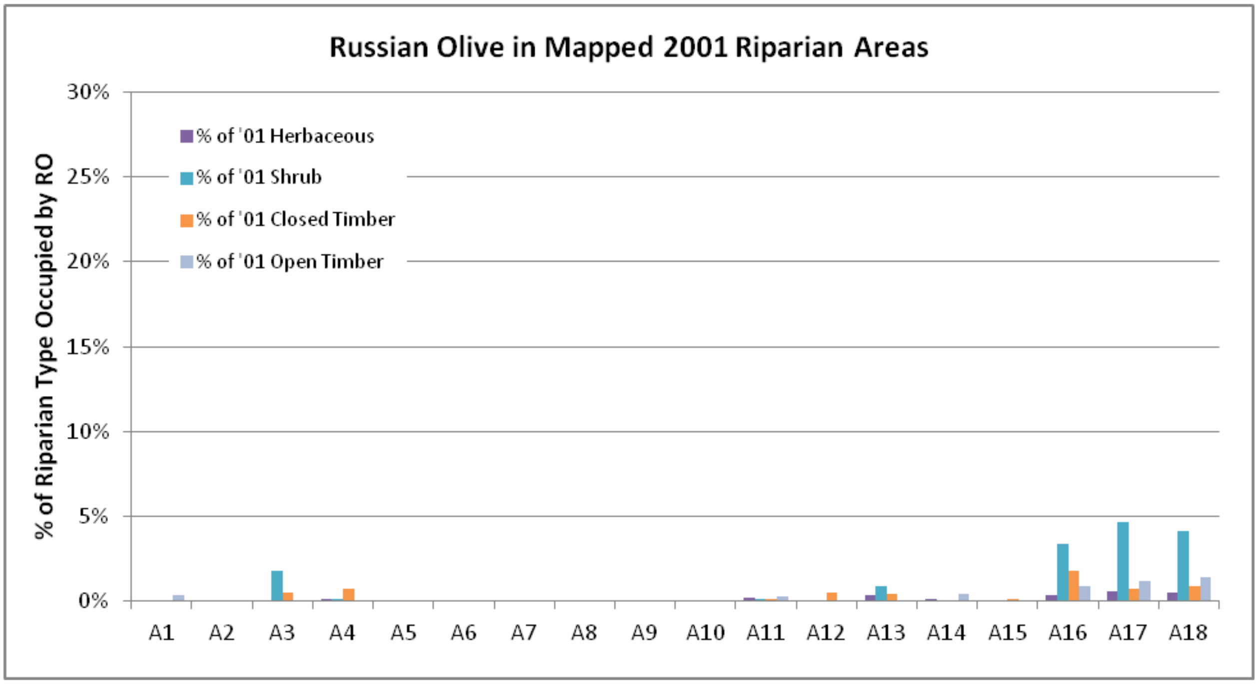

Figure 22. Percent of each riparian category occupied by Russian olive by riparian category, Region A.

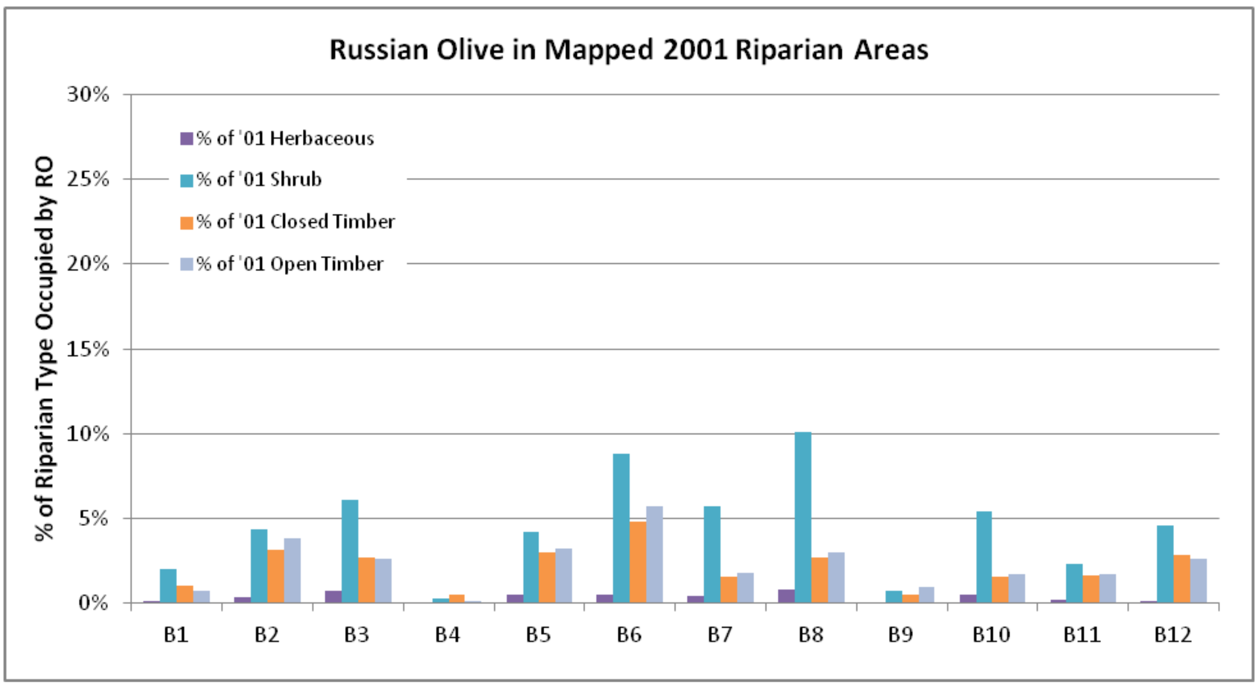

Figure 23. Percent of each riparian category occupied by Russian olive by riparian category, Region B.

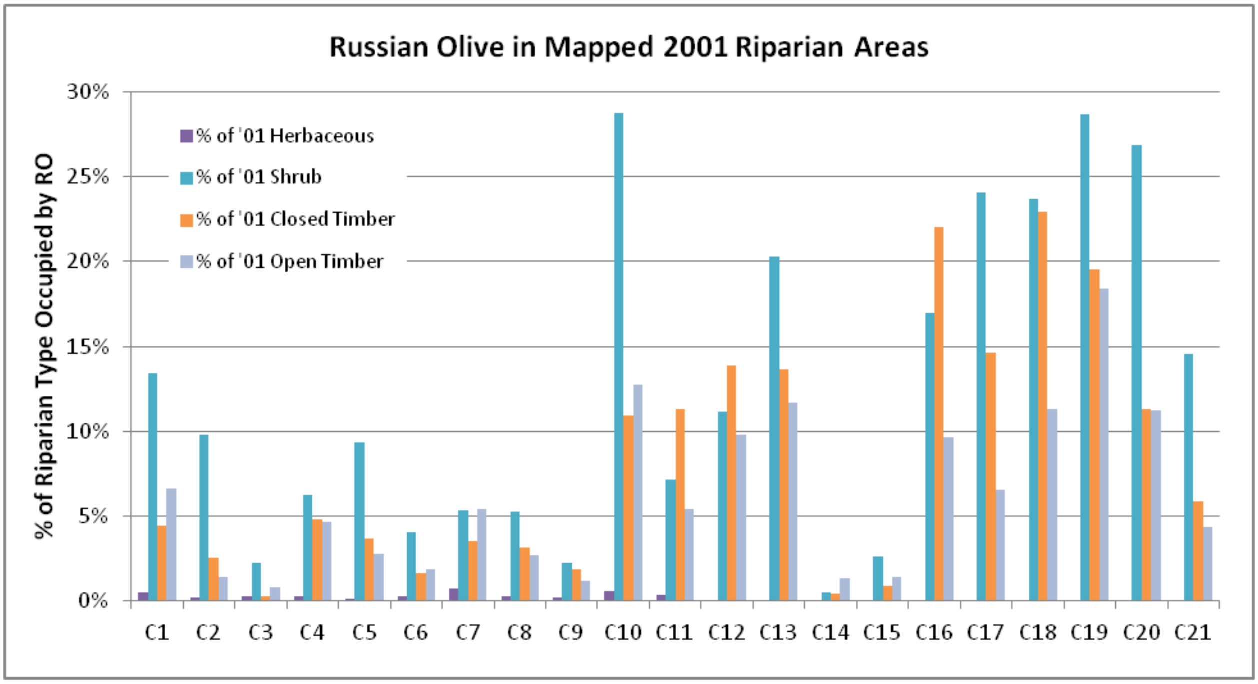

Figure 24. Percent of each riparian category occupied by Russian olive by riparian category, Region C.

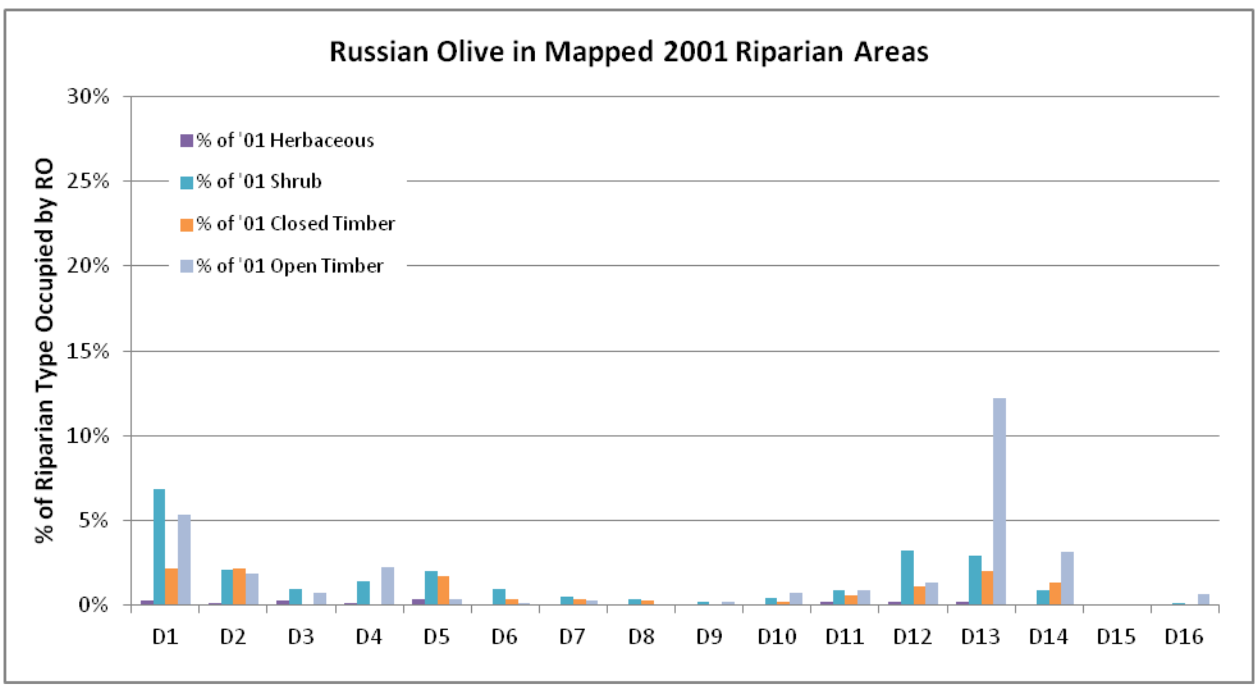

Figure 25. Percent of each riparian category occupied by Russian olive by riparian category, Region D.

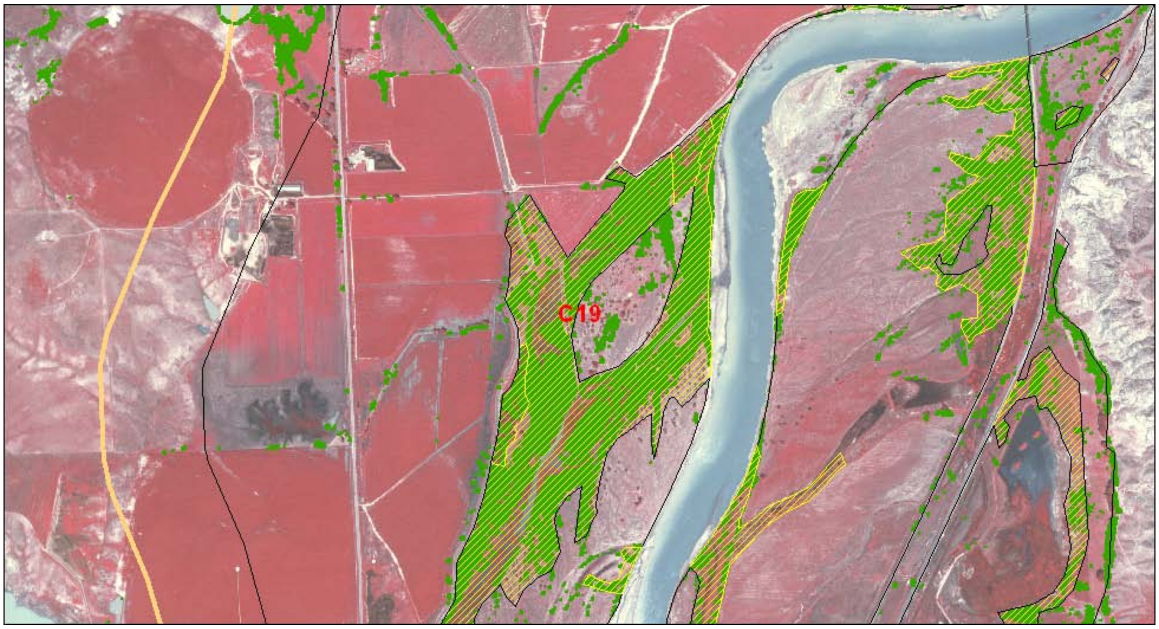

Figure 26. A portion of Reach C19 in Custer County showing dense Russian olive (green) within the 2001 riparian mapping (yellow hatch = herbaceous, shrub, and timber).

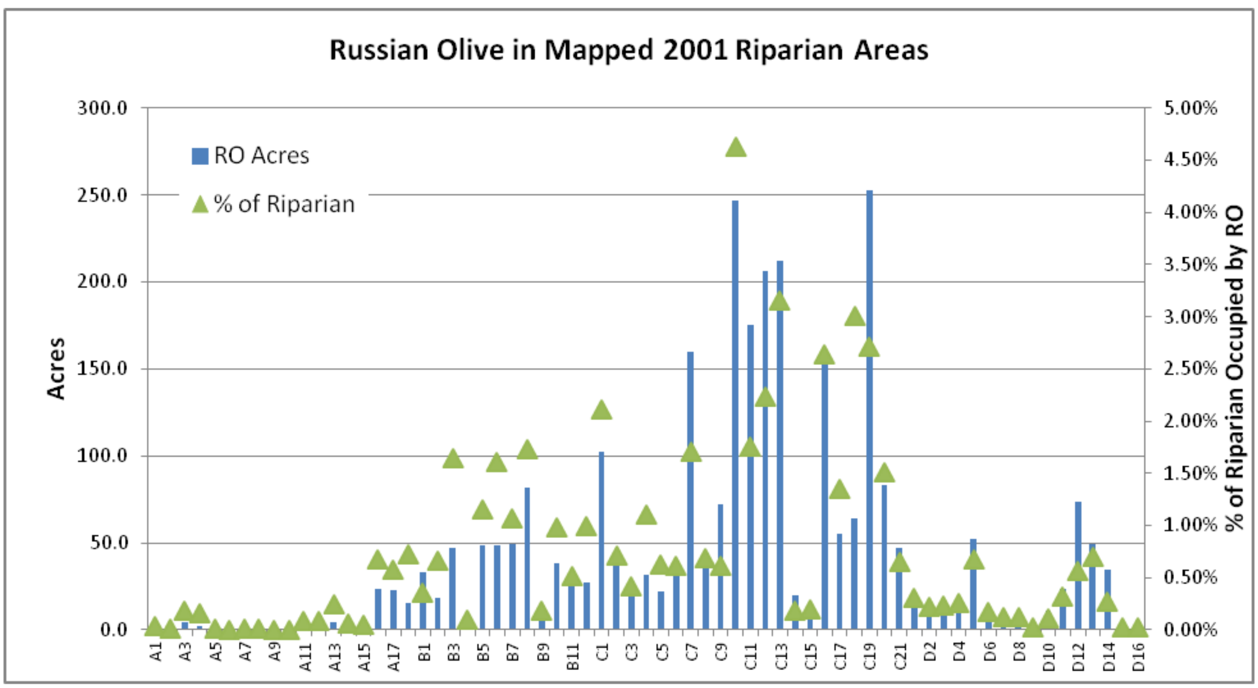

Figure 27. Russian Olive distributions in mapped 2001 riparian areas.

Figure 28 shows Russian olive by reach and its proximity to 2001 Bank Stabilization Physical Features. The columns represent 25 meter buffers around the bank stabilization features (25, 50, 75, and 100). The area of Russian olive >100m away from the physical features is not shown and is by far the largest percentage of Russian olive area. On the secondary axis is the total length of bank stabilization features by reach. From this there does not seem to be a correlation between the amount of bank stabilization and the amount of Russian olive in a reach. Reaches with similar lengths of stabilization may have greatly different amounts of Russian olive.

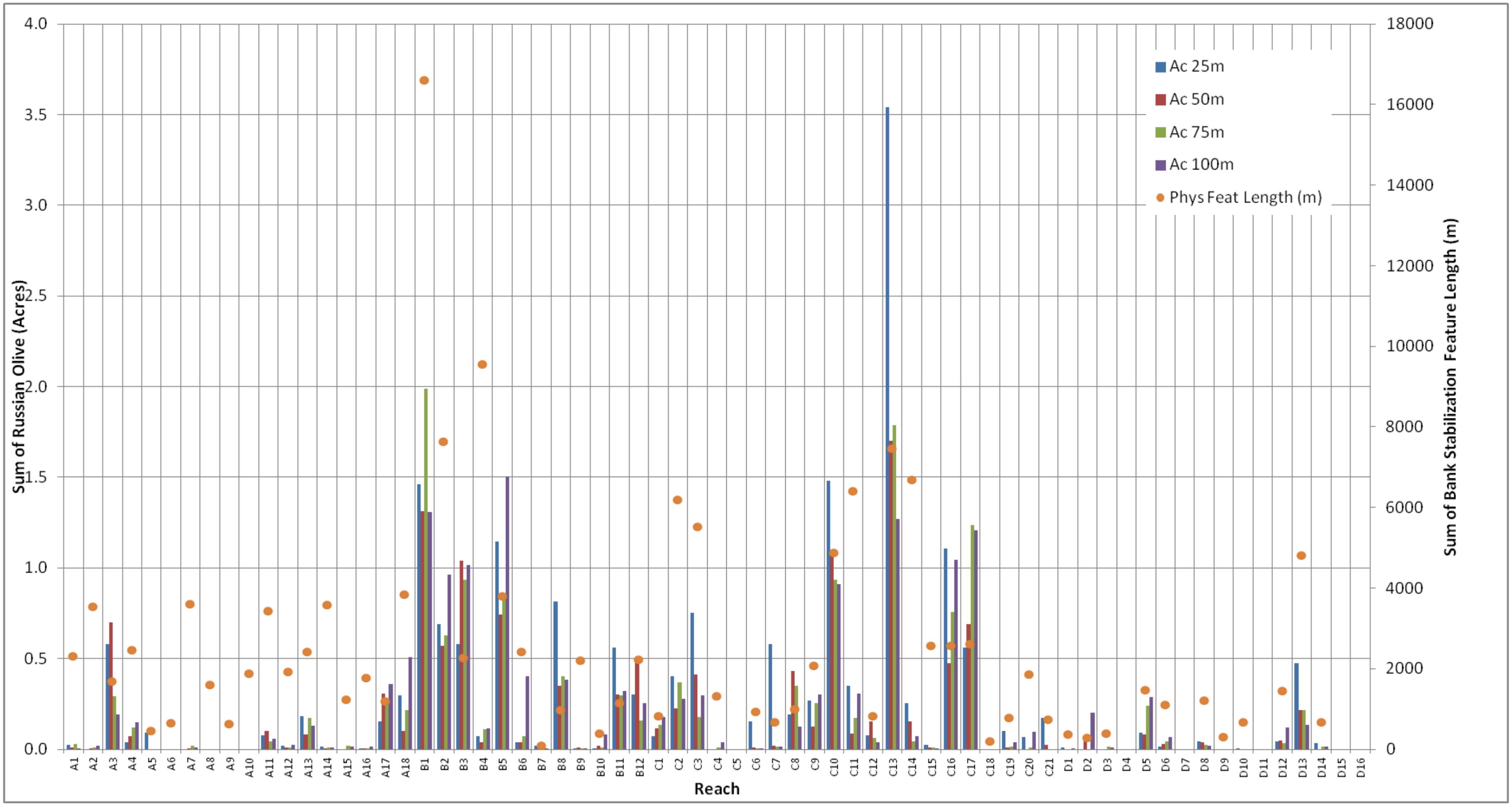

Figure 28. Proximity of Russian olive to 2001 bank stabilization physical features.

When summarizing all of the Russian olive acreage together and assessing its proximity to bank stabilization physical features, there appear to be some trends. Figure 29 suggests that for the Russian olive within 100 meters of the bank stabilization features, there is a preference for being within 25 meters of the feature. There is a 30% drop when stepping out to 50 meters, with an increasing trend to 75 and 100 meters.

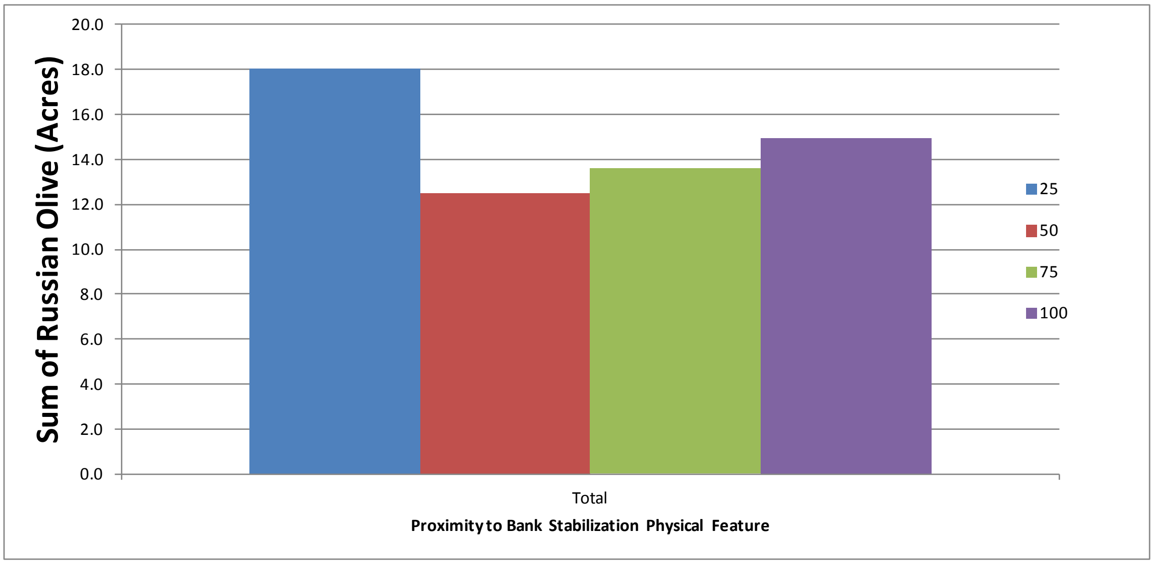

Figure 29. Proximity of Russian olive to bank stabilization physical features.

Conclusions:

The following key points result from the analysis:

- Region C has the most Russian olive by a factor of 2. This is due partly to a wider river corridor.
- As a percentage of each region, Region B has the highest density of Russian olive.
- Russian olive populations drop off dramatically above Reach A16.
- Geomorphic channel type does not seem to play a significant role in the presence of Russian olive.
- Most of the Russian olive is within the active floodplain as defined by the 100-year inundation boundary.
- Regions B and C have the highest concentrations of Russian olive within the 100-year inundation boundary, with three times the percent of the region's area occupied.
- Russian olive actively colonizes historic river channels, seasonally inundated areas, and areas within the active floodplain as defined by the 1950s Bankfull Channel, Channel Migration Zones, and 2001 Fisheries Habitat mapping.
- Areas that are restricted from active channel processes though bank protection, dikes, and levees (CMZ Restricted Migration Areas) tend to have less occurrence of Russian olive than their corresponding unrestricted areas.

Recommendations:

- Future analysis may want to look at the relationships of reaches with significant Russian olive occupations outside of the mapped 100-year inundation boundary with their immediate downstream reach to assess if more upland Russian olive populations are acting as seed sources for downstream populations within the inundation boundary.
- Reaches C14 and C15 should be investigated further to assess why they have significantly lower populations of Russian olive than their adjacent reaches with the similar geographies.
- Determine the percent of riparian shrub polygons that exist because they are Russian olive. Thus, is the existence of Russian olive skewing the riparian analysis by making it appear that there is more riparian shrub habitat than there would be without the Russian olive?
- Land use correlations were not part of the is scope of work and could be investigated.
- Elevation correlations were not part of this scope of work and could be investigated.
- Soil type correlations were not part of this scope of work and could be investigated.

Summary Tables:

		Inundation		RMA		1950s Channel	
Row Labels	RO (Ac)	Inside	Outside	N	Y	Channel	Island
PC	43.1	26.9	16.2	39.8	3.3	1.2	2.0
PC1	0.5	0.1	0.4	0.5			
PC2	0.3	0.0	0.2	0.3		0.0	
PC3	0.7	0.0	0.7	0.7		0.0	
PC4	0.1	0.0	0.1	0.1		0.0	0.1
PC5	0.3	0.1	0.2	0.3	0.0		
PC6	0.7	0.0	0.7	0.7	0.0		
PC7	2.3	1.5	0.8	2.1	0.1	0.1	0.0
PC8	2.9	0.7	2.3	2.9	0.0	0.1	
PC9	0.8	0.1	0.7	0.8		0.0	0.0
PC10	1.6	0.1	1.5	1.6	0.0	0.0	0.0
PC11	0.4	0.3	0.1	0.3	0.1	0.0	
PC12	0.3	0.2	0.2	0.3	0.1	0.0	0.0
PC13	0.2	0.2	0.0	0.2		0.0	0.0
PC14	8.4	4.7	3.7	6.5	1.9	0.5	1.4
PC15	1.2	0.7	0.5	0.9	0.3	0.1	0.0
PC16	1.7	0.8	0.8	1.4	0.3	0.1	0.1
PC17	0.4	0.3	0.1	0.4	0.0	0.0	
PC18	18.3	16.7	1.6	18.0	0.3	0.1	0.3
PC19	0.4	0.0	0.4	0.4		0.0	
PC20	0.3	0.2	0.1	0.3	0.0	0.0	0.0
PC21	1.2	0.2	1.1	1.2	0.0	0.0	0.1

		Inundation		RMA		1950s Channel	
Row Labels	RO (Ac)	Inside	Outside	N	Y	Channel	Island
A	342.9	92.3	250.7	336.7	6.3	21.4	14.6
A1	1.9	0.7	1.2	1.8	0.0	0.0	0.0
A2	1.8	0.4	1.4	1.7	0.1	0.0	0.0
A3	5.3	4.6	0.6	3.6	1.7	0.9	0.7
A4	4.0	2.7	1.3	2.8	1.2	1.4	0.9
A5	0.5	0.2	0.3	0.4	0.1	0.0	0.0
A6	0.1	0.1	0.0	0.1		0.0	
A7	1.3	0.5	0.8	1.2	0.0	0.2	0.0
A8	0.4	0.4	0.0	0.4	0.1	0.0	0.0
A9	0.1	0.1	0.0	0.1		0.0	0.0
A10	0.0	0.0		0.0		0.0	0.0
A11	2.3	2.3	0.0	1.9	0.4	0.2	0.1
A12	4.1	2.9	1.2	4.1	0.0	1.3	0.5
A13	13.7	5.0	8.8	13.4	0.3	0.9	0.4
A14	3.5	2.5	1.0	3.5	0.0	0.2	0.1
A15	1.4	1.2	0.2	1.4	0.0	0.5	0.1
A16	48.7	28.7	19.9	48.5	0.2	10.5	9.1
A17	204.5	21.8	182.6	203.4	1.1	3.5	1.4
A18	49.3	17.9	31.4	48.3	1.0	1.7	1.0

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		Inundation		RMA		1950s Channel	
Row Labels	RO (Ac)	Inside	Outside	N	Y	Channel	Island
B	790.9	476.2	314.6	757.5	33.4	143.6	90.4
B1	132.5	41.6	90.9	124.4	8.1	10.4	3.5
B2	64.7	24.6	40.1	62.4	2.3	5.9	3.5
B3	95.5	49.8	45.7	88.1	7.4	11.6	5.6
B4	18.4	2.3	16.1	17.9	0.5	0.7	0.1
B5	108.0	54.5	53.5	102.8	5.2	15.7	8.2
B6	63.7	48.7	15.0	63.2	0.6	11.0	11.2
B7	76.3	55.7	20.7	76.0	0.3	26.5	9.3
B8	116.7	91.2	25.6	113.9	2.8	24.3	30.9
B9	6.0	5.9	0.1	5.5	0.6	2.1	1.3
B10	44.0	38.8	5.1	43.2	0.8	10.0	3.8
B11	32.1	30.6	1.4	28.8	3.2	12.9	2.9
B12	33.0	32.5	0.4	31.3	1.7	12.5	10.0

		Inundation		RMA		1950s Channel	
Row Labels	RO (Ac)	Inside	Outside	N	Y	Channel	Island
C	2,458.1	2,122.2	335.9	2,404.1	54.0	370.1	233.5
C1	105.8	104.5	1.3	103.8	2.1	9.3	4.4
C2	46.9	45.8	1.0	42.0	4.9	7.0	6.6
C3	26.8	21.2	5.7	22.3	4.5	2.1	1.4
C4	40.6	33.9	6.7	40.5	0.0	6.6	1.8
C5	25.5	22.4	3.1	25.5		1.5	2.0
C6	47.1	40.0	7.1	46.6	0.5	7.4	6.0
C7	174.8	164.4	10.4	172.5	2.3	35.1	36.3
C8	51.5	43.4	8.1	47.4	4.1	6.2	6.4
C9	77.9	74.0	3.9	77.1	0.8	21.7	20.4
C10	257.3	250.5	6.8	255.0	2.3	15.1	1.5
C11	197.7	182.6	15.1	195.0	2.7	51.4	55.5
C12	230.8	205.6	25.2	229.2	1.6	42.3	39.3
C13	226.1	215.8	10.3	216.1	10.0	29.7	7.2
C14	22.2	21.6	0.6	21.3	0.9	3.1	0.4
C15	8.7	8.0	0.7	8.6	0.0	1.0	0.2
C16	212.1	170.2	41.9	208.0	4.0	53.9	17.9
C17	93.4	66.5	26.9	80.8	12.6	19.6	20.4
C18	89.2	65.4	23.8	89.2		12.2	1.3
C19	382.6	254.1	128.5	381.9	0.7	24.2	1.3
C20	90.3	83.7	6.6	90.3		11.9	2.8
C21	51.0	48.6	2.4	51.0		8.7	0.3

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		Inundation		RMA		1950s Channel	
Row Labels	RO (Ac)	Inside	Outside	N	Y	Channel	Island
D	969.2	335.1	634.1	963.6	5.6	128.6	38.3
D1	60.4	19.9	40.5	60.3	0.1	6.5	0.4
D2	41.0	10.8	30.2	40.7	0.3	1.4	
D3	34.8	10.7	24.1	34.8	0.0	0.9	0.1
D4	96.3	16.3	80.0	96.3	0.0	3.4	1.0
D5	161.2	49.0	112.2	160.8	0.4	24.6	8.0
D6	16.2	7.1	9.1	15.6	0.6	2.1	0.8
D7	9.1	7.4	1.7	9.1		5.0	1.1
D8	11.0	9.7	1.3	11.0	0.0	5.8	1.9
D9	1.2	1.0	0.2	1.2		0.4	0.1
D10	17.7	11.9	5.8	17.7	0.0	5.8	2.3
D11	66.5	31.8	34.7	65.5	1.0	9.5	3.4
D12	157.6	74.8	82.9	157.5	0.1	25.0	13.1
D13	190.3	44.7	145.6	187.5	2.8	22.2	6.1
D14	89.4	35.7	53.8	89.3	0.1	15.9	0.0
D15	6.6	0.8	5.7	6.6			
D16	9.8	3.5	6.3	9.8			