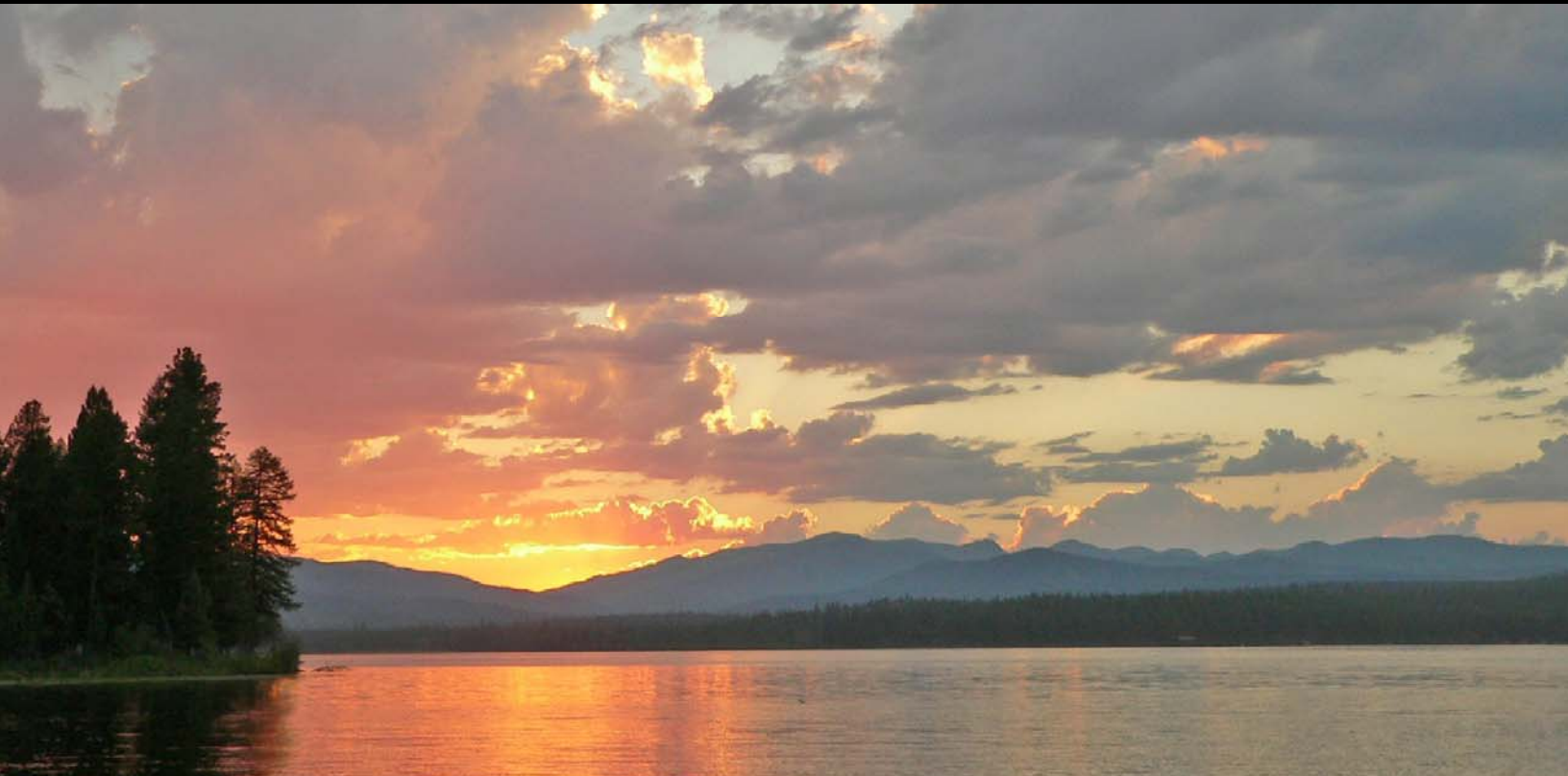




# Prioritized Areas on Noxon and Cabinet Gorge Reservoirs

Sanders County, MT - 2017



Sanders County  
Aquatic Invasive Plants Task Force  
Priority Area Monitoring

Nov. 20, 2017

**Prepared for:**

Board of County Commissioners  
Aquatic Invasive Plant Task Force  
Sanders County, Montana  
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## Preface:

This report presents data collected by Water and Environmental Technologies, Butte Montana, in 2017 on Noxon and Cabinet Gorge reservoirs. Funding was provided by Sanders County, Montana through the Aquatic Invasive Plants Task Force. All surveys were conducted by Jay Slocum and John Babcock.

For more information please contact Jay Slocum at [jslocum@waterenvtech.com](mailto:jslocum@waterenvtech.com), or visit our website at [www.waterenvtech.com](http://www.waterenvtech.com).



**Photo 1 & 2: Dense vegetation and shallow water along shorelines.**



Prioritized Areas on Noxon and Cabinet Gorge Reservoirs, Sanders County, MT – 2017  
Sanders County Aquatic Invasive Plants Task Force

Jay Slocum – Senior Wildlife Biologist  
Water and Environmental Technologies – Butte, MT

## Introduction:

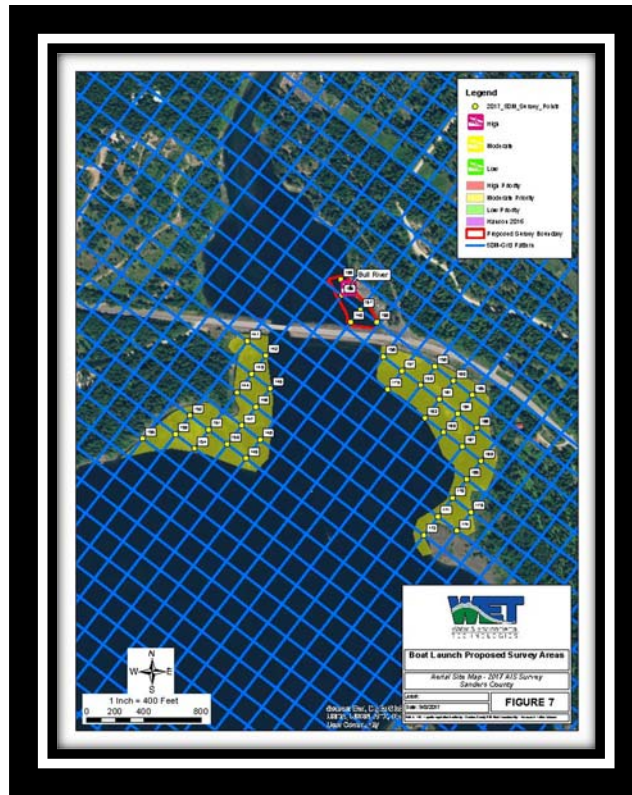
Eurasian watermilfoil (EWM) (*Myriophyllum spicatum* L.), curlyleaf pondweed (*Potamogeton crispus* L.), and flowering rush (*Butomus umbellatus* L.) are non-native invasive species that, when present, have been associated with declines in native plant species richness and diversity (Turnage et al. 2014). By systematically surveying infested priority areas, the locations and intensities of infestations will become evident. This information will give reservoir managers baseline information to focus management options and facilitate suitable control methods.

The 2017 Alternatives Analysis (DeBruyckere et al. 2017) and the 2017 Adaptive Management Plan (Getsinger et al. 2017) provide recommendations for ongoing vegetation monitoring methods and adaptive management alternatives in priority areas. These documents, along with input from Sanders County Aquatic Invasive Plants Task Force Facilitator Kim Bergstrom, helped Water and Environmental Technologies (WET) personnel revise the survey methodology implemented during the 2017 priority areas surveys on Noxon and Cabinet Gorge reservoirs. Changes to the survey methodology include prioritized areas, such as boat launches and well-established EWM infestation areas.

There were eight (8) priority recreational access sites located on Noxon Reservoir and an additional five (5) well-established EWM bed priority areas (**Table 1**). On Cabinet Gorge Reservoir, there were four (4) priority recreation access sites and an additional two (2) well established EWM bed priority areas (**Table 2**).

## Methods:

Methods used in the prioritized areas were similar to the 2017 Littoral Survey of Noxon and Cabinet Gorge reservoirs (Slocum 2017). The priority areas and the reservoir-wide surveys were conducted concurrently, therefore, the same data collection technology, bed mapping methodology, and geospatial database was utilized. To create the point intercept data required for the priority areas, existing data review was conducted prior to the survey. A 50-meter grid pattern was developed for the priority areas to allow for site-specific sampling. This grid pattern facilitated the creation of the *2017 Pre-Defined Point Intercept Sampling Location for Priority Areas*. As shown in the example below (**Illustration 1**), this 50-meter grid pattern represents the ideal locations for each point intercept survey. It is important to note that the grid pattern and the pre-defined sampling points were created through aerial photo interpretation, therefore, some pre-defined survey points were located in shallow waters or dense aquatic vegetation with no boater access (**Photo 1 & 2**).



**Illustration 1. Reservoir-wide 50-meter grid sampling pattern with pre-defined point intercept sampling locations.**

#### Point Intercept Surveys:

Point intercept surveys were conducted on September 11 through September 15, 2017 to assess the aquatic plant communities in the 19 identified priority areas and quantify the level of infestation of EWM. Pre-survey data analysis showed there were 346 proposed point intercept survey sites in the priority areas on Noxon and Cabinet Gorge reservoirs. However, due to low flows, dense surface vegetation, and reservoir water drawdowns for infrastructure maintenance, many bed areas near shorelines and shallow areas were inaccessible. These areas were surveyed in calm water conditions that allowed for point intercept data collection along the bed edges augmented by ocular estimations of the extent and density of the bed. These methods did not assess invasive species in areas that contained less than 20% density, thus the actual areas inhabited by invasive species is greater than the delineated bed areas.

EWM, curlyleaf pondweed, and flowering rush beds were delineated with the relative density of each invasive species quantified. Density was quantified by recording the amount of invasive species vegetation covering the sampling implement during each thatch rake toss using a scale from 1-5, with 5 representing 80-100% coverage. Larger significant beds containing non-target species were also delineated for future reference and possible analysis. The point intercept survey data was used to construct bed delineations and help quantify invasive species density in the mapped areas.

To populate the geospatial database, invasive species beds that contained any quantifiable densities were mapped. This included dense EWM beds and areas that did not meet the 50% density criteria but did contain quantifiable densities of invasive species. These low-density beds were typically found in previously treated or mapped areas.

Researchers have identified hybrid Eurasian/northern watermilfoil in these reservoirs and are assessing its impacts on northern watermilfoil populations and distribution. Distinguishing between native northern watermilfoil and the invasive EWM is difficult and time intensive due to the presence of hybrids. These hybrid watermilfoils have morphological characteristics of both the native and invasive species and tend to exhibit growth and density characteristics more closely related to the EWM. For the purposes of this survey, hybrid watermilfoil was not quantified individually, rather, it was classified as invasive EWM.

Past surveys did not include the analysis of small-scale areas, such as access sites and bed priority areas. Many of the priority areas discussed in the following section are associated with previously identified and mapped beds. These previously identified areas were originally delineated and analyzed at much larger scales. Following recommendations contained in the 2017 Alternatives Analysis (DeBruyckere et al. 2017), small-scale site-specific analysis was conducted within identified boat launch and priority bed areas. Therefore, many delineated beds are discussed as smaller-scale sub-plots of the originally identified mapped areas. The predefined survey areas associated with the priority access sites were developed by the Sanders County Aquatic Invasive Plants Task Force. These survey areas were designed to serve as an initial estimate of where EWM occurred in relation to each boat launch. It is anticipated that these site-specific survey areas will be modified in the future to reflect the 2017 survey findings.

## Results and Discussion:

Noxon Reservoir:

South Shore

This access site contains EWM, curlyleaf pond weed, and flowering rush. EWM is abundant north of the boat launch, but is present throughout the area (**Figure 1**). Approximately 0.71 acres of dense EWM were delineated. An additional 2.31 acres of infested area containing less than 50% densities were also mapped. Approximately 0.58 acres located adjacent to the mapped dense bed were not accessible but was visually considered a dense bed of EWM. Therefore, the total area containing dense beds is approximately 1.29 acres.

Marten Creek (NOX-31)

This access site contains EWM of varying densities. EWM is abundant east and west of the boat launch along the shoreline, but is present throughout the area (**Figure 2**). Approximately 0.21 acres of dense EWM were delineated in the boat launch survey area. An additional 1.30 acres of infested area containing less than 50% densities were also mapped. Approximately 2.56 acres located outside but adjacent to the boat launch survey area were delineated and classified as dense EWM beds.

#### North Shore

This access site contains EWM of varying densities. EWM is abundant east and west of the boat launch, occurring along the shoreline in the upper littoral zone of 0-15 ft (**Figure 3**). The boat launch ramp did not contain any quantifiable invasive species. Within the boat launch survey area, the western mapped bed (NOX-3/37/59) contains an average of 3.5 bed density according to the three (3) survey points taken in the area. However, the overall delineated area of bed NOX-3/37/59 included areas downstream containing lower densities of EWM, therefore, the overall 22.83 acres mapped averaged a density of 2.0. To adjust for this discrepancy in mapping scale, the delineated area west of the boat launch, located adjacent to the access site, were added to the dense bed calculations for this area. Therefore, an estimated 1.37 acres of dense EWM are present within or adjacent to this survey area.

#### Trout Creek

This access site contains dense patches of EWM and sparse patches of flowering rush. EWM is more abundant west of the boat launch, occurring in the upper littoral zone of 0-15 ft (**Figure 4**). The boat launch ramp did not contain any quantifiable invasive species. Approximately, 0.53 acres of dense EWM were delineated within or adjacent to the boat launch survey area. It is important to note that areas adjacent to and downstream of this boat launch survey area contains approximately 41.29 acres of dense beds.

#### Vermilion Bay

This access site contains one (1) continuous dense patch of EWM, located along the shoreline in upper littoral zone of 0-15ft (**Figure 5**). Approximately 0.18 acres of dense EWM were delineated within the boat launch survey area, and approximately 0.24 acres is located west and north along the adjacent shoreline. The total continuous bed is approximately 0.42 acres.

#### Kirby Access

This access site contains two (2) dense patches of EWM, located east and west of the boat launch, occurring along bank edges at depths up to 20 feet (**Figure 6**). The boat launch ramp did not contain any quantifiable invasive species. Approximately 0.18 acres of dense EWM were delineated within the boat launch survey area, and approximately 2.89 acres were located upstream and downstream along the adjacent shorelines. It is important to note that the area adjacent to and upstream of this boat launch contains the majority of dense EWM.

#### Finley Flats (NOX-48)

This access site contains EWM, curlyleaf pond weed, and flowering rush. EWM is abundant southeast of the boat launch, but is present throughout the area (**Figure 7**). This area was problematic to survey, low flows and the dense surface vegetation limited access. Survey points were taken along the perimeter of dense beds in navigable waters, methodical point-intercept survey methods were not applicable at the time of the survey. One (1) dense EWM bed (NOX 48-1) was identified totaling 0.42 acres. NOX-48-2 located adjacent to the dense bed contained limited access, therefore, ocular estimates designated the density of the EWM bed in this area under 50 percent. This density is a conservative estimation and should be verified during future surveys. A low-density bed (NOX-48-3) occurs in the boat launch ramp area and follows the downstream shore line for approximately 2,450 feet. The inside bend of the river (NOX48-4) had

limited access but visual assessments determined that the majority of the area was covered by dense coontail (*Ceratophyllum demersum*). The 2016 reservoir-wide survey conducted by Hansen identified NOX-48-5 as a dense EWM bed. During the 2017 survey effort only the perimeter was assessed due to thick surface vegetation. The edge of this bed contains sparse EWM and curlyleaf pondweed with coontail likely the predominant species. NOX-48-6 was also a perimeter bed assessment due to limited access. The edge of this bed contains sparse curlyleaf pondweed and patches of flowering rush with coontail the predominant species.

#### Flat Iron Access

No invasive species were observed at this access site. There is a dense patch of elodea (*Elodea canadensis*) located in and adjacent to the boat ramp area (**Figure 8**). This non-target species was mapped because this dense patch is likely affecting recreation access and boater satisfaction.

#### NOX-1

This priority bed area located near Rock Island and upstream of Noxon Rapids Dam contains curlyleaf pondweed, and flowering rush, no dense beds of EWM were encountered during the 2017 survey (**Figure 9**). Due to low flows and dense surface vegetation this area had limited boat access. This area was not methodically sampled at a 50-meter resolution.

#### NOX-2

This priority bed area located at the mouth of Marten Creek Bay contains EWM, and curlyleaf pondweed, but no dense beds of EWM were encounter during the 2017 survey (**Figure 10**). Due to low flows and survey time limitations this area was not methodically sampled at a 50-meter resolution.

#### NOX-11

This priority bed area located near the railroad trestle contains two (2) dense beds and several EWM patches with densities of less than 50% (**Figure 11**). Beds were located along shorelines in the upper littoral zone of 0-10 ft at varying densities. Approximately 0.42 acres adjacent to the shoreline and associated with NOX-3/37/59 contained dense EWM and was mapped separately from the rest of the patch. As mentioned above, this patch also contains dense EWM near the east end of the delineated area which is located adjacent to the North Shore Access. NOX-11 contained dense surface vegetation that limited access; however, perimeter sampling coupled by ocular estimates classified 10.25 acres as a “dense bed”. The shoreline downstream of NOX-11 contained low densities of EWM which may provide a source area for future infestations. A total of 10.67 acres of dense EWM was delineated in this area.

#### NOX-8

This priority bed area located adjacent to many North Shore homes contains EWM, and curlyleaf pondweed, though no dense beds of EWM were encountered during the 2017 survey (**Figure 12**). The mapped bed contains areas of dense curlyleaf pondweed, however, the overall EWM density was below 50 percent. The 11.25 acres did contain dense patches of invasive weeds and surface vegetation, however, the overall density for the plot was less than 50% EWM. Due to limited access, evaluation of the shoreline was not conducted but ocular estimations determined the entire mapped area is densely vegetated with both native and invasive species.

NOX-4A, and NOX-4B

These priority bed areas, located on the north shore of the Clark Fork River across from the Trout Creek Access, contain one (1) dense bed of EWM that occurs along the shoreline in the upper littoral zone of 0-15 ft (**Figure 13**). The majority of the 13.57 acres of dense EWM is located on the east end of the patch with continuous infestation present along the downstream shoreline. It is important to note that the south bank of the river (NOX-5) in this area is also infested with dense EWM. In these southern areas, a total of 41.29 acres of dense EWM are affecting the shorelines and upper littoral zone, as noted in the prior discussion related to the Trout Creek Access Site.

Cabinet Gorge Reservoir:

Heron Access

This access site contains one (1) dense bed of EWM. A second patch is located west of the boat launch survey area and contains densities of less than 50% (**Figure 14**). These beds are located along the shoreline in the upper littoral zone of 0-10 ft at varying densities. Approximately 0.10 acres within the boat launch survey area contains dense EWM, with 0.29 acres located adjacent and downstream of the survey area, totaling 0.39 acres. The shoreline downstream of CAB-29-1 contains low densities of EWM.

Big Eddy Access

This access site contains EWM, and dense patches of coontail. EWM was more abundant upstream of the boat launch, but was present throughout the area (**Figure 15**). The boat launch ramp and dock area contain dense EWM, however, most of the bed contained lower densities. Due to the scale of the mapping effort, these EWM site-specific dense areas were noted in the survey comments but too small for delineation. It was determined that coontail was the predominant species throughout the area. Dense vegetation was delineated totaling 1.92 acres; however, the mapped bed contained less than 50% EWM.

Bull River (CAB-5 and CAB-6)

This area contains EWM, curlyleaf pondweed and dense patches of coontail. EWM was not detected near the access site, but was abundant south of the highway, in the CAB-5 & 6 priority bed areas (**Figure 16**). Curlyleaf pondweed was present south of the boat launch in relatively low densities (CAB-20). The areas associated with CAB-5 & 6 were problematic to survey; low flows, and dense surface vegetation limited access. Survey points were taken along the perimeter of dense beds in navigable water. CAB-5-1 contains approximately 9.09 acres of dense EWM and is located near the shoreline in the upper littoral zone. The area adjacent to this dense bed (CAB-5-2) was delineated due to dense surface vegetation that was predominately coontail. CAB-5-3 was identified as a dense bed of EWM covering approximately 0.30 acres. CAB-6-1 contains dense surface vegetation, ocular estimates coupled with perimeter surveys designated 5.39 acres in this area as a “*dense bed*”. CAB-6-2 contained shallow waters limiting access, however, densities were observed to be significantly lower than adjacent areas. The 3.56 acres associated with CAB-6-3 was dry during the 2017 survey, however, this area is likely infested when inundated. The 2016 littoral survey identified this area (CAB-6-3) as a dense EWM bed (Hanson 2016) and in 2017 dry EWM plants were observed. A total of 18.34 acres associated with CAB-5 & 6 were classified as dense EWM beds.

## Noxon Park

This area contains EWM, curlyleaf pondweed, flowering rush, and dense patches of coontail. EWM was present throughout the boat launch survey area but did not exceed 50% densities (**Figure 17**). An area west of the boat launch and adjacent to the shoreline did contain densities of EWM up to 40%, however, the majority of dense vegetation located within the survey area consisted of coontail patches. The area surrounding the boat launch survey area contains multiple dense patches of EWM, totaling approximately 123.83 acres. Survey points were taken along the perimeter of dense beds in navigable water.

## Conclusion and Recommendations:

On Noxon Reservoir, a total of 4.18 acres of dense EWM beds were delineated within the eight (8) boat launch survey areas. EWM dense beds immediately adjacent to the boat launch survey areas totaled 46.98 acres (**Figures 1-8**). An additional 24.24 acres of dense EWM were identified in five (5) priority bed areas on Noxon Reservoir (**Figures 9-13**). A total of 75.4 acres of dense EWM was delineated within or adjacent to these 13 priority sites (**Table 1**).

On Cabinet Gorge Reservoir, a total of 0.10 acres of dense EWM beds were delineated within the four (4) boat launch survey areas. EWM dense beds immediately adjacent to the boat launch survey areas totaled 124.12 acres (**Figures 14-17**). An additional 18.34 acres of dense EWM were identified in the two (2) priority bed areas on Cabinet Gorge Reservoir (**Figure 16**). A total of 142.56 acres of dense EWM was delineated within or adjacent to these six (6) priority sites (**Table 2**).

To facilitate additional quantifiable data within certain areas that contained limited access, surveys should be conducted per-treatment to better quantify areas that were inaccessible during the 2017 survey.

## Future Surveys:

Ongoing monitoring efforts should continue utilizing the database provided. By refining the *2017 Pre-Defined Point Intercept Sampling Location for Priority Areas* and incorporating the 2017 survey results, future surveys can be conducted more efficiently and effectively. Referencing the predefined priority areas grid pattern schemas will also help maintain survey methodology consistency. Future surveys should duplicate and repopulate the Invasive Species Bed Delineation Polygons and Survey Point Intercept Data feature classes provided. This will allow for unbiased records of each future monitoring event to be contained in one centralized database for easy reference and analysis. This monitoring database should be coupled with a treatment and control database in the future. By merging the monitoring and treatment results into one data system, resource managers will be able to make informed invasive species control decisions.

## References:

- DeBruyckere, L., and T. Pennington. 2017. Analysis of Treatment Alternatives for Invasive Watermilfoil in Noxon Rapids and Cabinet Gorge Reservoirs, Sanders County, Montana, Creative Resource Strategies, Salem, OR.
- Getsinger, K.D., J.D. Madsen, G. Turnage, and J. Badger. 2017. Invasive aquatic plant control for Noxon and Cabinet Gorge reservoirs, Montana: An adaptive management plan. A report prepared for the Sanders County Aquatic Invasive Plants Task Force. Geosystems Research Institute Report #5074.
- Hanson, E. 2016. Noxon and Cabinet Gorge Reservoirs Littoral Survey 2016, Sanders County, Montana. Hanson Environmental, Missoula, MT.
- Turnage, G. and J. D. Madsen. 2014. Littoral Survey of Noxon and Cabinet Gorge Reservoirs, Montana, 2013. GRI Report #5061, Geosystems Research Institute, Mississippi State University. January 2014.
- Slocum, J. 2017. Littoral Survey of Noxon and Cabinet Gorge Reservoirs, Sanders County, Montana. Water and Environmental Technologies, Butte, MT.



## Tables:

Table 1. Access Sites and Priority Bed Areas on Noxon Reservoir.

Table 2. Access Sites and Priority Bed Areas on Cabinet Gorge Reservoir.

**Table 1. Access Sites and Priority Bed Areas on Noxon Reservoir.**

Figure Number	Access Site/Priority Bed Area	Acres of Dense Eurasian Watermilfoil Within Survey Area	Acres of Dense Eurasian Watermilfoil Adjacent to Survey Area
Figure 1	South Shore	1.29	0
Figure 2	Marten Creek & Nox-31	0.21	2.56
Figure 3	North Shore	1.37	0
Figure 4	Trout Creek	0.53	41.29
Figure 5	Vermilion Bay	0.18	0.24
Figure 6	Kirby Access	0.18	2.89
Figure 7	Finley Flats & Nox-48	0.42	0
Figure 8	Flat Iron Access	0	0
<i>Sub-total for Access Sites</i>		<i>4.18</i>	<i>46.98</i>
Figure 9	NOX-1	0	NA
Figure 10	NOX-2	0	NA
Figure 11	NOX-11	10.67	NA
Figure 12	NOX-8	0	NA
Figure 13	NOX-4A & 4B	13.57	NA
<i>Sub-total for Priority Bed Area</i>		<i>24.24</i>	<i>NA</i>
<b>Total Acreage</b>		<b>28.42</b>	<b>46.98</b>
<b>Total Reservoir-Wide</b>		<b>75.4</b>	

**Table 2. Access Sites and Priority Bed Areas on Cabinet Gorge Reservoir.**

Figure Number	Access Site/Priority Bed Area	Acres of Dense Eurasian Watermilfoil Within Survey Area	Acres of Dense Eurasian Watermilfoil Adjacent to Survey Area
Figure 14	Heron Access	0.1	0.29
Figure 15	Big Eddy Access	0	0
Figure 16	Bull River & CAB-5 & 6	0	0
Figure 17	Noxon Park	0	123.83
<i>Sub-total for Access Sites</i>		<i>0.1</i>	<i>124.12</i>
Figure 16	CAB-5	9.39	NA
Figure 16	CAB-6	8.95	NA
<i>Sub-total for Priority Bed Area</i>		<i>18.34</i>	<i>NA</i>
<b>Total Acreage</b>		<b>18.44</b>	<b>124.12</b>
<b>Total Reservoir-Wide</b>		<b>142.56</b>	

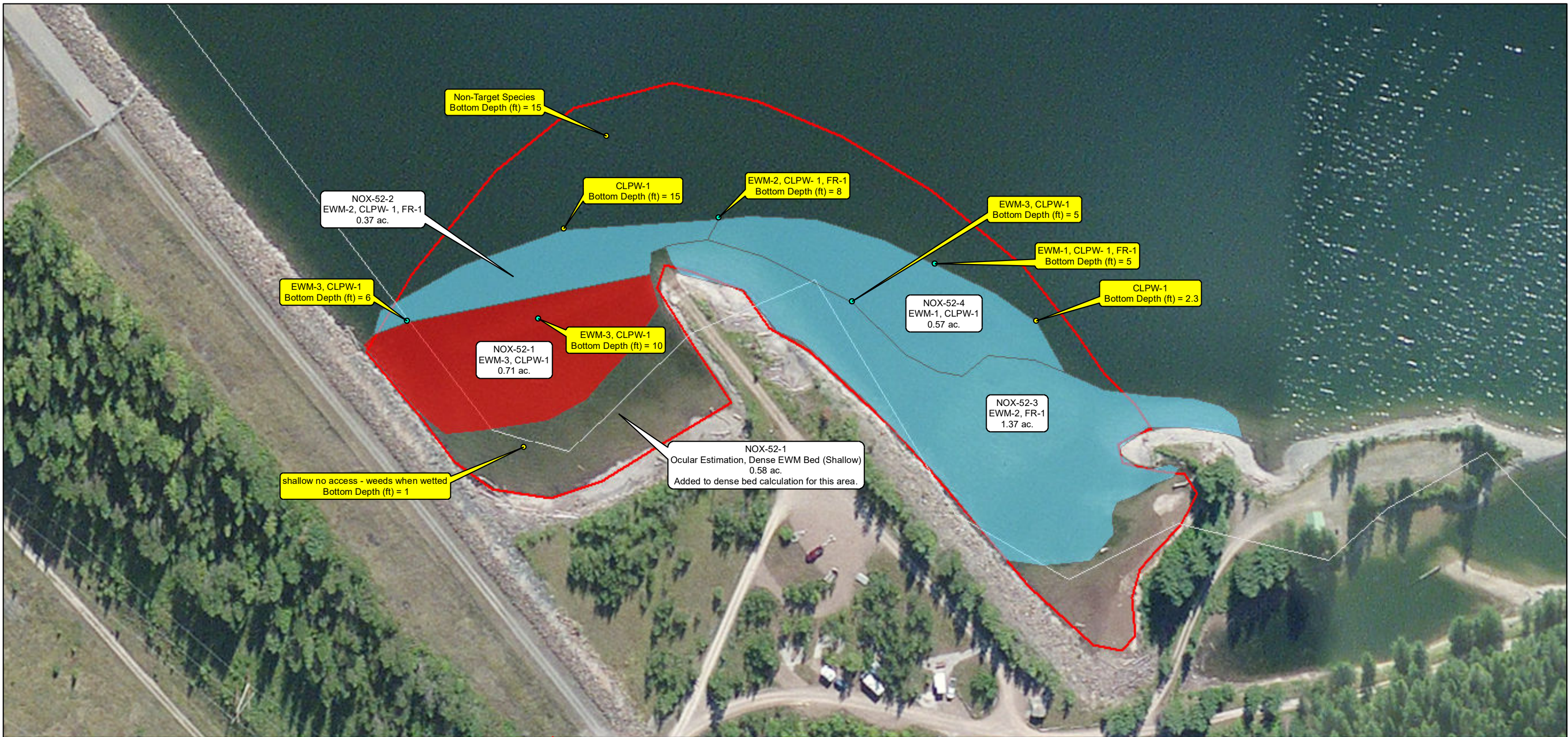
## Figures:

Figures 1 - 8. Bed Delineations of Invasive Species Near Boat Launch Sites on Noxon Reservoir.

Figures 8 – 13. Bed Delineations of Invasive Species in Priority Treatment Plots on Noxon Reservoir.

Figure 14 – 17. Bed Delineation of Invasive Species Near Boat Launch Sites & Priority Treatment Plots on Cabinet Gorge Reservoir.





**Legend**

- Rake Toss Points with Eurasian watermilfoil
- Rake Toss Points
- Dense Eurasian watermilfoil beds
- Low density or non-target sp. beds
- Boat Launch Survey Area
- Noxon Rapids Reservoir

Note:  
EWM = Eurasian watermilfoil  
CLPW = curlyleaf pondweed  
FR = flowering rush

Density was quantified by recording the amount of invasive species vegetation covering the sampling implement during each hatch rake toss using a scale from 1-5, with 5 representing 100% coverage.

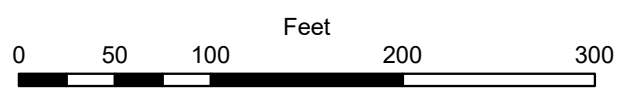
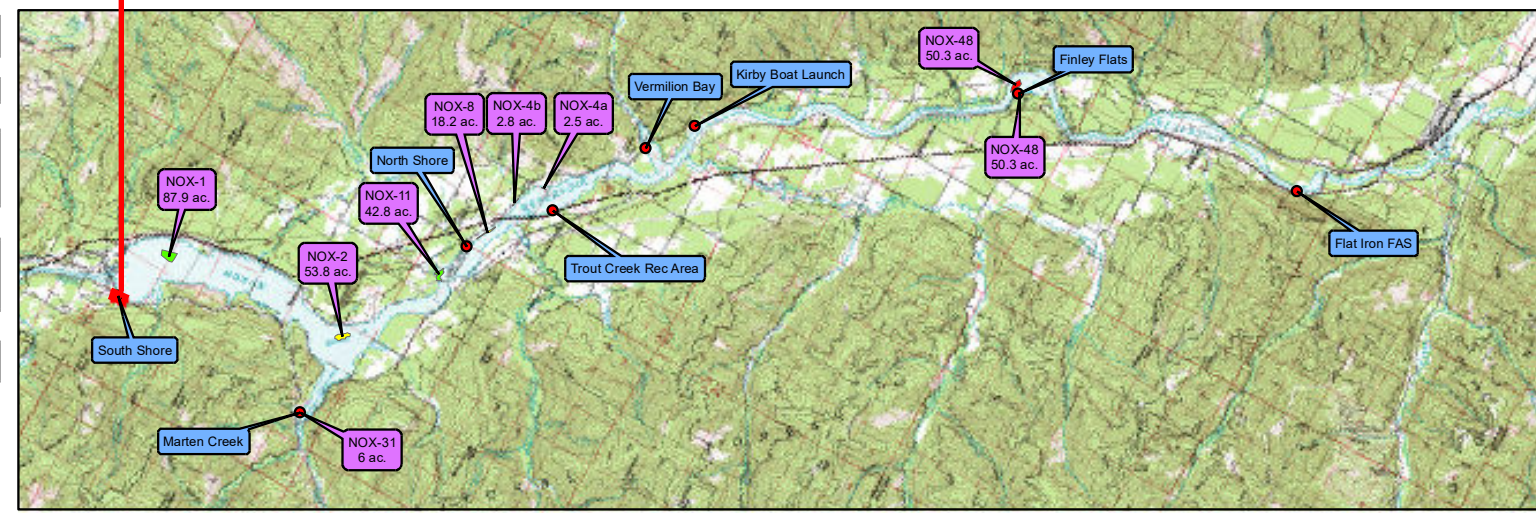
Priority Treatment Plot - ID  
Plot Area (ac.)

Access Point

2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Inside Survey Area

2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Adjacent to Survey Area

Survey Point Density & Comments  
Bottom Depth (ft)



**Bed Delineations of Invasive Species  
Near South Shore on Noxon Reservoir**

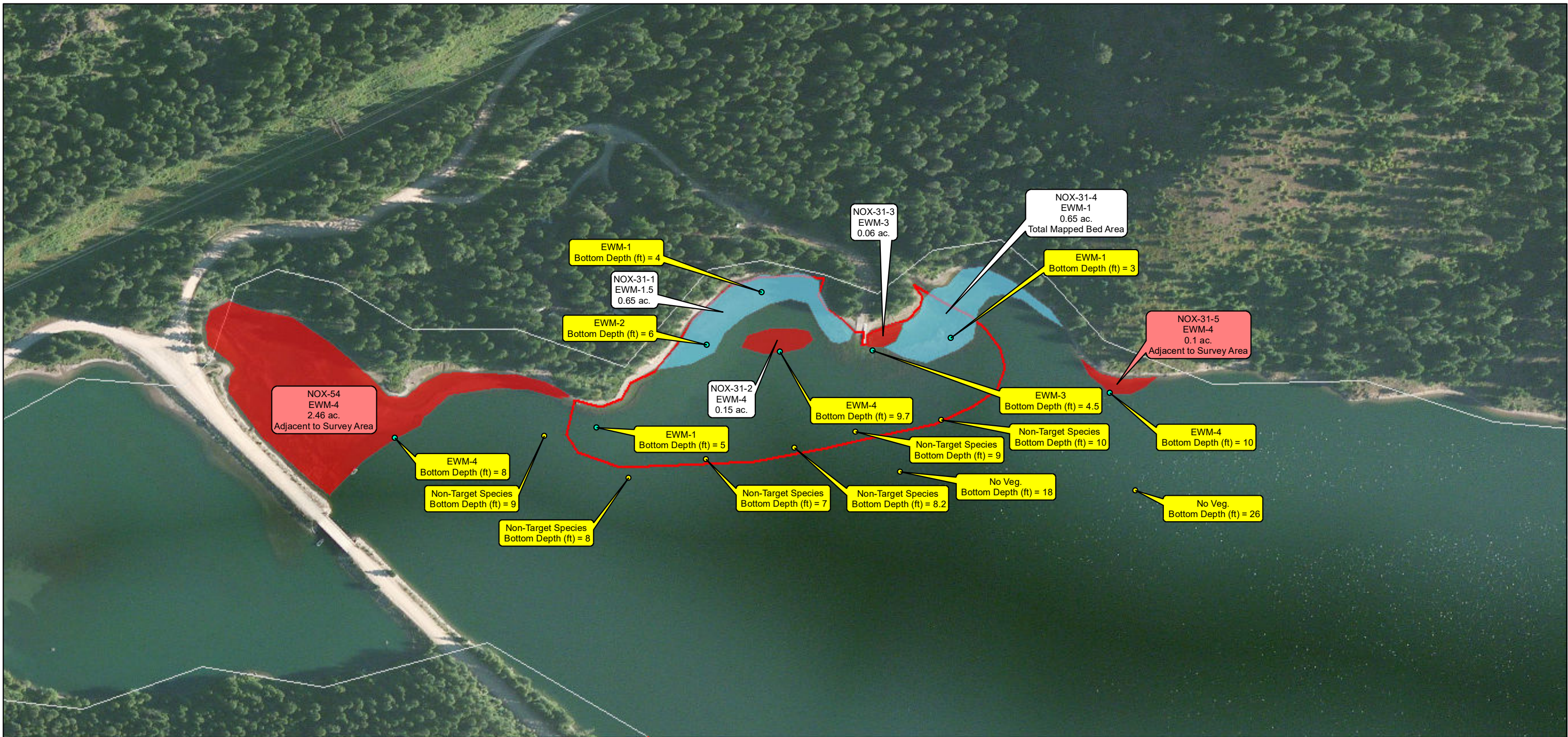
*Aerial Site Map - 2017 AIS Survey  
Sanders County*

Job#: SandersM01  
Date: 11/22/2017

**FIGURE 1**

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**Legend**

- Rake Toss Points with Eurasian watermilfoil
- Rake Toss Points
- Dense Eurasian watermilfoil beds
- Low density or non-target sp. beds
- Boat Launch Survey Area
- Noxon Rapids Reservoir

Note:  
 EWM = Eurasian watermilfoil  
 CLPW = curlyleaf pondweed  
 FR = flowering rush

Density was quantified by recording the amount of invasive species vegetation covering the sampling implement during each thatch rake toss using a scale from 1-5, with 5 representing 100% coverage.

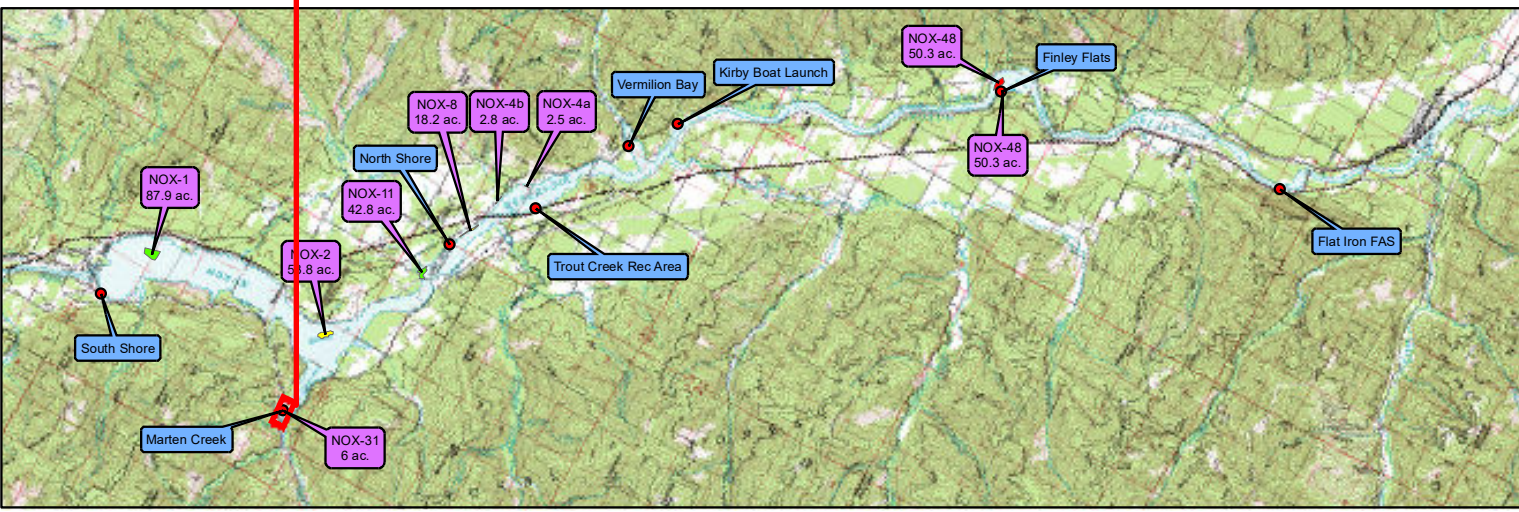
Priority Treatment Plot - ID  
 Plot Area (ac.)

Access Point

2017 Bed ID -  
 Survey Bed Density  
 Delineated Area (ac.)  
 Inside Survey Area

2017 Bed ID -  
 Survey Bed Density  
 Delineated Area (ac.)  
 Adjacent to Survey Area

Survey Point Density & Comments  
 Bottom Depth (ft)



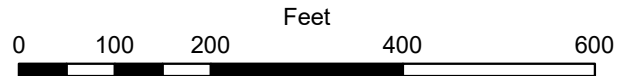
**Bed Delineations of Invasive Species Near Marten Creek & NOX-31 on Noxon Reservoir**

*Aerial Site Map - 2017 AIS Survey Sanders County*

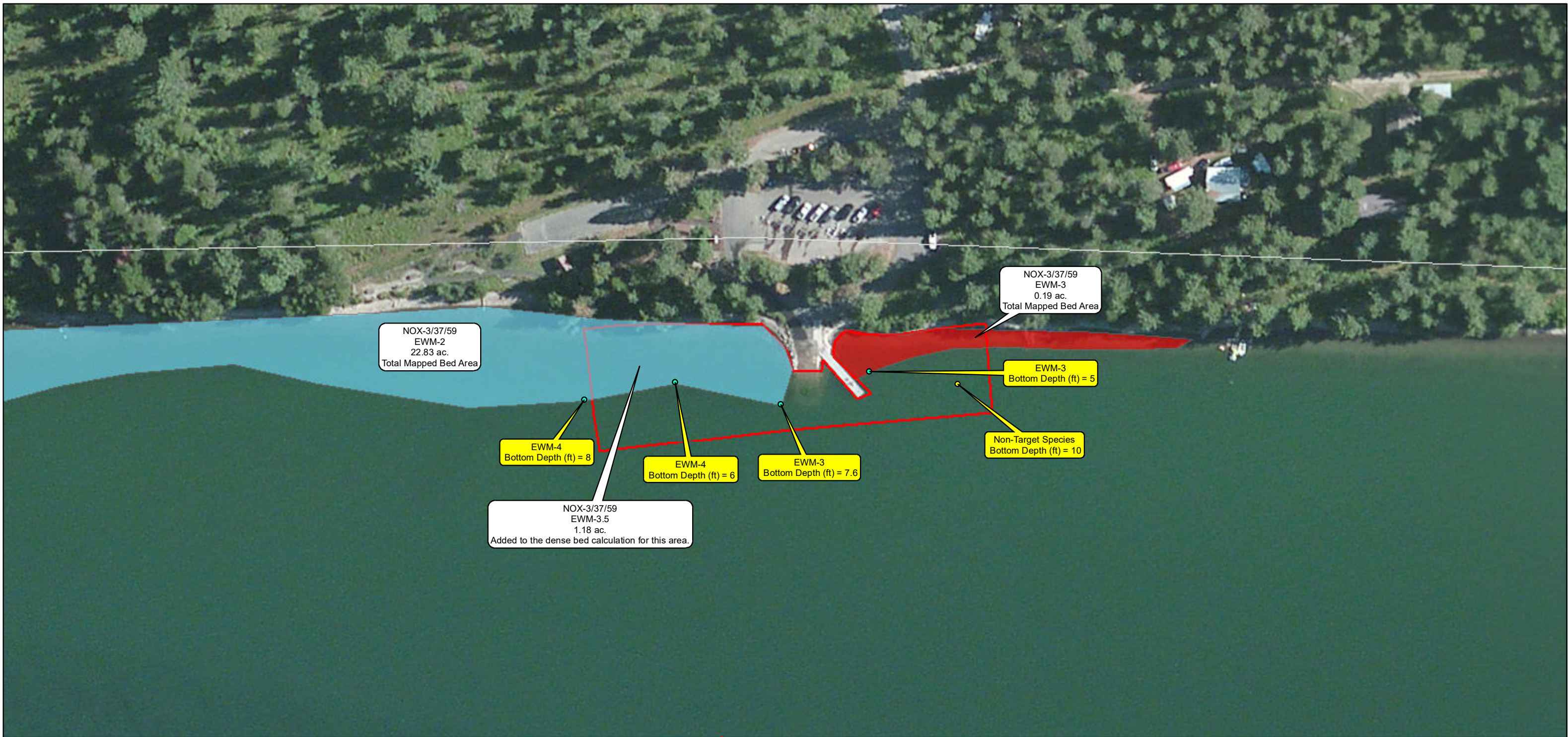
Job#: SandersM01  
 Date: 11/22/2017

**FIGURE 2**

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**Legend**

- Rake Toss Points with Eurasian watermilfoil
- Rake Toss Points
- Dense Eurasian watermilfoil beds
- Low density or non-target sp. beds
- Boat Launch Survey Area
- Noxon Rapids Reservoir

Note:  
EWM = Eurasian watermilfoil  
CLPW = curlyleaf pondweed  
FR = flowering rush

Density was quantified by recording the amount of invasive species vegetation covering the sampling implement during each tatch rake toss using a scale from 1-5, with 5 representing 100% coverage.

0 50 100 200 300  
Feet

Priority Treatment Plot - ID  
Plot Area (ac.)

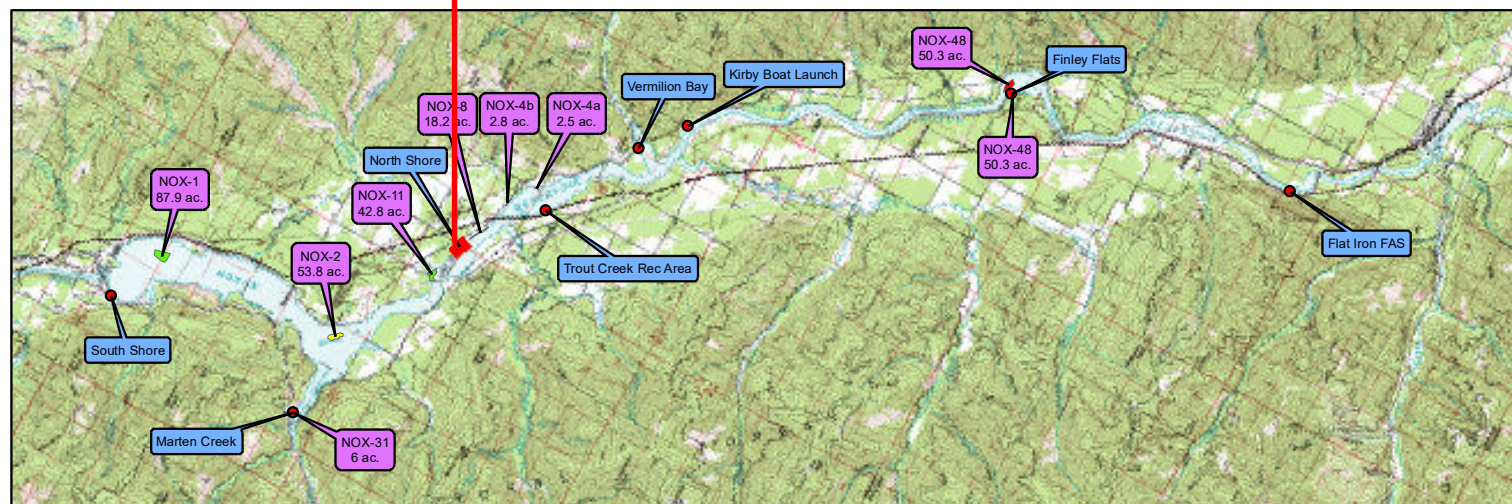
Access Point

2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Inside Survey Area

2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Adjacent to Survey Area

Survey Point Density & Comments  
Bottom Depth (ft)

W N E S



**WET**  
Water & Environmental  
TECHNOLOGIES

**Bed Delineations of Invasive Species  
Near North Shore on Noxon Reservoir**

**Aerial Site Map - 2017 AIS Survey  
Sanders County**

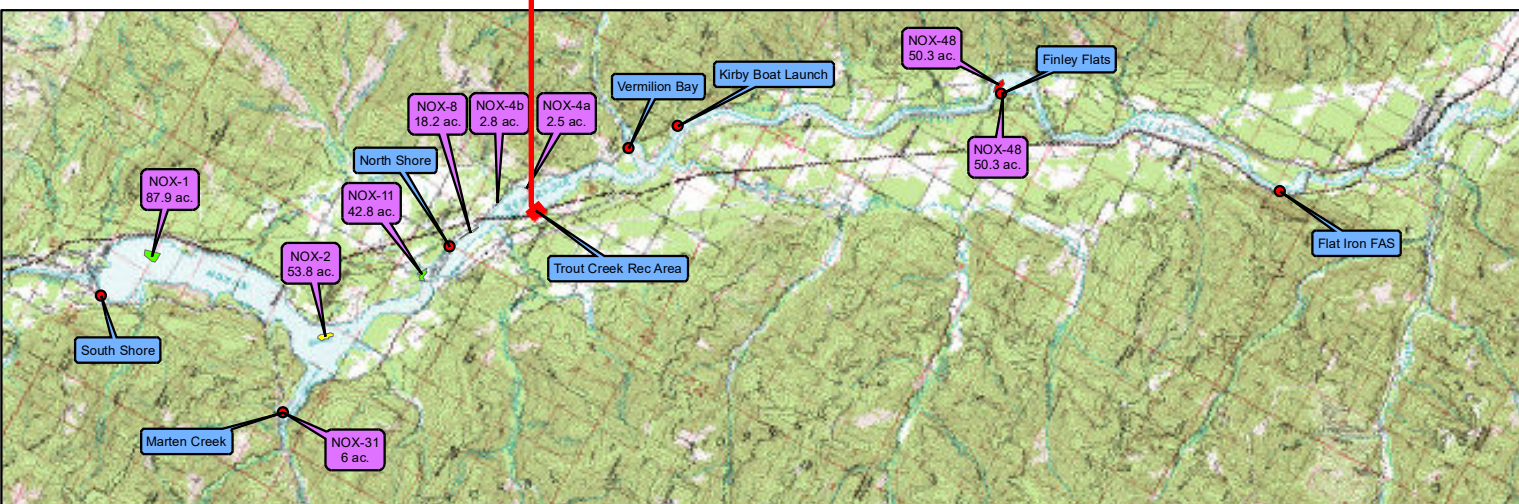
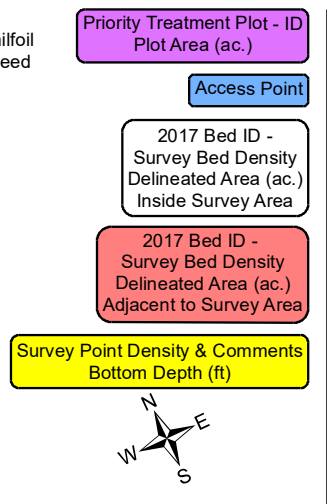
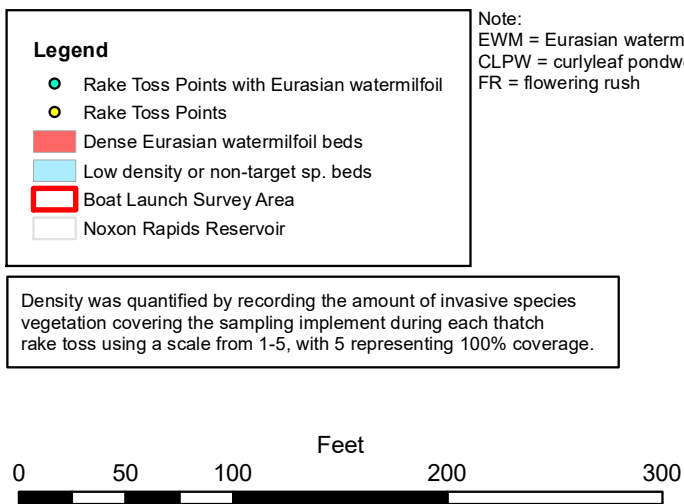
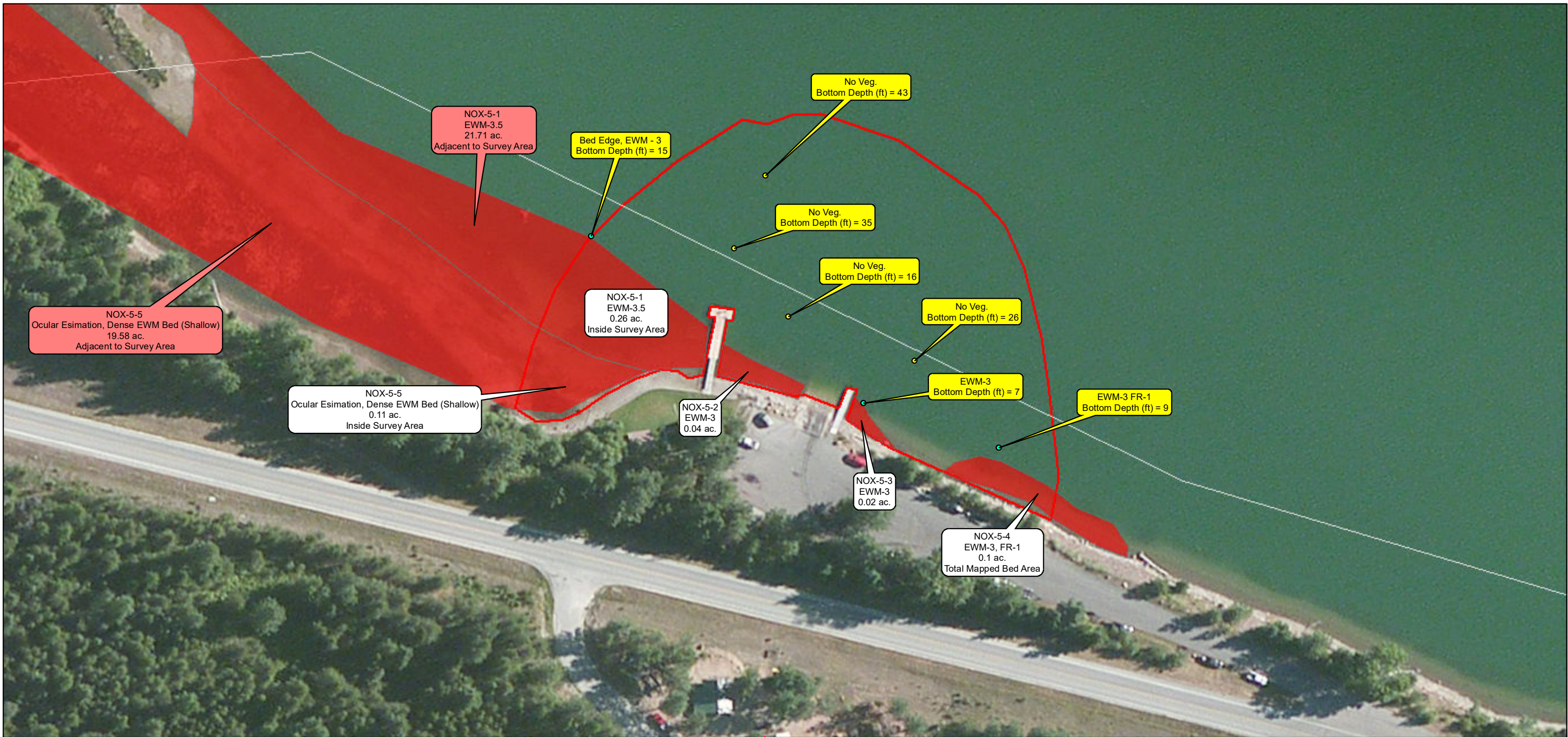
Job#: SandersM01

Date: 11/22/2017

Path: M:\AIS - Aquatic Vegetation Monitoring - Sanders County\X\_Figure\_3\_North\_Shore.mxd, Author: jsloum

**FIGURE 3**





**WET**  
Water & Environmental  
TECHNOLOGIES

**Bed Delineations of Invasive Species  
Near Trout Creek on Noxon Reservoir**

**Aerial Site Map - 2017 AIS Survey  
Sanders County**

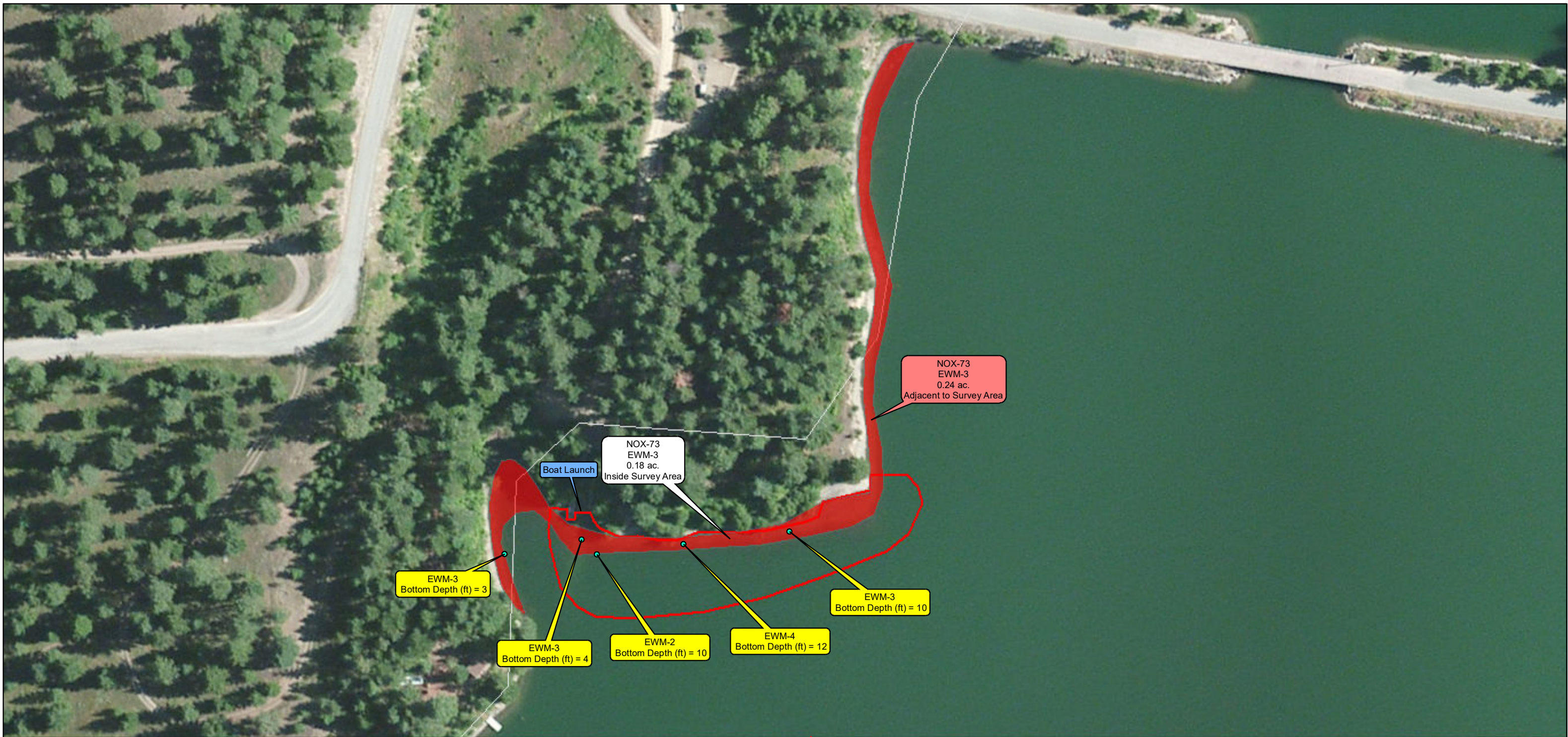
Job#: SandersM01

Date: 11/22/2017

Path: M:\AIS - Aquatic Vegetation Monitoring - Sanders County\X\_Figure\_4\_Trout\_Creek.mxd, Author: jslocum

**FIGURE 4**





**Legend**

- Rake Toss Points with Eurasian watermilfoil
- Rake Toss Points
- Dense Eurasian watermilfoil beds
- Low density or non-target sp. beds
- Boat Launch Survey Area
- Noxon Rapids Reservoir

Note:  
EWM = Eurasian watermilfoil  
CLPW = curlyleaf pondweed  
FR = flowering rush

Density was quantified by recording the amount of invasive species vegetation covering the sampling implement during each hatch rake toss using a scale from 1-5, with 5 representing 100% coverage.

0 50 100 200 300  
Feet

Priority Treatment Plot - ID  
Plot Area (ac.)

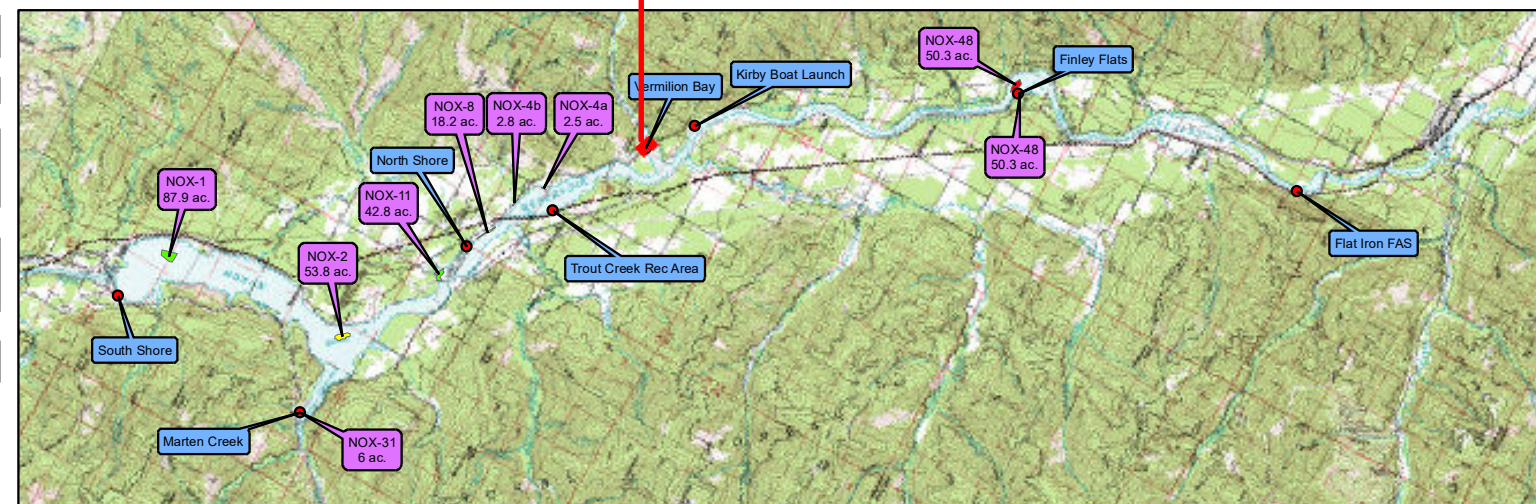
Access Point

2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Inside Survey Area

2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Adjacent to Survey Area

Survey Point Density & Comments  
Bottom Depth (ft)

W N E  
S



**WET**  
Water & Environmental  
TECHNOLOGIES

**Bed Delineations of Invasive Species  
Near Vermilion Bay on Noxon Reservoir**

**Aerial Site Map - 2017 AIS Survey  
Sanders County**

Job#: SandersM01

Date: 11/22/2017

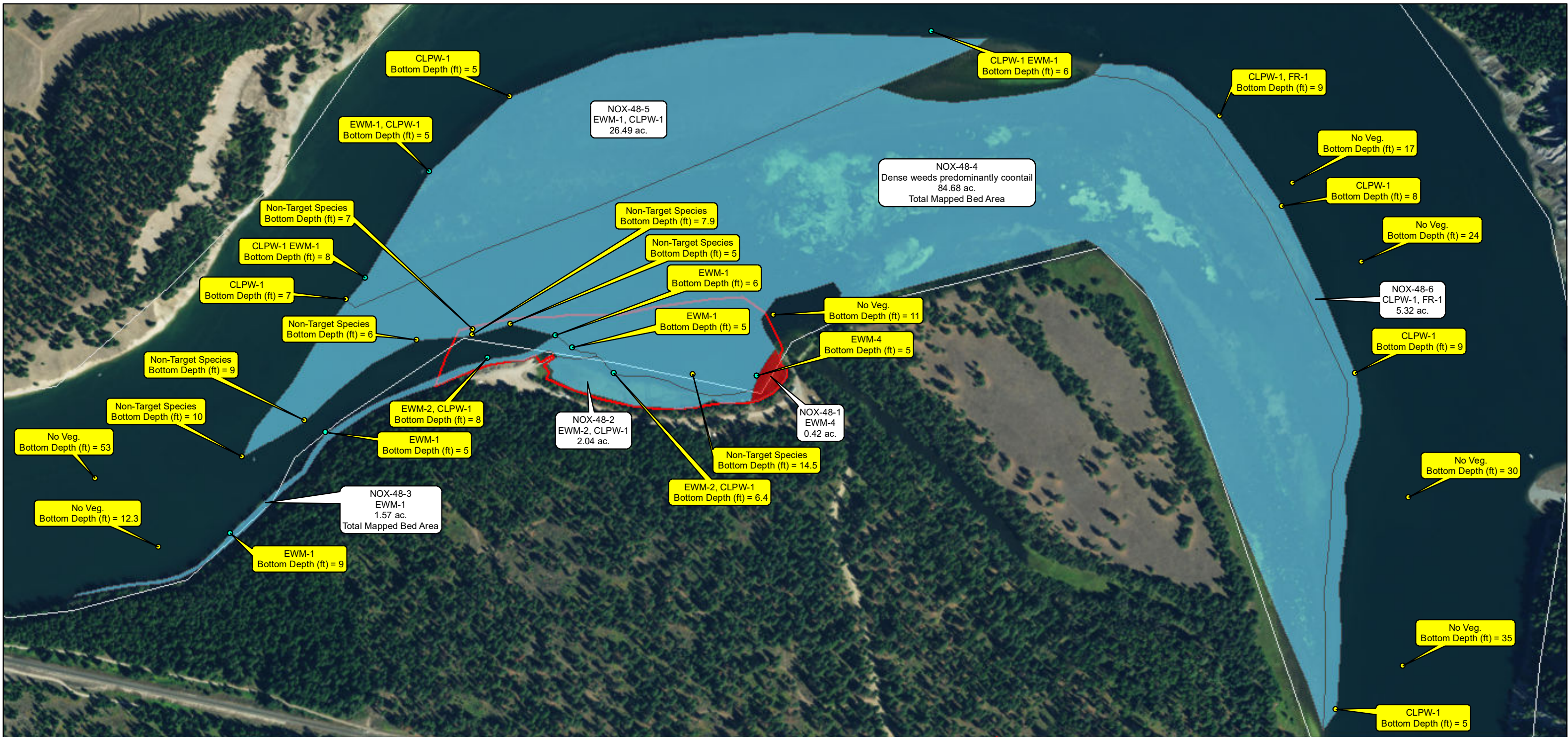
Path: M:\AIS - Aquatic Vegetation Monitoring - Sanders County\X\_Figure\_5\_Vermilion Bay.mxd, Author: jslocum

**FIGURE 5**









**Legend**

- Rake Toss Points with Eurasian watermilfoil
- Rake Toss Points
- Dense Eurasian watermilfoil beds
- Low density or non-target sp. beds
- Boat Launch Survey Area
- Noxon Rapids Reservoir

Note:  
 EWM = Eurasian watermilfoil  
 CLPW = curlyleaf pondweed  
 FR = flowering rush

Density was quantified by recording the amount of invasive species vegetation covering the sampling implement during each hatch rake toss using a scale from 1-5, with 5 representing 100% coverage.

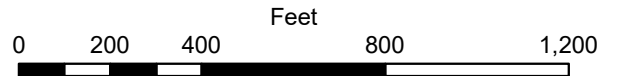
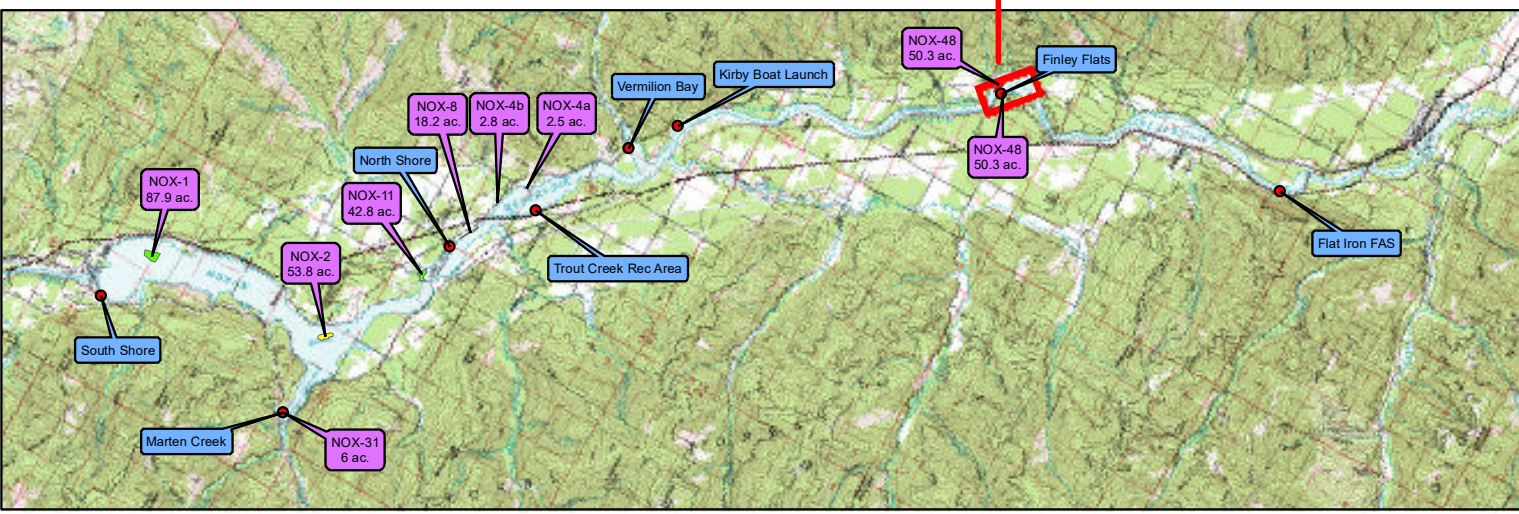
Priority Treatment Plot - ID  
 Plot Area (ac.)

Access Point

2017 Bed ID -  
 Survey Bed Density Delineated Area (ac.)  
 Inside Survey Area

2017 Bed ID -  
 Survey Bed Density Delineated Area (ac.)  
 Adjacent to Survey Area

Survey Point Density & Comments  
 Bottom Depth (ft)



**Bed Delineations of Invasive Species Near Finley Flats & NOX-48 on Noxon Reservoir**

*Aerial Site Map - 2017 AIS Survey  
 Sanders County*

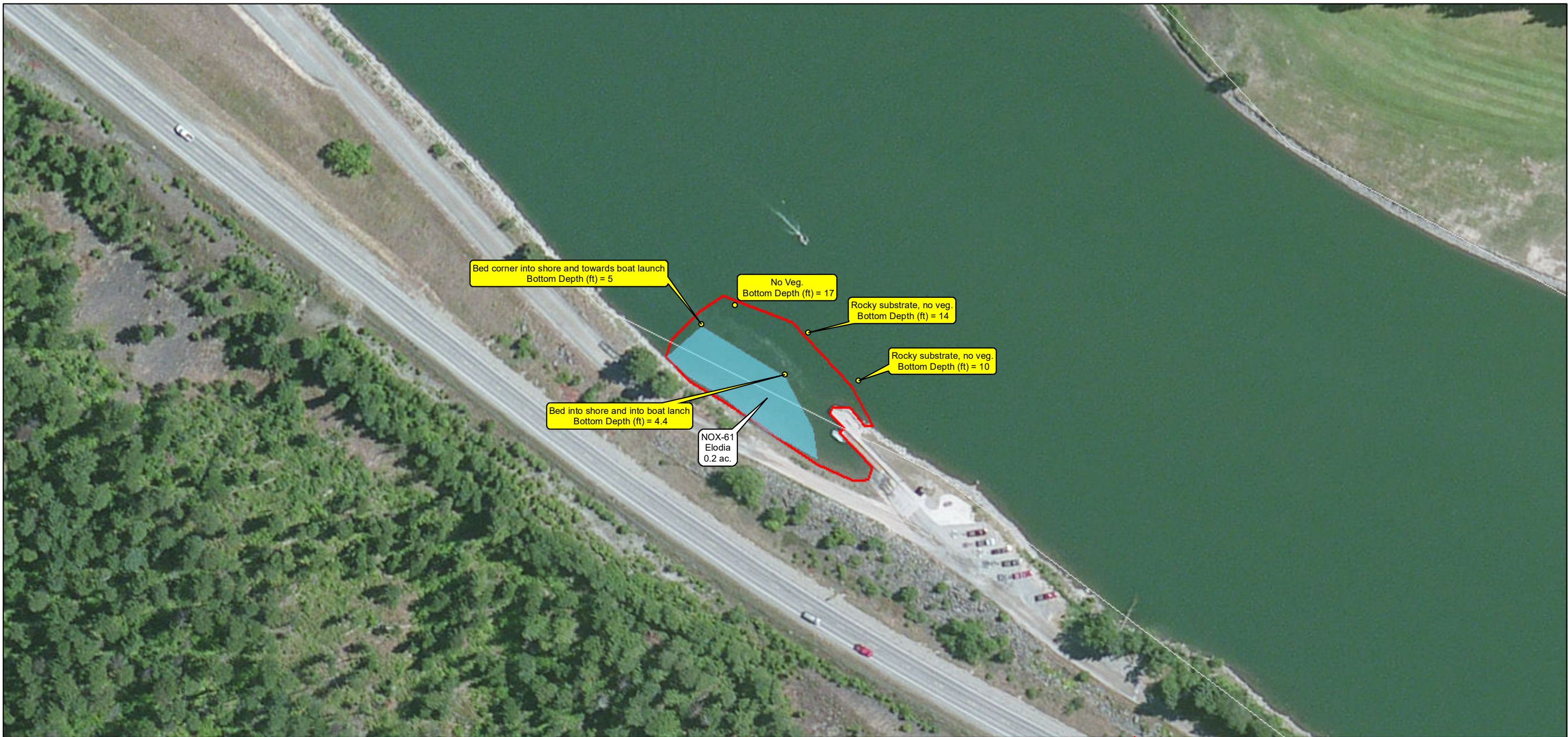
Job#: SandersM01

Date: 11/22/2017

**FIGURE 7**

Path: M:\AIS - Aquatic Vegetation Monitoring - Sanders County\X\_Figure\_7\_Finley\_Flats.mxd, Author: jslocum





**Legend**

- Rake Toss Points with Eurasian watermilfoil
- Rake Toss Points
- Dense Eurasian watermilfoil beds
- Low density or non-target sp. beds
- Boat Launch Survey Area
- Noxon Rapids Reservoir

Note:  
EWM = Eurasian watermilfoil  
CLPW = curlyleaf pondweed  
FR = flowering rush

Density was quantified by recording the amount of invasive species vegetation covering the sampling implement during each thatch rake toss using a scale from 1-5, with 5 representing 100% coverage.

0 50 100 200 300  
Feet

Priority Treatment Plot - ID  
Plot Area (ac.)

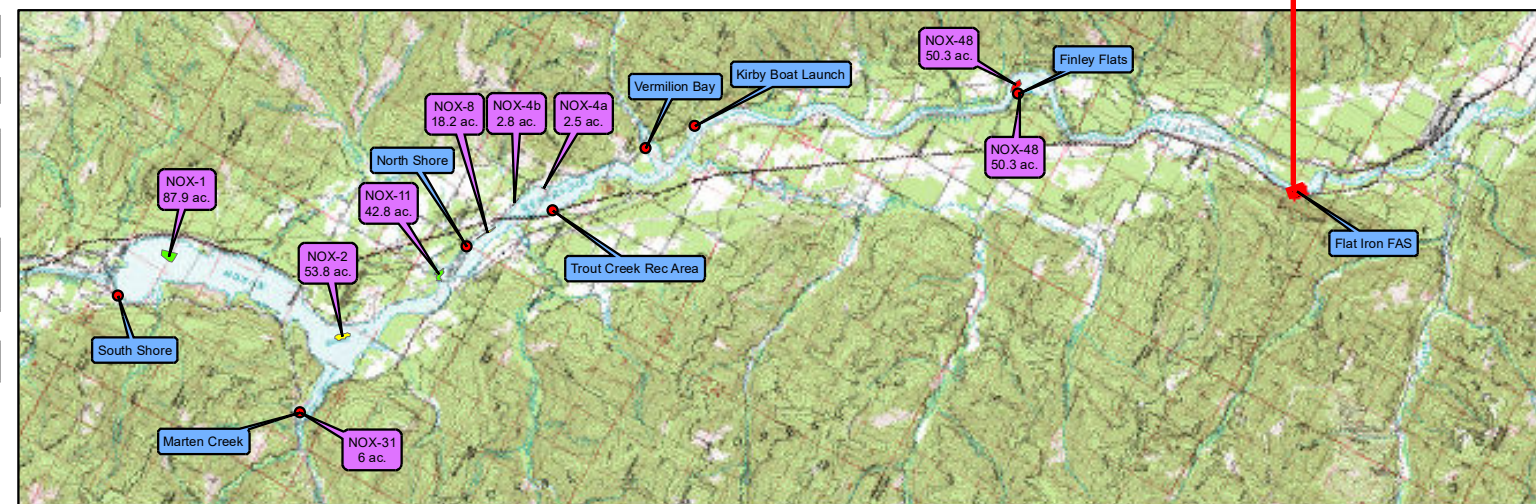
Access Point

2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Inside Survey Area

2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Adjacent to Survey Area

Survey Point Density & Comments  
Bottom Depth (ft)

N  
S  
E  
W



**WET**  
Water & Environmental  
TECHNOLOGIES

**Bed Delineations of Invasive Species  
Near Flat Iron on Noxon Reservoir**

**Aerial Site Map - 2017 AIS Survey  
Sanders County**

Job#: SandersM01

Date: 11/22/2017

Path: M:\AIS - Aquatic Vegetation Monitoring - Sanders County\X\_Figure\_8\_Flat\_Iron.mxd, Author: jslocum

**FIGURE 8**





**Legend**

- Rake Toss Points with Eurasian watermilfoil
- Rake Toss Points
- Dense Eurasian watermilfoil beds
- Low density or non-target sp. beds
- Boat Launch Survey Area
- Noxon Rapids Reservoir

Note:  
 EWM = Eurasian watermilfoil  
 CLPW = curlyleaf pondweed  
 FR = flowering rush

Density was quantified by recording the amount of invasive species vegetation covering the sampling implement during each thatch rake toss using a scale from 1-5, with 5 representing 100% coverage.



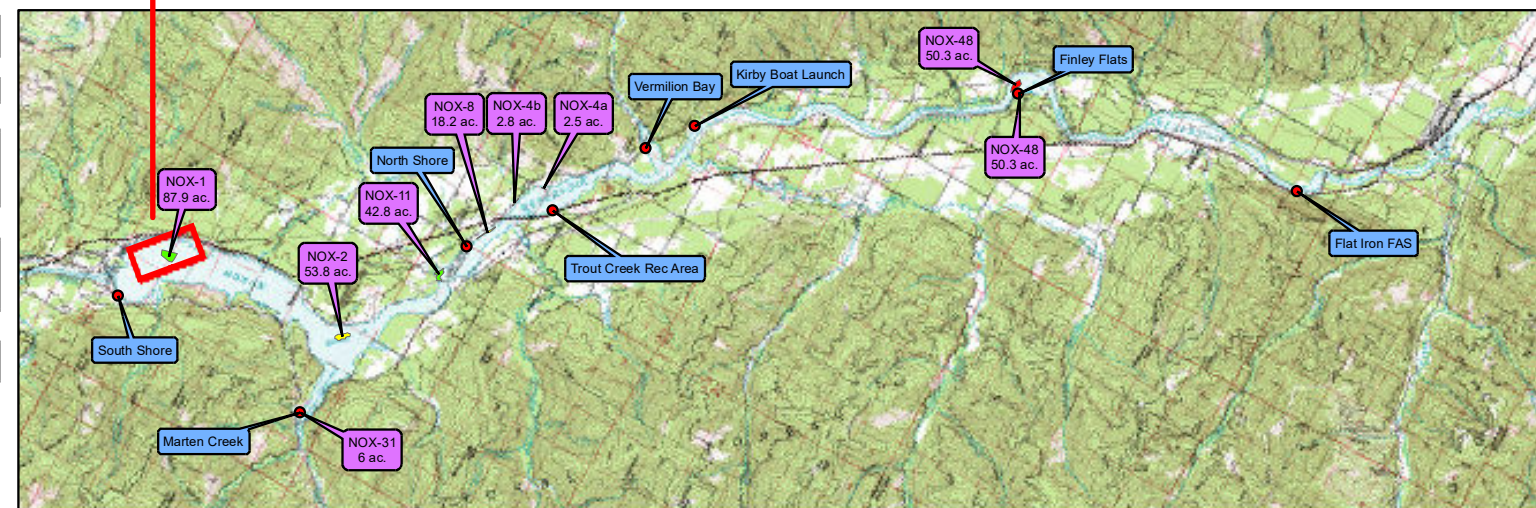
**Priority Treatment Plot - ID**  
 Plot Area (ac.)

**Access Point**

**2017 Bed ID - Survey Bed Density Delineated Area (ac.)**  
 Inside Survey Area

**2017 Bed ID - Survey Bed Density Delineated Area (ac.)**  
 Adjacent to Survey Area

**Survey Point Density & Comments**  
 Bottom Depth (ft)



**Bed Delineations of Invasive Species  
 In Priority Treatment Plot NOX-1 on Noxon**

**Aerial Site Map - 2017 AIS Survey  
 Sanders County**

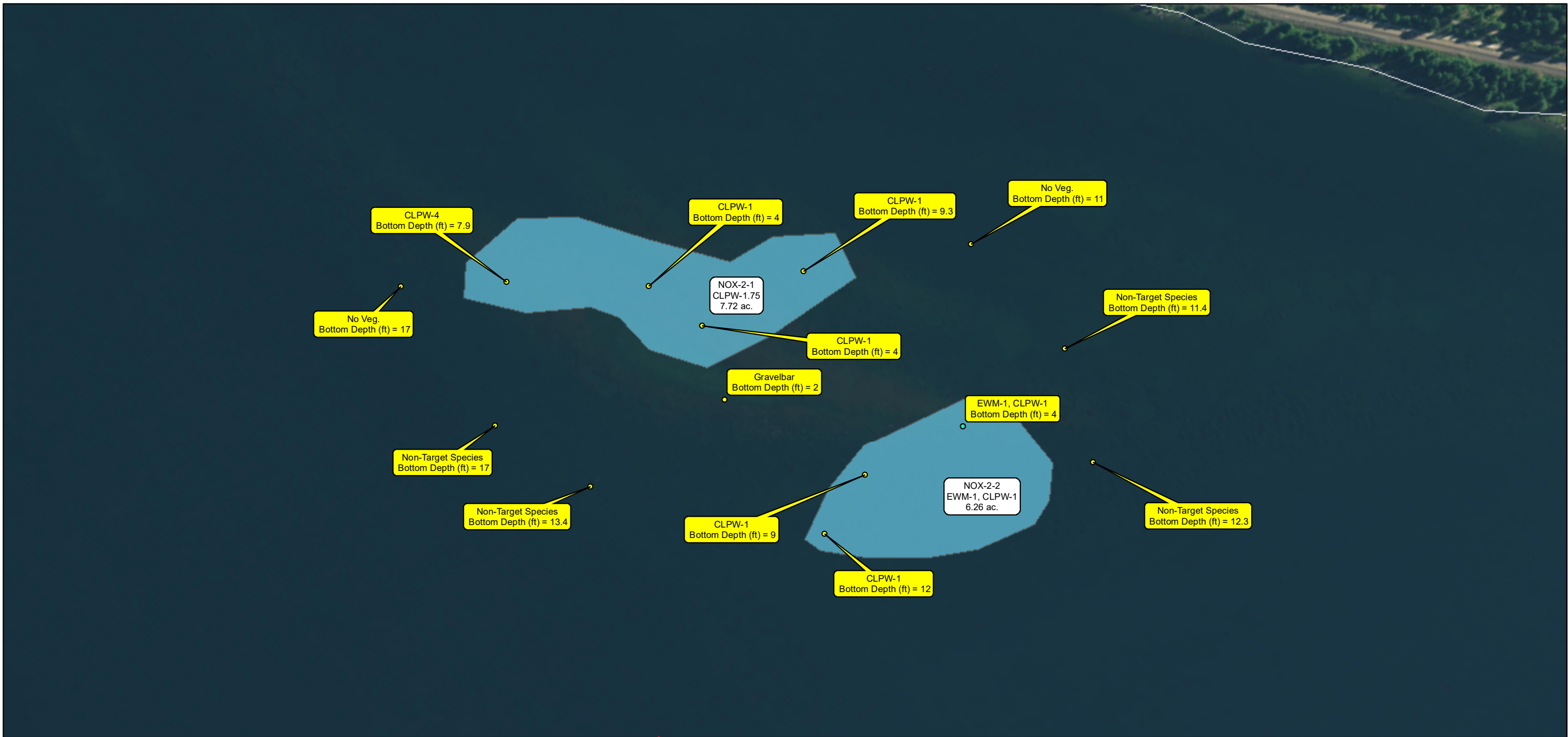
Job#: SandersM01

Date: 11/22/2017

**FIGURE 9**

Path: M:\AIS - Aquatic Vegetation Monitoring - Sanders County\X\_Figure\_9\_NOX\_1.mxd, Author: jsloum





**Bed Delineations of Invasive Species  
 In Priority Treatment Plot NOX-2 on Noxon**

**Aerial Site Map - 2017 AIS Survey  
 Sanders County**

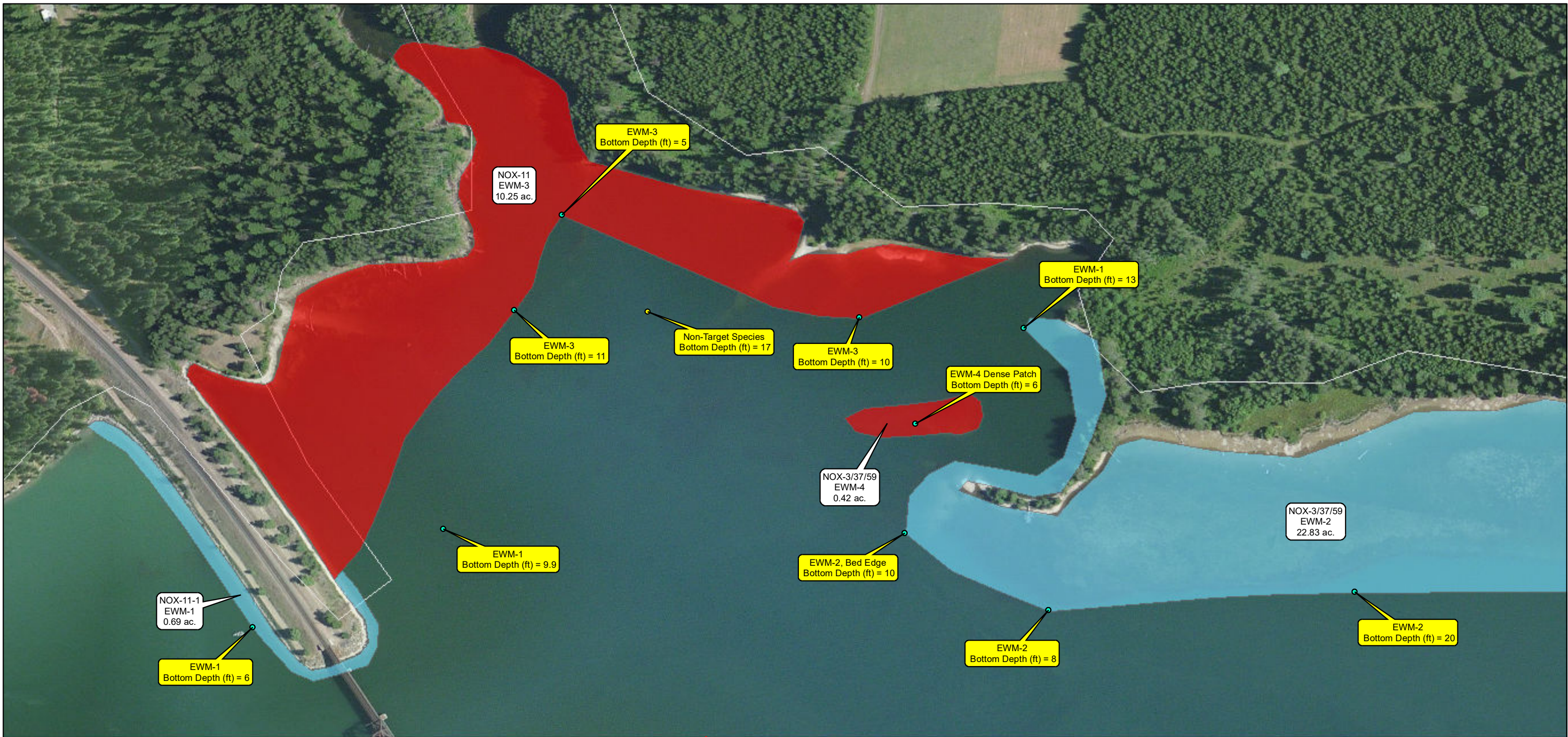
Job#: SandersM01

Date: 11/22/2017

Path: M:\AIS - Aquatic Vegetation Monitoring - Sanders County\X\_Figure\_10\_NOX\_2.mxd, Author: jslocum

**FIGURE 10**





**Legend**

- Rake Toss Points with Eurasian watermilfoil
- Rake Toss Points
- Dense Eurasian watermilfoil beds
- Low density or non-target sp. beds
- Boat Launch Survey Area
- Noxon Rapids Reservoir

Note:  
 EWM = Eurasian watermilfoil  
 CLPW = curlyleaf pondweed  
 FR = flowering rush

Density was quantified by recording the amount of invasive species vegetation covering the sampling implement during each hatch rake toss using a scale from 1-5, with 5 representing 100% coverage.



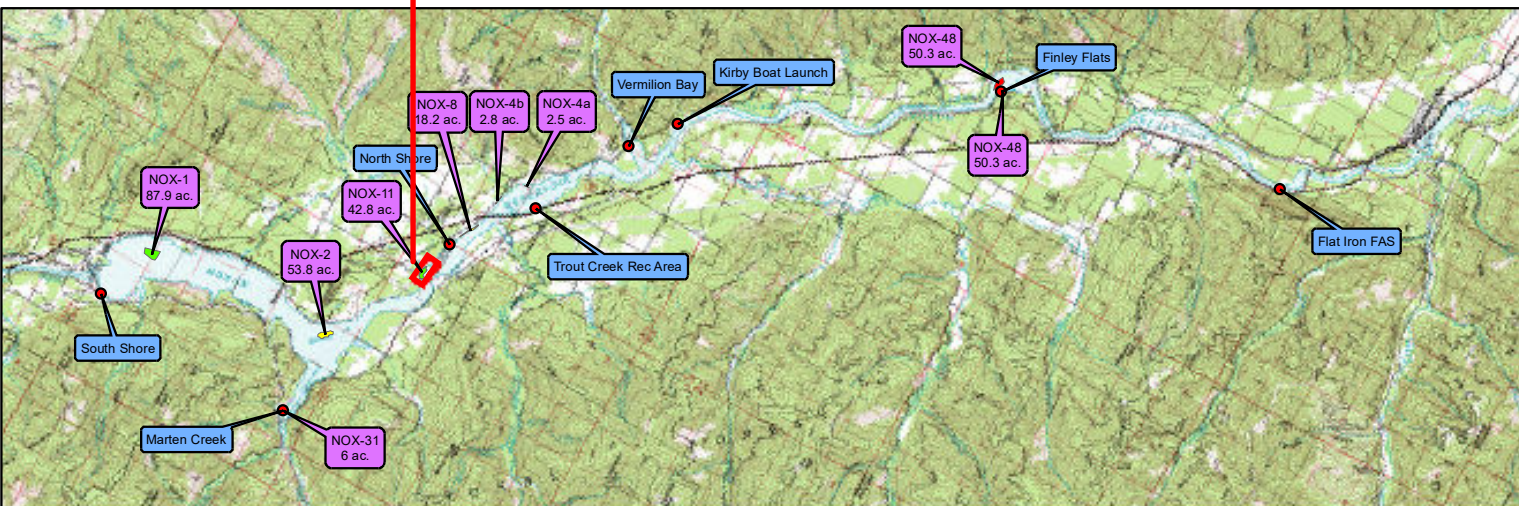
**Priority Treatment Plot - ID**  
 Plot Area (ac.)

**Access Point**

**2017 Bed ID - Survey Bed Density Delineated Area (ac.)**  
 Inside Survey Area

**2017 Bed ID - Survey Bed Density Delineated Area (ac.)**  
 Adjacent to Survey Area

**Survey Point Density & Comments**  
 Bottom Depth (ft)



**Bed Delineations of Invasive Species  
 In Priority Treatment Plot NOX-11 on Noxon**

**Aerial Site Map - 2017 AIS Survey  
 Sanders County**

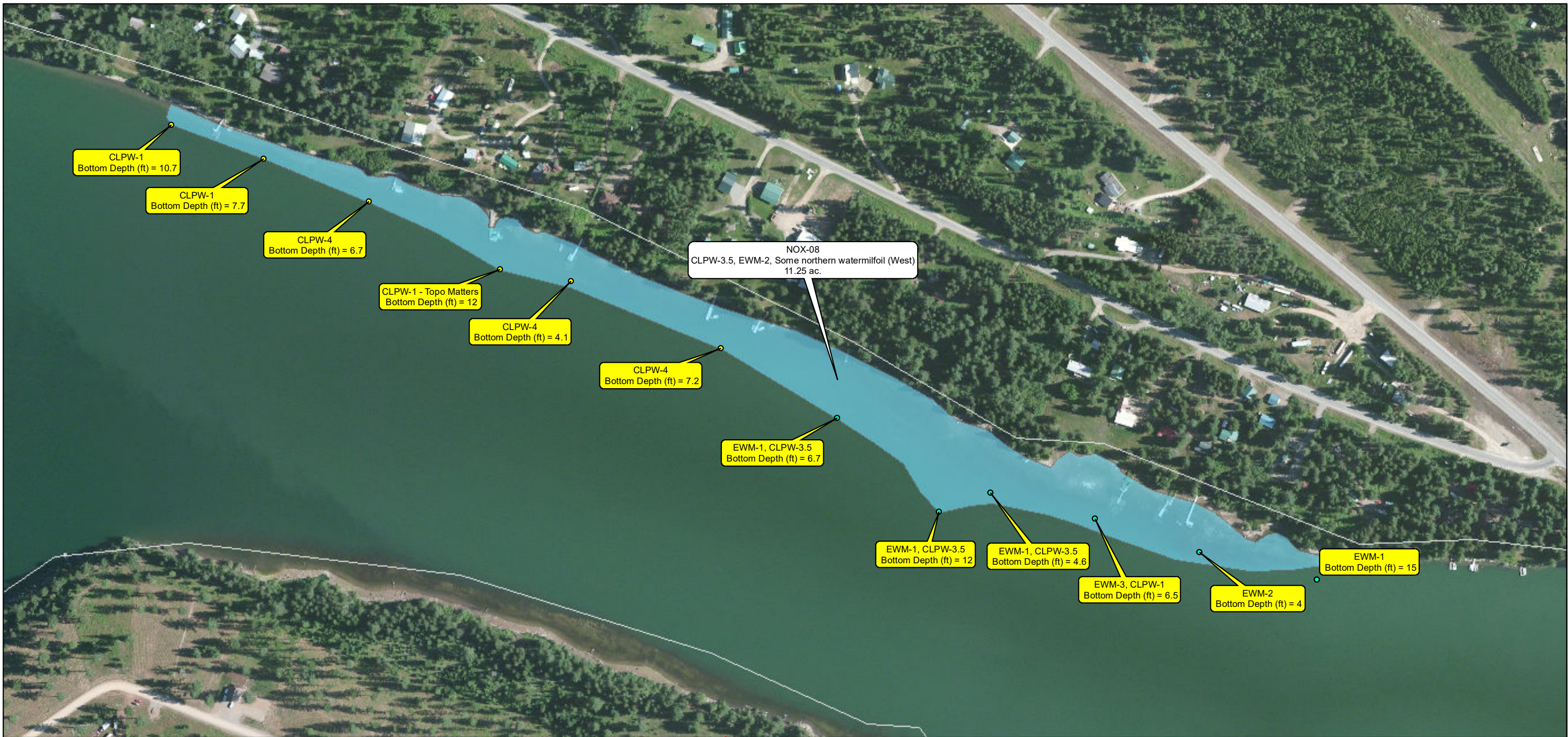
Job#: SandersM01

Date: 11/22/2017

**FIGURE 11**

Path: M:\AIS - Aquatic Vegetation Monitoring - Sanders County\X\_Figure\_11\_NOX\_11.mxd, Author: jsloum





**Legend**

- Rake Toss Points with Eurasian watermilfoil
- Rake Toss Points
- Dense Eurasian watermilfoil beds
- Low density or non-target sp. beds
- Boat Launch Survey Area
- Noxon Rapids Reservoir

Note:  
 EWM = Eurasian watermilfoil  
 CLPW = curlyleaf pondweed  
 FR = flowering rush

Density was quantified by recording the amount of invasive species vegetation covering the sampling implement during each thatch rake toss using a scale from 1-5, with 5 representing 100% coverage.

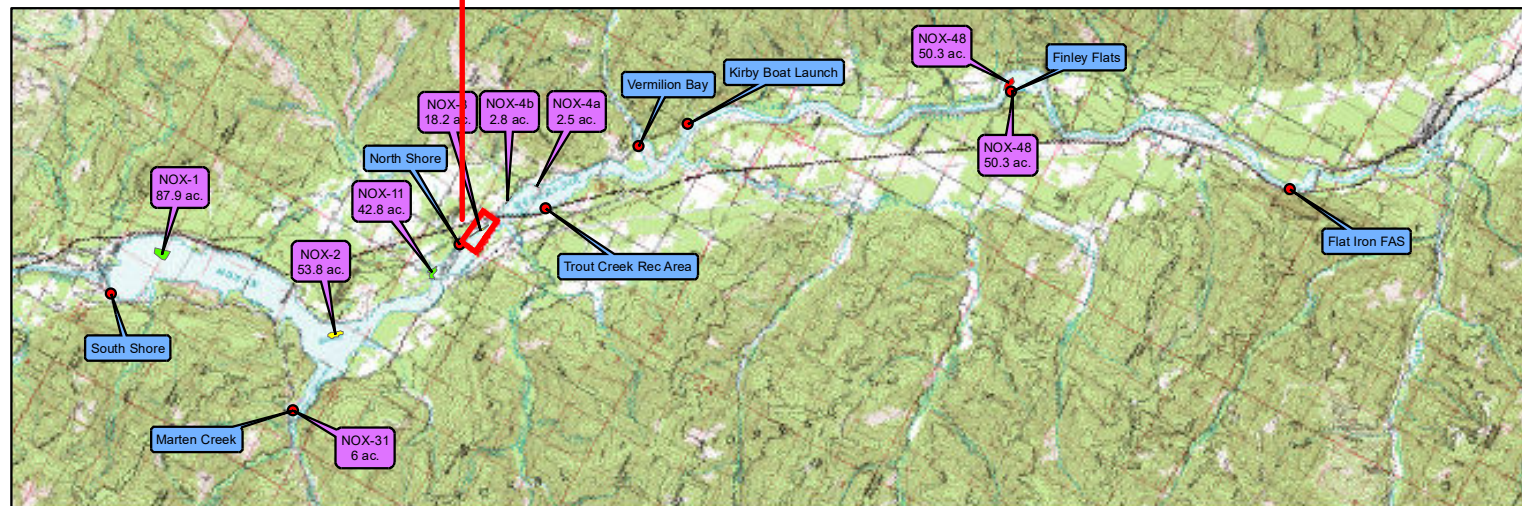
Priority Treatment Plot - ID  
 Plot Area (ac.)

Access Point

2017 Bed ID -  
 Survey Bed Density  
 Delineated Area (ac.)  
 Inside Survey Area

2017 Bed ID -  
 Survey Bed Density  
 Delineated Area (ac.)  
 Adjacent to Survey Area

Survey Point Density & Comments  
 Bottom Depth (ft)



**Bed Delineations of Invasive Species  
 In Priority Treatment Plot NOX-8 on Noxon**

*Aerial Site Map - 2017 AIS Survey  
 Sanders County*

Job#: SandersM01  
 Date: 11/22/2017

**FIGURE 12**

Path: M:\AIS - Aquatic Vegetation Monitoring - Sanders County\X\_Figure\_12\_NOX\_8.mxd, Author: jslorum





**Legend**

- Rake Toss Points with Eurasian watermilfoil
- Rake Toss Points
- Dense Eurasian watermilfoil beds
- Low density or non-target sp. beds
- Boat Launch Survey Area
- Noxon Rapids Reservoir

Note:  
EWM = Eurasian watermilfoil  
CLPW = curlyleaf pondweed  
FR = flowering rush

Density was quantified by recording the amount of invasive species vegetation covering the sampling implement during each tatch rake toss using a scale from 1-5, with 5 representing 100% coverage.

0 250 500 1,000 1,500 Feet

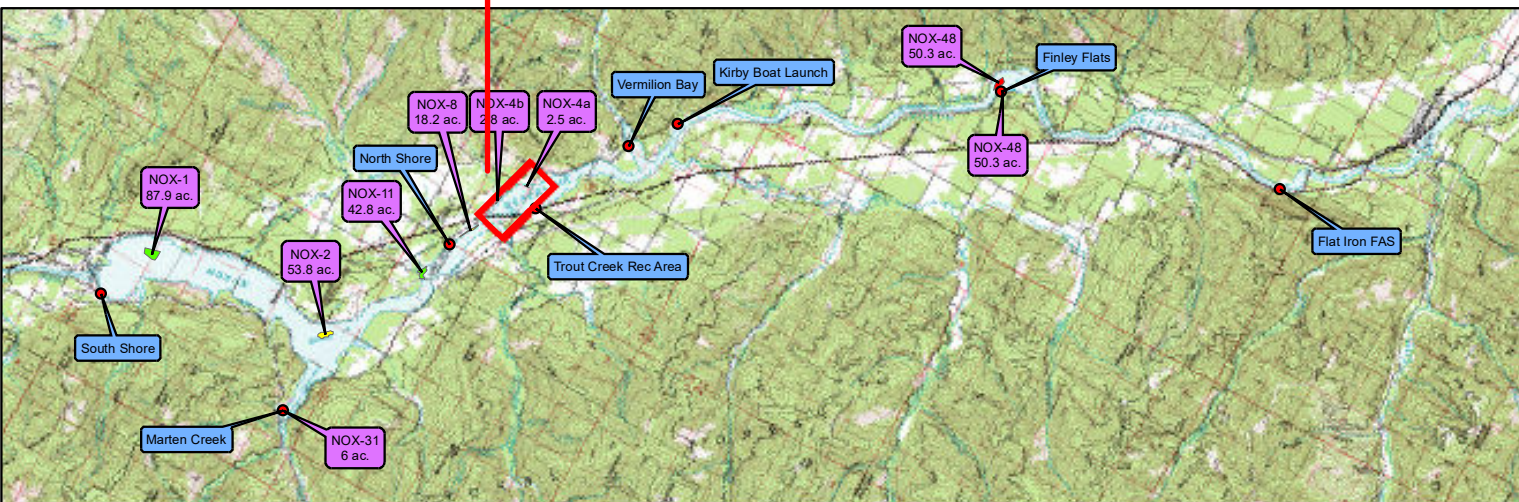
Priority Treatment Plot - ID  
Plot Area (ac.)

Access Point

2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Inside Survey Area

2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Adjacent to Survey Area

Survey Point Density & Comments  
Bottom Depth (ft)



**WET**  
Water & Environmental  
TECHNOLOGIES

**Bed Delineations of Invasive Species  
In Priority Treatment Plots NOX-4A & 4B on Noxon**

**Aerial Site Map - 2017 AIS Survey  
Sanders County**

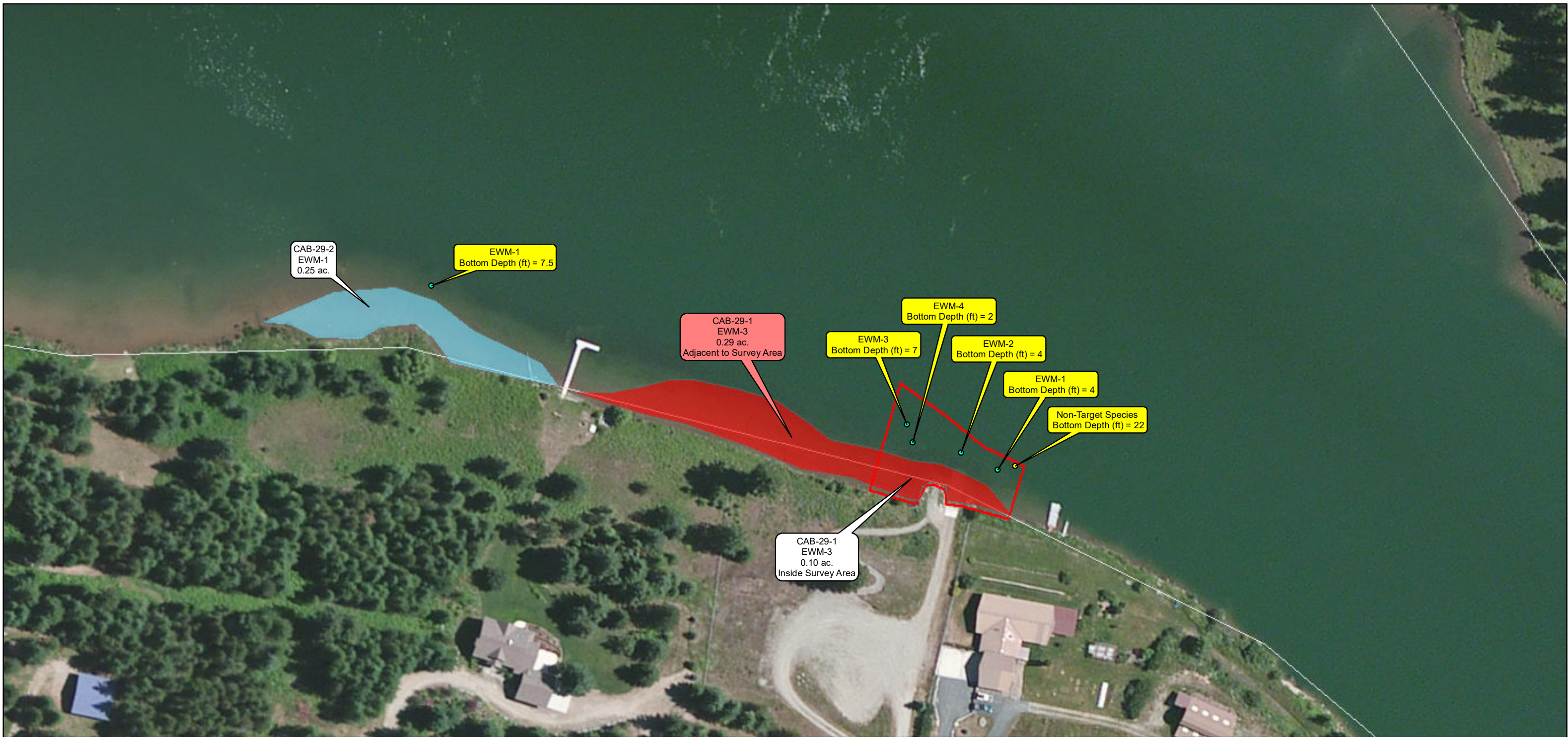
Job#: SandersM01

Date: 11/22/2017

**FIGURE 13**

Path: M:\AIS - Aquatic Vegetation Monitoring - Sanders County\X\_Figure\_13\_NOX\_4.mxd, Author: jslocum





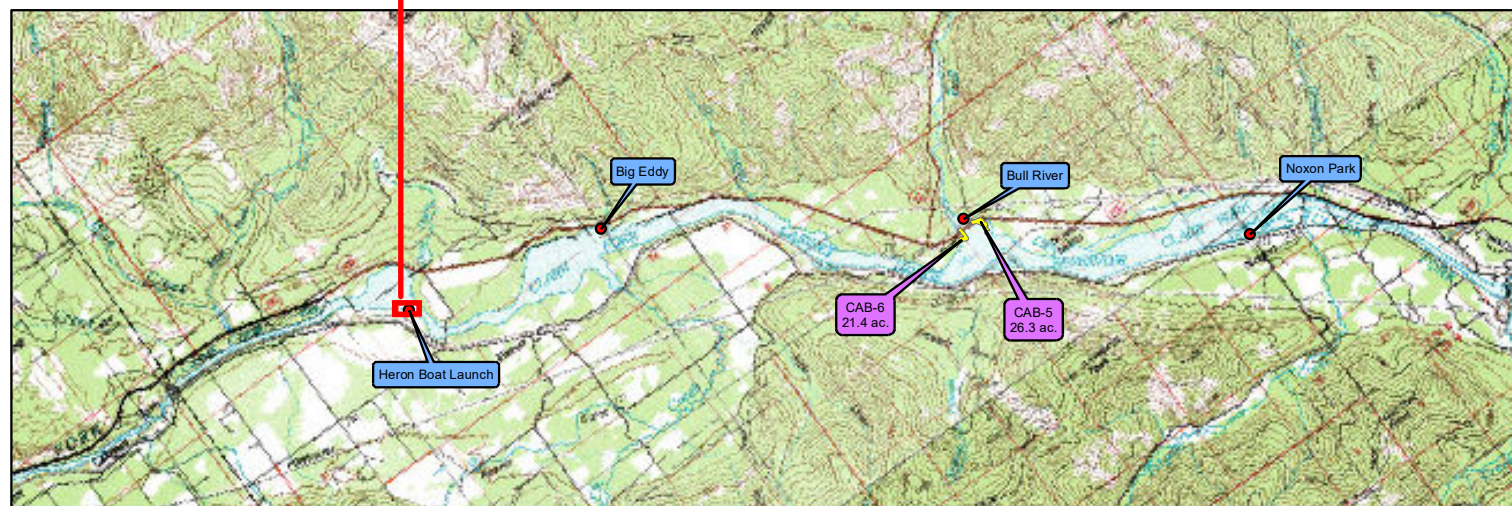
**Priority Treatment Plot - ID**  
 Plot Area (ac.)

**Access Point**

**2017 Bed ID - Survey Bed Density Delineated Area (ac.)**  
 Inside Survey Area

**2017 Bed ID - Survey Bed Density Delineated Area (ac.)**  
 Adjacent to Survey Area

**Survey Point Density & Comments**  
 Bottom Depth (ft)



**Bed Delineations of Invasive Species  
 Near Heron Access on Cabinet Gorge Reservoir**

**Aerial Site Map - 2017 AIS Survey  
 Sanders County**

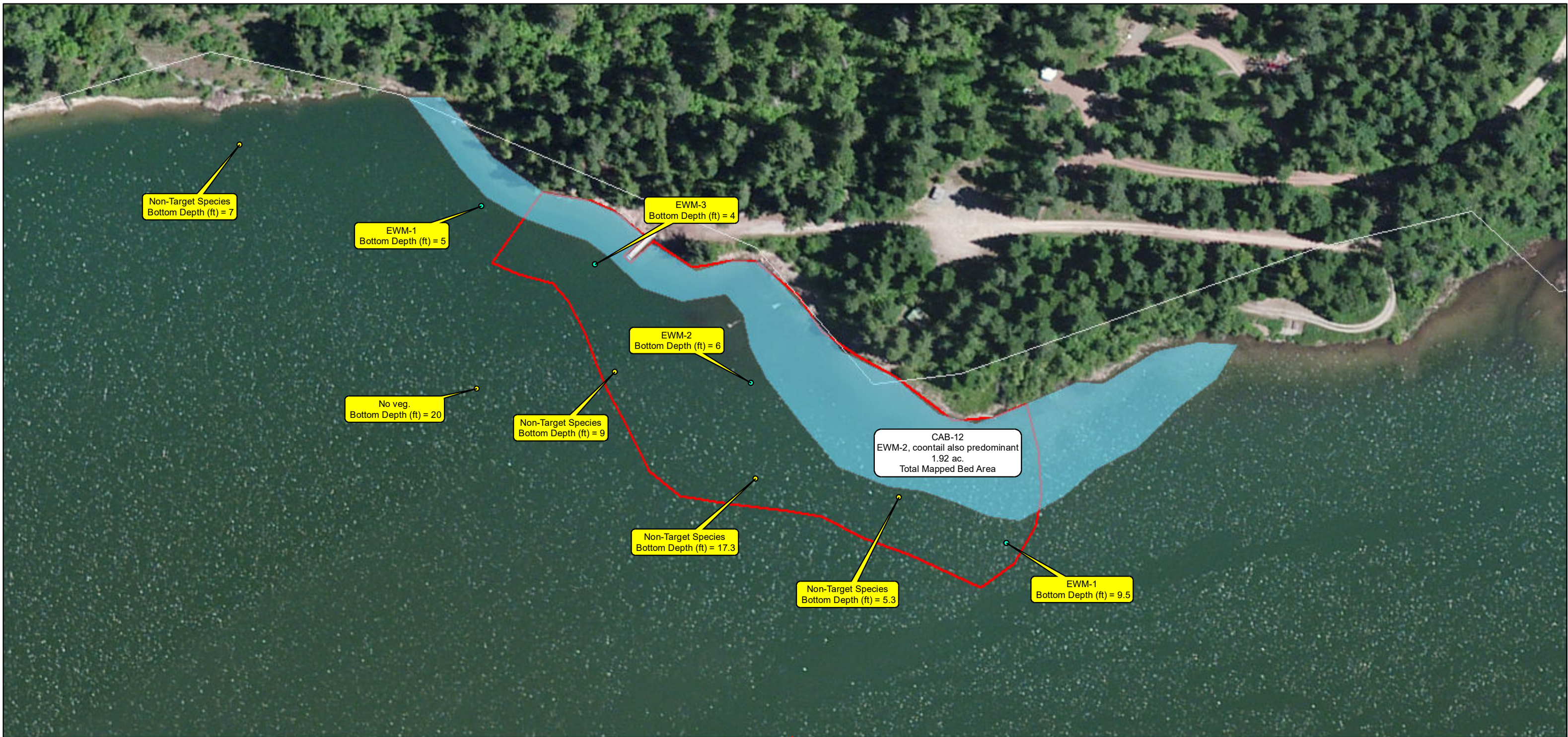
Job#: SandersM01

Date: 11/22/2017

Path: M:\AIS - Aquatic Vegetation Monitoring - Sanders County\X\_Figure\_14\_Heron.mxd, Author: jsloum

**FIGURE 14**





**Legend**

- Rake Toss Points with Eurasian watermilfoil
- Rake Toss Points
- Dense Eurasian watermilfoil beds
- Low density or non-target sp. beds
- Boat Launch Survey Area
- Cabinet Gorge Reservoir

Note:  
EWM = Eurasian watermilfoil  
CLPW = curlyleaf pondweed  
FR = flowering rush

Priority Treatment Plot - ID  
Plot Area (ac.)

Access Point

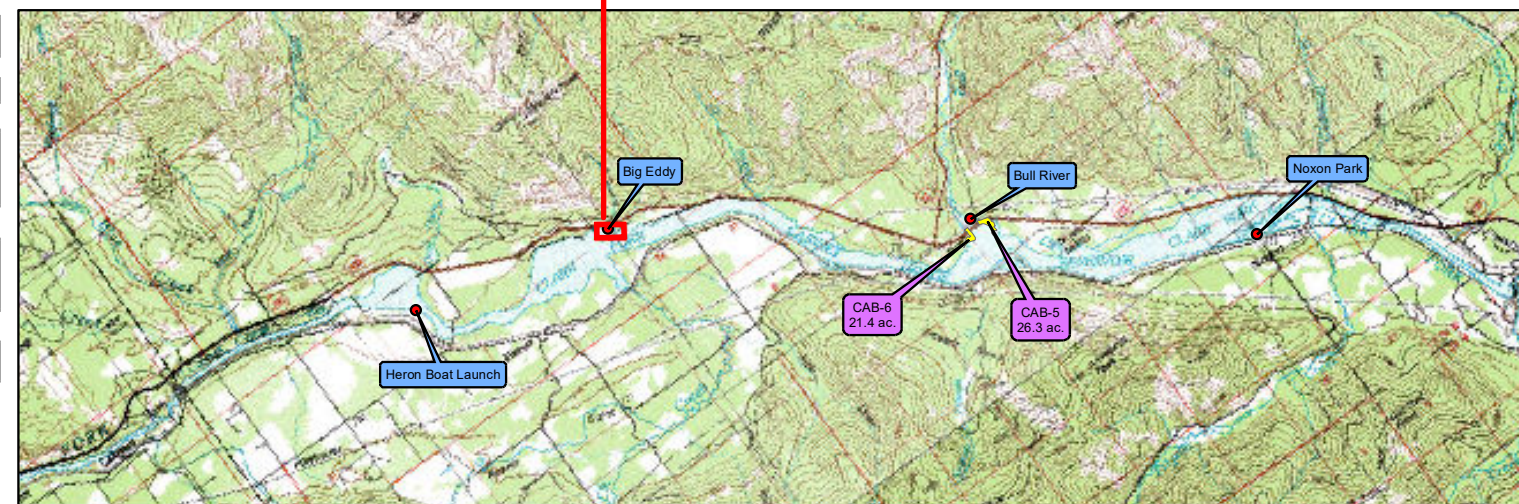
2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Inside Survey Area

2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Adjacent to Survey Area

Survey Point Density & Comments  
Bottom Depth (ft)

Density was quantified by recording the amount of invasive species vegetation covering the sampling implement during each hatch rake toss using a scale from 1-5, with 5 representing 100% coverage.

0 50 100 200 300  
Feet



**Bed Delineations of Invasive Species  
Near Big Eddy on Cabinet Gorge Reservoir**

**Aerial Site Map - 2017 AIS Survey  
Sanders County**

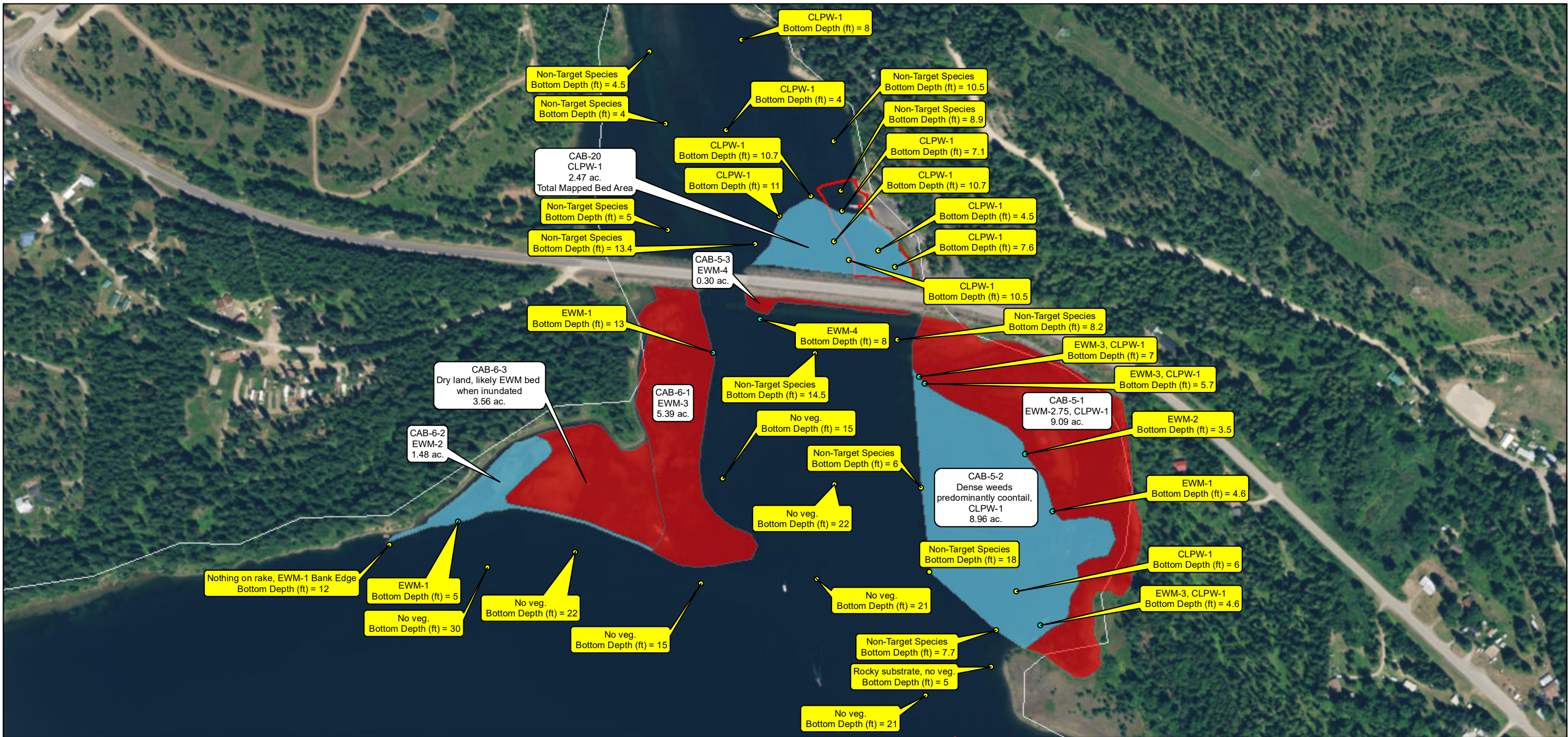
Job#: SandersM01

Date: 11/22/2017

Path: M:\AIS - Aquatic Vegetation Monitoring - Sanders County\X\_Figure\_15\_BigEddy.mxd, Author: jslocum

**FIGURE 15**





**Legend**

- Rake Toss Points with Eurasian watermilfoil
- Rake Toss Points
- Dense Eurasian watermilfoil beds
- Low density or non-target sp. beds
- Boat Launch Survey Area
- Cabinet Gorge Reservoir

Note:  
EWM = Eurasian watermilfoil  
CLPW = curlyleaf pondweed  
FR = flowering rush

Priority Treatment Plot - ID  
Plot Area (ac.)

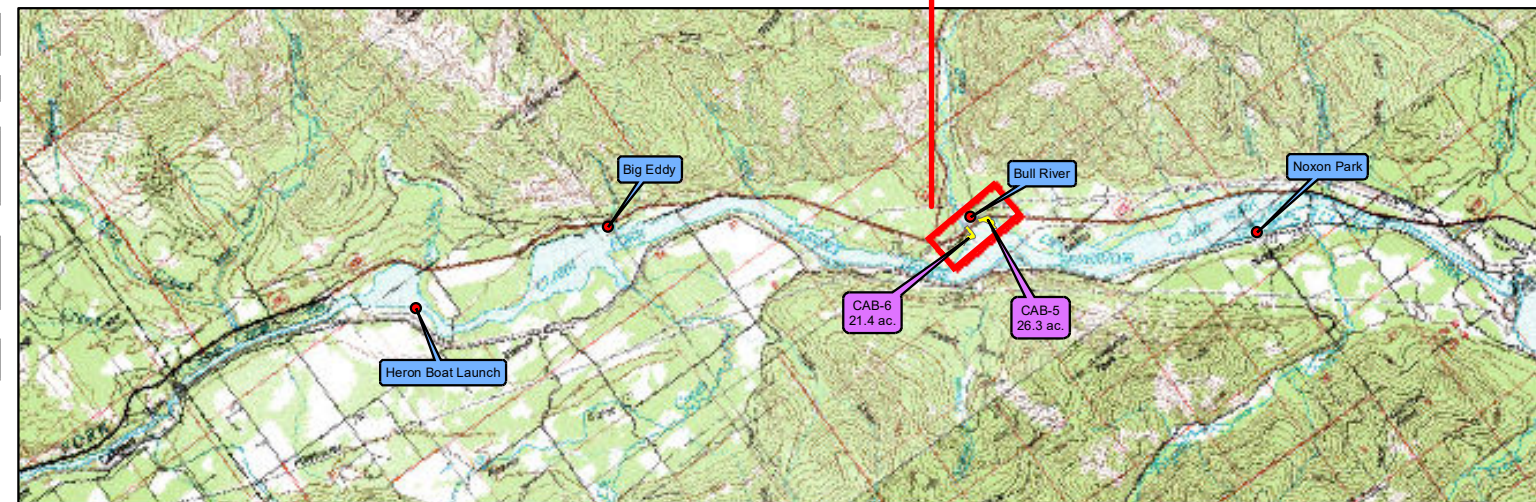
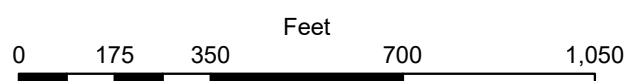
Access Point

2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Inside Survey Area

2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Adjacent to Survey Area

Survey Point Density & Comments  
Bottom Depth (ft)

Density was quantified by recording the amount of invasive species vegetation covering the sampling implement during each tatch rake toss using a scale from 1-5, with 5 representing 100% coverage.



**Bed Delineations of Invasive Species Near Bull River & CAB-5 & 6 on Cabinet Gorge Reservoir**

**Aerial Site Map - 2017 AIS Survey Sanders County**

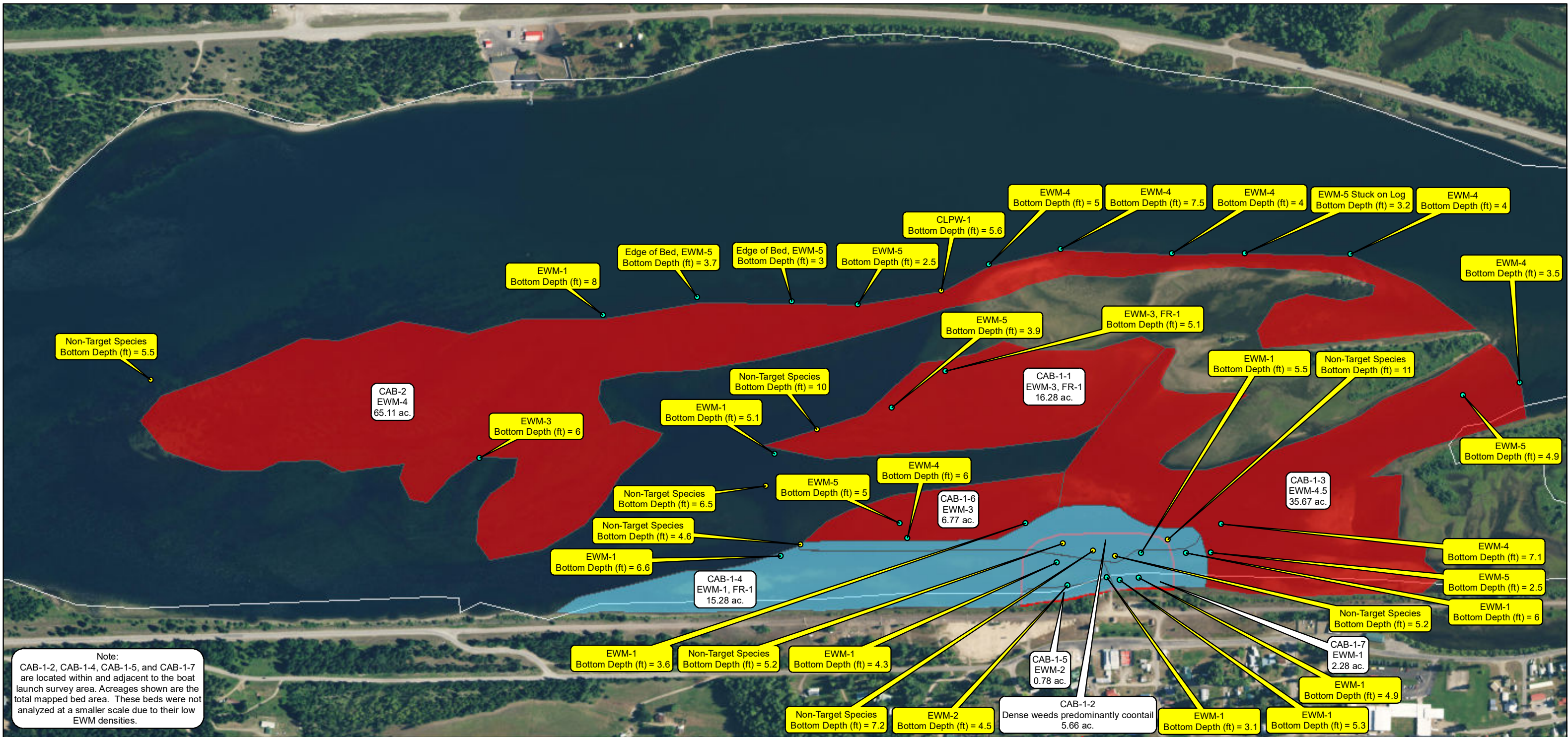
Job#: SandersM01

Date: 11/22/2017

**FIGURE 16**

Path: M:\AIS - Aquatic Vegetation Monitoring - Sanders County\X\_Figure\_16\_BullRiver.mxd, Author: jsloum





**Legend**

- Rake Toss Points with Eurasian watermilfoil
- Rake Toss Points
- Dense Eurasian watermilfoil beds
- Low density or non-target sp. beds
- Boat Launch Survey Area
- Cabinet Gorge Reservoir

Note:  
EWM = Eurasian watermilfoil  
CLPW = curlyleaf pondweed  
FR = flowering rush

Priority Treatment Plot - ID  
Plot Area (ac.)

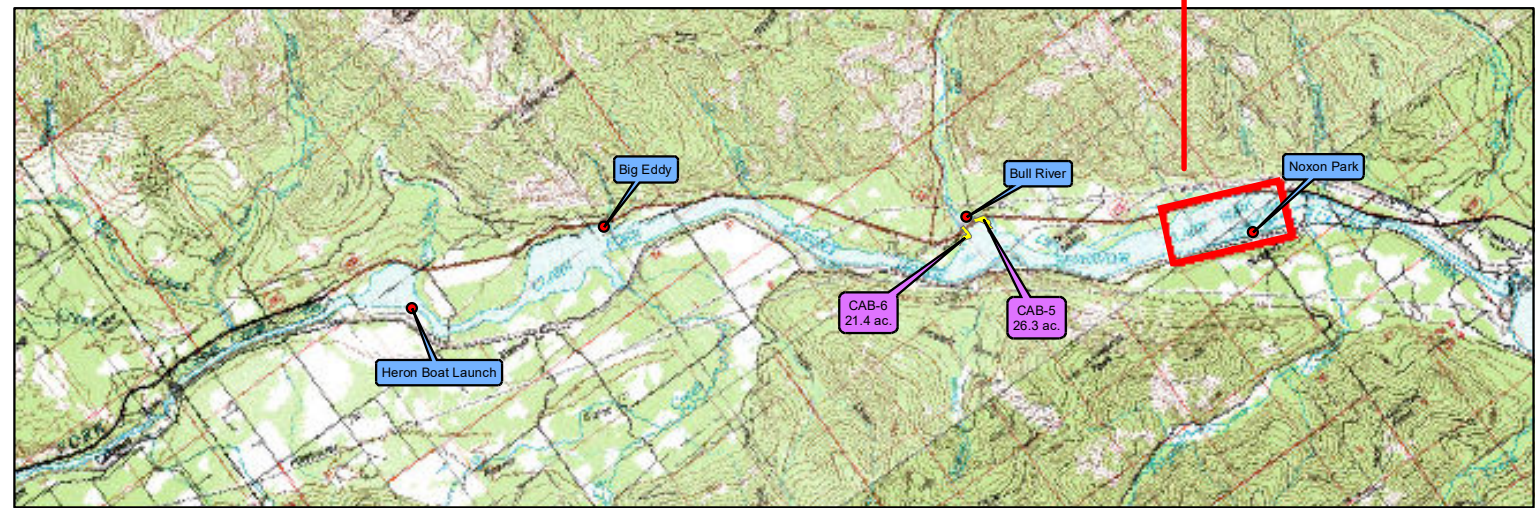
Access Point

2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Inside Survey Area

2017 Bed ID -  
Survey Bed Density  
Delineated Area (ac.)  
Adjacent to Survey Area

Survey Point Density & Comments  
Bottom Depth (ft)

Density was quantified by recording the amount of invasive species vegetation covering the sampling implement during each tatch rake toss using a scale from 1-5, with 5 representing 100% coverage.



**Bed Delineations of Invasive Species  
Near Noxon Park on Cabinet Gorge Reservoir**

**Aerial Site Map - 2017 AIS Survey  
Sanders County**

Job#: SandersM01

Date: 11/22/2017

Path: M:\AIS - Aquatic Vegetation Monitoring - Sanders County\X\_Figure\_17\_Noixon.mxd, Author: jslcom

**FIGURE 17**