

**MOSES LAKE SHORELINE INVENTORY  
 ECOLOGICAL FUNCTION SUMMARY  
 DRAFT AS OF JULY 23, 2005**

**Reach 1 Shoreline Characterization Summary**

| <b>Hazard Potential</b> | <b>Habitat Conditions</b>   | <b>Public Access</b> | <b>Key Modifications</b>  |
|-------------------------|---|----------------------|---|
| Steep slopes: 76%       | Undeveloped: 57.8%<br>Riparian tree cover: 64.7%<br>Priority habitats: 1<br>Species of concern: 4<br>Fish Species: 10 | Public land: 5.1%    | Principal land use: undeveloped<br>Imperviousness: 3.6%<br>Roads: 4 m<br>Bulkheads: 2.7%<br>Docks: 29 |

Ecological functions along Reach 1 are impaired by residential development, which covers 30.2% of the jurisdiction, and account for the majority of the estimated 3.6% imperviousness within the reach. Upland vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is extremely limited in extent (less than 1% of the reach), though this might be in part due to the relatively steeper nearshore and greater windward fetch found along this reach. The majority of the reach is presently undeveloped (57.8%) and has overhanging vegetation (64.7%), which helps provide shading of aquatic habitat and bank stability. The northern half of the reach is classified as a priority riparian habitat, primarily consisting of willow and Russian olive trees.

Only a small portion of the reach has shoreline hardening (2.7%), which increases wave reflectivity, thereby affecting aquatic vegetation and the habitat for the ten fish species found along this reach. This aquatic habitat is further impaired by the fairly large number of docks (29) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

**Reach 2 Shoreline Characterization Summary**

| <b>Hazard Potential</b> | <b>Habitat Conditions</b>  | <b>Public Access</b> | <b>Key Modifications</b>   |
|-------------------------|--|----------------------|--|
| Steep slopes: 0.4%      | Wetlands: 11.6%<br>Undeveloped: 47.8%<br>Riparian tree cover: 44.6%<br>Priority habitats: 1<br>Species of concern: 4<br>Fish Species: 10 |                      | Principal land use: undeveloped<br>Imperviousness: 11.4%<br>Roads: 167 m<br>Bulkheads: 4.6%<br>Docks: 24 |

Ecological functions along Reach 2 are impaired by residential development, which covers 50.6% of the jurisdiction and accounts for the majority of the estimated 11.4% imperviousness for the reach. Riparian vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. Roadways, which cover 167 m of the jurisdiction, may be another source of nonpoint

source pollution. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is fairly extensive, though is only found along less than half the reach. Most of the reach's nearshore is classified as a priority habitat for waterfowl concentrations, while approximately 11.6% of the reach is also classified as wetlands (WDFW, 2002). Much of the reach is presently undeveloped (47.8%) and has overhanging vegetation (44.6%), which helps provide shading of aquatic habitat and bank stability. Only a small portion of the reach has shoreline hardening (4.6%), which increases wave reflectivity, thereby affecting aquatic vegetation and the habitat for the ten fish species found along this reach. This aquatic habitat is further impaired by the fairly large number of docks (24) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

### Reach 3 Shoreline Characterization Summary

| Hazard Potential    | Habitat Conditions  | Public Access | Key Modifications  |
|---------------------|---|---------------|--|
| Steep slopes: 20.3% | Wetlands: 0.6%<br>Undeveloped: 28.9%<br>Riparian tree cover: 51.7%<br>Priority habitats: 1<br>Species of concern: 4<br>Fish Species: 10 |               | Principal land use: residential.<br>Imperviousness: 15.9%<br>Roads: 342.1 m<br>Bulkheads: 21.4%<br>Docks: 40 |

Ecological functions along Reach 3 are impaired by residential development, which covers 64.5% of the jurisdiction and accounts for the majority of the estimated 15.9% imperviousness for the reach. Riparian vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. Roadways, which cover 342 m of the jurisdiction, may be another source of nonpoint source pollution. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is fairly limited, found in narrow strips along less than one third of the reach. In addition, wetlands are only found in 0.6% of the reach. A small northern portion the reach's nearshore is also classified as a priority habitat for waterfowl concentrations (WDFW, 2002). While much of the reach is presently undeveloped (28.9%), most of the reach has overhanging vegetation (51.7%), which helps provide shading of aquatic habitat and bank stability. Despite having only moderate windward fetch and erosion-resistant mixed alluvium shorelines, a relatively large portion of the reach has shoreline hardening (21.4%), which increases wave reflectivity, thereby affecting aquatic vegetation and the ten fish species found along this reach. This aquatic habitat is further impaired by the fairly large number of docks (40) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

### Reach 4 Shoreline Characterization Summary

| Hazard Potential   | Habitat Conditions                    | Public Access | Key Modifications                |
|--------------------|---------------------------------------|---------------|----------------------------------|
| Steep slopes: 4.8% | Wetlands: 16.3%<br>Undeveloped: 47.3% |               | Principal land use: residential. |

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|--|--|--|--|
|  | Riparian tree cover: 8.2%<br>Priority habitats: 4<br>Species of concern: 4<br>Natural Heritage points: 1<br>Fish Species: 12 |  | Imperviousness: 7.6%<br>Roads: 14 m<br>Bulkheads: 11.4%<br>Docks: 38 |
|--|--|--|--|

Ecological functions along Reach 4 are impaired by residential development, which covers 52.4% of the jurisdiction and accounts for the majority of the estimated 7.6% imperviousness for the reach. Riparian vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is fairly extensive along most of the reach, notably exceeding 10m in width for over one-third of the reach. Four types of priority habitat are found along this reach. In addition, approximately 16.3% of the reach is classified as wetlands. While much of the reach is presently undeveloped (47.3%), very little of the reach has overhanging vegetation (8.2%), which helps provide shading of aquatic habitat and bank stability, though this vegetation includes Russian olive, a highly invasive exotic species. A relatively small portion of the reach has shoreline hardening (11.4%), which increases wave reflectivity, thereby affecting aquatic vegetation and the habitat for the twelve fish species found along this reach. This aquatic habitat is further impaired by the fairly large number of docks (38) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

**Reach 5 Shoreline Characterization Summary**

| <b>Hazard Potential</b> | <b>Habitat Conditions</b>   | <b>Public Access</b> | <b>Key Modifications</b>  |
|-------------------------|---|----------------------|---|
| Steep slopes: 14.7%     | Wetlands: 28.3%<br>Undeveloped: 43.5%<br>Riparian tree cover: 4%<br>Priority habitats: 2<br>Species of concern: 4<br>Fish Species: 11 |                      | Principal land use: residential.<br>Imperviousness: 5.8%<br>Roads: 322 m<br>Bulkheads: 3.1% |

Ecological functions along Reach 5 are impaired by residential development, which covers 48.4% of the jurisdiction and accounts for the majority of the estimated 5.8% imperviousness for the reach. Riparian vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. Roadways, which cover 322 m of the jurisdiction, may be another source of nonpoint source pollution. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is extremely restricted, extending less than 7.4% of the reach, which has a predominantly shallow nearshore. However, approximately 28.3% of the reach is classified as wetlands. The small embayments and wetlands at the end of Lewis Horn are also classified as a priority habitat for waterfowl concentrations. Much of the reach is presently undeveloped (43.5%), while most of the

reach has overhanging vegetation (64.7%), which helps provide shading of aquatic habitat and bank stability, though this vegetation includes Russian olive, a highly invasive exotic species. Having limited fetch and a substrate comprised of erosion-resistant mixed alluvium, a very limited portion of the reach has shoreline hardening (3.1%), which increases wave reflectivity, thereby affecting aquatic vegetation and the habitat for the eleven fish species found along this reach. This aquatic habitat is further impaired by exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

**Reach 6 Shoreline Characterization Summary**

| <b>Hazard Potential</b> | <b>Habitat Conditions</b>   | <b>Public Access</b>                               | <b>Key Modifications</b>  |
|-------------------------|---|--|---|
| Steep slopes: 13.1%     | Wetlands: 1.9%<br>Riparian tree cover: 7.4%<br>Species of concern: 4<br>Fish Species: 9 | Public land: 42.9%<br>Parks: 1<br>Boat launches: 1 | Principal land use: parks/open land<br>Imperviousness: 5.8%<br>Roads: 440 m<br>Bulkheads: 5.2%<br>Docks: 21<br>DOE Facility/Site: 1 |

Ecological functions along Reach 6 are impaired by recreational and residential development, which account for the majority of the estimated 5.8% imperviousness for the reach. Riparian vegetation has been removed and replaced with buildings, lawns and parking lots, which can promote increased runoff and nonpoint source pollution. Roadways, which cover 440 m of the jurisdiction, may be another source of nonpoint source pollution. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is fairly restricted (less than 25% of the reach), though this might be in part due to the relatively steeper nearshore found along this reach. In addition, only 1.9% of the reach is classified as wetlands, while only a small portion of the reach has overhanging vegetation (7.4%), which helps provide shading of aquatic habitat and bank stability. This vegetation includes Russian olive, a highly invasive exotic species. Despite having limited fetch and a substrate comprised of erosion-resistant mixed alluvium, a limited portion of the reach has shoreline hardening (5.2%), which increases wave reflectivity, thereby affecting aquatic vegetation and the habitat for the nine fish species found along this reach. This aquatic habitat is further impaired by the fairly large number of docks (21) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

**Reach 7 Shoreline Characterization Summary**

| <b>Hazard Potential</b> | <b>Habitat Conditions</b>  | <b>Public Access</b>          | <b>Key Modifications</b>  |
|-------------------------|--|-------------------------------|---|
| Steep slopes: 65.9%     | Undeveloped: 10.1%<br>Riparian tree cover: 5.4%<br>Species of concern: 4<br>Priority habitats: 2<br>Natural Heritage | Public land: 0.2%<br>Parks: 1 | Principal land use: residential.<br>Imperviousness: 19.8%<br>Bulkheads: 7.1%<br>Docks: 18 |

|  |                              |  |  |
|--|------------------------------|--|--|
|  | points: 1<br>Fish Species: 9 |  |  |
|--|------------------------------|--|--|

Ecological functions along Reach 7 are impaired by residential development, which covers 89.9% of the jurisdiction and accounts for the estimated 19.8% imperviousness for the reach. Riparian vegetation has been removed and replaced with buildings, lawns and footpaths to the shore, which can promote increased runoff and nonpoint source pollution. While no wetlands are located in the reach, emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, covers approximately 40% of the reach, though the limits to extent and widths might be in part due to the relatively steep upland slope and nearshore found along this reach. In addition, only a small portion of the reach is presently undeveloped (10.1%) or has overhanging vegetation (5.4%), which helps provide shading of aquatic habitat and bank stability. Two priority habitats and one Natural Heritage site are associated with this reach. Despite having a limited fetch and a substrate comprised of erosion-resistant mixed alluvium, a portion of the reach has shoreline hardening (7.1%), which increases wave reflectivity, thereby affecting aquatic vegetation and the habitat for the nine fish species found along this reach. This aquatic habitat is further impaired by a number of docks (18) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

#### Reach 8 Shoreline Characterization Summary

| Hazard Potential   | Habitat Conditions  | Public Access | Key Modifications   |
|--------------------|---|---------------|---|
| Steep slopes: 3.5% | Wetlands: 5%<br>Undeveloped: 5.75<br>Riparian tree cover: 33.1%<br>Priority habitats: 3<br>Species of concern: 4<br>Fish Species: 6 |               | Principal land use: residential-1 family<br>Imperviousness: 30%<br>Bulkheads: 62%<br>Storm drains: 1<br>Docks: 41<br>DOE Facility/Site: 1 |

Ecological functions along Reach 8 are impaired by residential development, which covers the entire jurisdiction and accounts for the estimated 30% imperviousness for the reach. Riparian vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. One storm sewer outfall also is found along this reach. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is extremely restricted, extending less than 15% of the reach. In addition, only 5% of the reach is classified as wetland habitat. However, approximately one-third of the reach has overhanging vegetation, which helps provide shading of aquatic habitat and bank stability. In addition, three types of priority habitats are associated with this reach. Despite having limited windward fetch and a substrate comprised of erosion-resistant mixed alluvium, a very high portion of the reach has shoreline hardening (62.0%), which increases wave reflectivity, thereby affecting aquatic vegetation and the habitat for the six fish species typically found along this reach. This aquatic habitat is further impaired by exotic weed

species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

**Reach 9 Shoreline Characterization Summary**

| <b>Hazard Potential</b>             | <b>Habitat Conditions</b>  | <b>Public Access</b> | <b>Key Modifications</b>   |
|-------------------------------------|--|----------------------|--|
| Steep slopes: 13%<br>Floodway: 6.1% | Wetlands: 7.5%<br>Undeveloped: 5.7%<br>Priority habitats: 3<br>Species of concern: 4 |                      | Principal land use: commercial<br>Imperviousness: 43.9%<br>Roads: 1045 m<br>Bulkheads: 1.8%<br>Storm drains: 1<br>Docks: 1 |

Ecological functions along Reach 9 are impaired by commercial and residential development, which accounts for the majority of the estimated 43.9% imperviousness for the reach. Riparian vegetation has been removed and replaced with lawns, which can promote increased runoff and nonpoint source pollution. Roadways and a railroad, which cover 1045 m of the jurisdiction, may be additional sources of nonpoint source pollution. One storm sewer outfall also is found along this reach. While 7.5% of the reach is classified as wetland habitat, there is no overhanging vegetation found along this reach. Three types of priority habitat are found along this reach. Having limited windward fetch and a substrate comprised of erosion-resistant mixed alluvium, a very small portion of the reach has shoreline hardening (1.8%), which increases wave reflectivity, thereby affecting aquatic vegetation and aquatic habitat. Only one dock is found along this reach. This aquatic habitat is further impaired by exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

**Reach 10 Shoreline Characterization Summary**

| <b>Hazard Potential</b> | <b>Habitat Conditions</b>  | <b>Public Access</b> | <b>Key Modifications</b>                                 |
|-------------------------|--|----------------------|--|
| Floodway: 52.5%         | Wetlands: 38.3%<br>Undeveloped: 70.8%<br>Priority habitats: 5<br>Species of concern: 4 |                      | Principal land use: undeveloped<br>Imperviousness: 24.8% |

Ecological functions along Reach 10 are impaired by commercial development, which accounts for the estimated 24.8% imperviousness for the reach. While the reach is primarily undeveloped and dominated by wetland habitat, which comprises 38.3% of the reach, some riparian vegetation has been removed, which can promote increased runoff and nonpoint source pollution. Besides wetland habitats, four types of priority habitats are found along this reach. There is no overhanging vegetation found along this reach. No shoreline hardening or docks are found along this reach.

**Reach 11 Shoreline Characterization Summary**

| <b>Hazard Potential</b> | <b>Habitat Conditions</b> | <b>Public Access</b> | <b>Key Modifications</b> |
|-------------------------|---------------------------|----------------------|--------------------------|
| Floodway: 13.5%         | Wetlands: 41.4%           |                      | Principal land use:      |

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|--|--|--|------------|
|  | Undeveloped: 6%<br>Priority habitats: 5<br>Species of concern: 4 |  | commercial |
|--|--|--|------------|

Ecological functions along Reach 11 are impaired by commercial development. While the reach is dominated by wetland habitat, which comprises 41.4% of the reach, some riparian vegetation has been removed, which can promote increased runoff and nonpoint source pollution. Besides wetland habitats, four types of priority habitats are associated with this reach. There is no overhanging vegetation found along this reach. No shoreline hardening or docks are found along this reach.

### Reach 12 Shoreline Characterization Summary

| Hazard Potential                     | Habitat Conditions   | Public Access               | Key Modifications  |
|--------------------------------------|--|-----------------------------|--|
| Floodway: 3.6%<br>Steep slopes: 2.5% | Wetlands: 22.2%<br>Undeveloped: 18.6%<br>Priority habitats: 3<br>Species of concern: 4 | Public land: 1%<br>Parks: 1 | Principal land use:<br>transportation-utilities<br>Imperviousness: 20.8%<br>Roads: 1855 m<br>Storm drains: 1<br>Docks: 1<br>DOE Facility/Site: 1 |

Ecological functions along Reach 12 are impaired by a wide variety of development. While three priority habitat are found along this reach and 22.2% is classified as wetland habitat, riparian vegetation has been removed and replaced with buildings, lawns, and parking lots, which can promote increased runoff and nonpoint source pollution. Imperviousness for the reach is estimated at 20.8%. Roadways and a railroad, which cover 2.77 km of the jurisdiction, may be additional sources of nonpoint source pollution. Water quality may be further impacted by stormwater discharges from the one storm sewer outfall found along this reach. While there are no bulkheads along the reach, artificial fill for the railroad grade has covered littoral habitat with coarse materials, increasing slope and wave reflectivity, thereby affecting aquatic vegetation and habitat for the seven fish species found along this reach. Only one dock is found along this reach. This reach is important for spring walleye spawning migrations.

### Reach 13 Shoreline Characterization Summary

| Hazard Potential   | Habitat Conditions   | Public Access                  | Key Modifications   |
|--------------------|--|--------------------------------|---|
| Steep slopes: 8.2% | Wetlands: 0.3%<br>Priority habitats: 3<br>Species of concern: 4<br>Fish Species: 7 | Public land: 26.7%<br>Parks: 1 | Principal land use: commercial-retail<br>Imperviousness: 32.8%<br>Roads: 2512 m<br>Storm drains: 2<br>Docks: 1<br>DOE Facilities/Sites: 7 |

Ecological functions along Reach 13 are impaired by the Columbia Basin Railroad and recreational and commercial development found along the reach, which account for the majority of the estimated 32.8% imperviousness for the reach. While 3 priority habitats are found along this reach, wetland habitat comprises only 0.3% of the reach, while riparian vegetation has been removed and replaced with buildings, lawns, and parking lots, which can promote increased runoff and nonpoint source pollution. Roadways and a railroad, which cover 4.0 km of the jurisdiction, may be additional sources of nonpoint source pollution. Water quality may be further impacted by stormwater discharges from the two storm sewer outfalls found along this reach. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is extremely restricted, extending 4.1% of the reach, though the limits to extent and widths might be in part due to the relatively steep nearshore found along this reach. While there are no bulkheads along the reach, artificial fill for the railroad grade has covered littoral habitat with coarse materials, increasing slope and wave reflectivity, thereby affecting aquatic vegetation and habitat for the seven fish species found along this reach. Only one dock is found along this reach. This aquatic habitat is further impaired by exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

### Reach 14 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions  | Public Access | Key Modifications   |
|------------------|---|---------------|---|
|                  | Wetlands: 52.8%<br>Undeveloped: 76%<br>Species of concern: 4<br>Priority habitat: 2<br>Fish Species: 14 |               | Principal land use: undeveloped<br>Imperviousness: 5.3%<br>Roads: 206 m |

Ecological functions on Reach 14 are relatively intact. The shoreline within this reach is predominantly made up of wetlands identified by the National Wetland Inventory, providing priority habitat for a wide variety of wildlife and fish species. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is extensive, with an average width between 5-10 m extending along 94.8% of the reach. The shoreline is an important spawning and rearing area for walleye, as well as bullhead and bluegill. While the reach is principally undeveloped (76.0%), residential

development in the upland is encroaching on the wetland environment and is a potential source of stormwater runoff and nonpoint pollution such as sediment, fertilizers and pesticides. Imperviousness is estimated to be 5.3% along this reach. Roadways and a railroad, which cover 256 m of the jurisdiction, may be additional sources of nonpoint source pollution. Currently there are no shoreline protection structures along this reach.

**Reach 15 Shoreline Characterization Summary**

| <b>Hazard Potential</b> | <b>Habitat Conditions</b>   | <b>Public Access</b> | <b>Key Modifications</b>   |
|-------------------------|---|----------------------|--|
| Steep slopes: 33.1%     | Undeveloped: 7.9%<br>Riparian tree cover: 9.6%<br>Priority habitats: 1<br>Species of concern: 4<br>Fish Species: 10 |                      | Principal land use: residential<br>Imperviousness: 25.25<br>Roads: 950 m<br>Bulkheads: 42%<br>Storm drains: 1<br>Docks: 29<br>DOE Facility/Site: 1 |

Ecological functions along Reach 15 are impaired by residential and commercial development, which covers most of the jurisdiction and accounts for the majority of the estimated 25.2% imperviousness for the reach. Only 7.9% of the land is still undeveloped along the reach. Riparian vegetation has been removed and replaced with buildings, lawns, and parking lots, which can promote increased runoff and nonpoint source pollution. Roadways, which cover 950 m of the jurisdiction, may be an additional source of nonpoint source pollution. One storm sewer outfall also is found along this reach. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is extremely limited, with an average width of less than 2 m and extending only 12.2% of the reach, though this might be in part due to the relatively steeper nearshore and greater windward fetch found along this reach. There are no wetlands located in this reach, though it is associated with 1 priority habitat. In addition, only 9.6% of the reach has overhanging vegetation, which helps provide shading of aquatic habitat and bank stability. This vegetation includes Russian olive, a highly invasive exotic species. Despite a substrate comprised of erosion-resistant cobble, a very high portion of the reach has shoreline hardening (42.0%), which increases wave reflectivity, thereby affecting aquatic vegetation and the habitat for the ten fish species typically found along this reach. This aquatic habitat is further impaired by the fairly large number of docks (29) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

**Reach 16 Shoreline Characterization Summary**

| <b>Hazard Potential</b> | <b>Habitat Conditions</b>  | <b>Public Access</b> | <b>Key Modifications</b>  |
|-------------------------|--|----------------------|---|
|                         | Undeveloped: 3.6%<br>Riparian tree cover: 1.7%<br>Priority habitats: 3<br>Species of concern: 4<br>Fish Species: 8 |                      | Principal land use: residential-1 family<br>Imperviousness: 24.8%<br>Roads: 1455 m<br>Bulkheads: 28.6%<br>Storm drains: 2 |

|  |  |  |           |
|--|--|--|-----------|
|  |  |  | Docks: 46 |
|--|--|--|-----------|

Ecological functions along Reach 16 are impaired by residential development, which predominantly covers the jurisdiction and accounts for the majority of the estimated 24.8% imperviousness for the reach. Only 3.6% of the land is still undeveloped along the reach. While 3 priority habitats are found along this reach, riparian vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. Roadways, which cover 1455 m of the jurisdiction, may be an additional source of nonpoint source pollution. Two storm sewer outfalls are also found along this reach. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution is limited, primarily comprised of an average width of less than 2 m extending along approximately one third of the reach (though this might be in part due to the relatively steeper nearshore and greater windward fetch found along this reach). There are no wetlands located along this reach. In addition, only 1.7% of the reach has overhanging vegetation, which helps provide shading of aquatic habitat and bank stability. This vegetation includes Russian olive, a highly invasive exotic species. Despite a substrate comprised of erosion-resistant cobble, a substantial portion of the reach has shoreline hardening (28.6%), which increases wave reflectivity, thereby affecting aquatic vegetation and the habitat for the twelve fish species typically found along this reach. This aquatic habitat is further impaired by the extremely high number of docks (46) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

#### Reach 17 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions   | Public Access                                      | Key Modifications   |
|------------------|--|--|---|
|                  | Undeveloped: 15.9%<br>Priority habitats: 4<br>Species of concern: 4<br>Natural Heritage points: 1<br>Fish Species: 7 | Public land: 50.8%<br>Parks: 1<br>Boat launches: 1 | Principal land use: recreation<br>Imperviousness: 0.05%<br>Docks: 1 |

Ecological functions along Reach 17 are impaired by recreational development. Riparian vegetation has been removed and replaced with parking lots, which can promote increased runoff and nonpoint source pollution. While there are no wetlands located along this reach, emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is extensive, with an average width between 2-5 m extending along 98.4% of the reach. One Natural Heritage location, four priority habitats, and at least seven fish species are found along this reach. Only 0.7% of the reach has shoreline hardening, and only one dock is found along the reach, associated with Lower Peninsula Park. The riparian habitat is further impaired by Russian olive, a highly invasive exotic species, as well as the exotic submergent species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

### Reach 18 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions  | Public Access | Key Modifications  |
|------------------|---|---------------|--|
|                  | Undeveloped: 9.7%<br>Priority habitats: 3<br>Species of concern: 4<br>Fish Species: 8 |               | Principal land use:<br>residential-1 family<br>Imperviousness: 13%<br>Roads: 592 m<br>Bulkheads: 34%<br>Docks: 9 |

Ecological functions along Reach 18 are impaired by residential development, which covers the majority of the jurisdiction and accounts for most of the estimated 13% imperviousness for the reach. Only 9.7% of the land is still undeveloped along the reach. Riparian vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. Roadways, which cover 592 m of the jurisdiction, may be an additional source of nonpoint source pollution. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution is limited, primarily comprised of an average width of less than 2 m extending along approximately half of the reach (though this might be in part due to the relatively steeper nearshore found along this reach). While there are no wetlands found along this reach, it is associated with three types of priority habitat. In addition, none of the reach has overhanging vegetation, which helps provide shading of aquatic habitat and bank stability. The riparian vegetation includes Russian olive and Yellow flag iris, both highly invasive exotic species. Despite a limited windward fetch and a substrate comprised of erosion-resistant cobble, a substantial portion of the reach has shoreline hardening (34.0%), which increases wave reflectivity, thereby affecting aquatic vegetation and the habitat for the eight fish species typically found along this reach. This aquatic habitat is further impaired by the relatively small number of docks (9) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

### Reach 19 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions  | Public Access | Key Modifications  |
|------------------|---|---------------|--|
|                  | Wetlands: 6.8%<br>Undeveloped: 2.5%<br>Priority habitats: 5<br>Species of concern: 4<br>Fish Species: 7 |               | Principal land use:<br>residential-1 family<br>Imperviousness: 24.2%<br>Roads: 562 m<br>Bulkheads: 42.7%<br>Storm drains: 3<br>Docks: 32 |

Ecological functions along Reach 19 are impaired by residential development, which covers the majority of the jurisdiction and accounts for most of the estimated 24.2% imperviousness for the reach. Only 2.5% of the land is still undeveloped along the reach. Riparian vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. Roadways and railroads, which

cover 627 m of the jurisdiction, may be an additional source of nonpoint source pollution. Three storm sewer outfalls are also found along this reach. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution is fairly extensive, primarily comprised of an average width between 2-5 m extending along 58% of the reach. Five types of priority habitat are associated with this reach. In addition, 6.8% of the reach is classified as wetland habitat. However, none of the reach has overhanging vegetation, which helps provide shading of aquatic habitat and bank stability. The riparian vegetation includes Russian olive and Yellow flag iris, both highly invasive exotic species. Despite a limited windward fetch and a substrate comprised of erosion-resistant cobble, a substantial portion of the reach has shoreline hardening (42.7%), which increases wave reflectivity, thereby affecting aquatic vegetation and the habitat for the seven fish species typically found along this reach. This aquatic habitat is further impaired by the relatively high number of docks (32) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

#### Reach 20 Shoreline Characterization Summary

| Hazard Potential   | Habitat Conditions   | Public Access                  | Key Modifications   |
|--------------------|--|--------------------------------|---|
| Steep slopes: 5.8% | Undeveloped: 15.2%<br>Priority habitats: 4<br>Species of concern: 4<br>Fish Species: 7 | Public land: 27.2%<br>Parks: 1 | Principal land use: residential.<br>Imperviousness: 15.1%<br>Roads: 768 m<br>Storm drains: 1<br>Docks: 11 |

Ecological functions along Reach 20 are impaired by residential and recreational development, which cover the majority of the jurisdiction, though 15.2% of the land is still undeveloped along the reach. Riparian vegetation has been removed and replaced with buildings, lawns, and parking lots, which can promote increased runoff and nonpoint source pollution. Based on land use, imperviousness of this reach is estimated to be approximately 15.1%. Roadways and railroads, which cover 893 m of the jurisdiction, may be additional sources of nonpoint source pollution. One storm sewer outfall also is found along this reach. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution is extremely limited, primarily comprised of an average width between 2-5 m extending along 6.1% of the reach (though this might be in part due to the relatively steeper nearshore found along this reach). In addition, there are no wetlands found along this reach. The reach provides four types of priority habitat as well as habitat for eight species of fish. The aquatic habitat is impaired by the relatively small number of docks (11) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

#### Reach 21 Shoreline Characterization Summary

| Hazard Potential | Habitat Conditions                    | Public Access | Key Modifications               |
|------------------|---------------------------------------|---------------|---------------------------------|
|                  | Wetlands: 77.2%<br>Undeveloped: 22.7% |               | Principal land use: residential |

|  |   |  |   |
|--|---|--|---|
|  | Priority habitats: 5<br>Species of concern: 4<br>Fish Species:3 |  | Imperviousness: 12.9%<br>Roads: 698 m<br>Storm drains: 3<br>Docks: 5<br>DOE Facilities/Sites: 2 |
|--|---|--|---|

While the shoreline within Reach 21 is predominantly made up of priority habitat wetlands also identified by the National Wetland Inventory, ecological functions are impaired by residential and recreational development, which cover the majority of the jurisdiction, though 22.7% of the land is still undeveloped along the reach. Riparian vegetation has been removed and replaced with buildings, lawns, and parking lots, which can promote increased runoff and nonpoint source pollution. Based on land use, imperviousness of this reach is estimated to be approximately 12.9%. Roadways, which cover 698 m of the jurisdiction, may be additional sources of nonpoint source pollution. Three storm sewer outfalls are also found along this reach. Besides wetlands, the reach provides four other types of priority habitat, as well as habitat for four species of fish. The aquatic habitat is impaired by the relatively small number of docks (5) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

#### Reach 22 Shoreline Characterization Summary

| <b>Hazard Potential</b>  | <b>Habitat Conditions</b>   | <b>Public Access</b>                               | <b>Key Modifications</b>   |
|--|---|--|--|
| Steep slopes: 1%<br>High erosion soils: 6.7%<br>High soil runoff: 6.7% | Wetlands: 45.8%<br>Undeveloped: 63.9%<br>Priority habitats: 7<br>Natural Heritage sites: 1<br>Species of concern: 4<br>Fish Species: 10 | Public land: 12.8%<br>Parks: 1<br>Boat launches: 1 | Principal land use: undeveloped<br>Imperviousness: 0.2%<br>Roads: 2650 m<br>Docks: 2 |

Ecological functions on Reach 22 are relatively intact. The shoreline within this reach is predominantly made up of priority habitat wetlands also identified by the National Wetland Inventory, providing potential habitat for a wide variety of wildlife and fish species. While the reach is largely undeveloped (63.9%), residential development in the upland is encroaching on the wetland environment and is a potential source of stormwater runoff and nonpoint pollution such as sediment, fertilizers and pesticides. Roadways and railroads, which cover 2.9 km of the jurisdiction, may be an additional source of nonpoint source pollution. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution is fairly extensive, extending over two-thirds of the reach, with approximately half having emergent vegetation zones with widths averaging 5-10 m. Besides wetlands and one Natural Heritage site, the reach provides six other types of priority habitat, as well as habitat for ten species of fish, including common carp, which may affect the health of the emergent vegetation along this shoreline. The aquatic habitat is impaired by two docks found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

### Reach 23 Shoreline Characterization Summary

| <b>Hazard Potential</b>   | <b>Habitat Conditions</b>   | <b>Public Access</b> | <b>Key Modifications</b>   |
|---|---|----------------------|--|
| Steep slopes: 32.5%<br>High erosion soils: 48%<br>High soil runoff: 48% | Wetlands: 36.1%<br>Riparian tree cover: 14.1%<br>Priority habitats: 5<br>Species of concern: 5<br>Natural Heritage points: 1<br>Fish Species: 7 |                      | Principal land use: residential-1 family<br>Imperviousness: 14%<br>Docks: 20 |

While over one-third of Reach 23 is comprised of priority habitat wetlands identified by the National Wetland Inventory, ecological functions along Reach 23 are impaired by residential development, which covers the majority of the jurisdiction and accounts for all the estimated 14% imperviousness found in this reach. Riparian vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint source pollution. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is fairly extensive, extending along approximately three-quarters of the reach. In addition, 14.1% of the reach has overhanging vegetation, which helps provide shading of aquatic habitat and bank stability. The riparian vegetation includes Russian olive, a highly invasive exotic species. Besides wetlands and one Natural heritage location, the reach provides four other types of priority habitat as well as habitat for seven species of fish. This aquatic habitat is impaired by a relatively high number of docks (20) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

### Reach 24 Shoreline Characterization Summary

| <b>Hazard Potential</b> | <b>Habitat Conditions</b>  | <b>Public Access</b> | <b>Key Modifications</b>  |
|-------------------------|--|----------------------|---|
| Steep slopes: 2.7%      | Wetlands: 72.8%<br>Undeveloped: 33.1%<br>Riparian tree cover: 4.5%<br>Priority habitats: 2<br>Species of concern: 5<br>Fish Species: 8 |                      | Principal land use: residential-1 family<br>Imperviousness: 12.1%<br>Roads: 247 m<br>Docks: 7 |

While the shoreline within Reach 24 is predominantly made up of wetlands identified by the National Wetland Inventory, ecological functions are impaired by residential development, which predominantly covers the jurisdiction, though 33.1% of the land is still undeveloped along the reach. Based on land use, imperviousness of this reach is estimated to be approximately 12.1%. Riparian vegetation has been removed and replaced with buildings and lawns, which can promote increased runoff and nonpoint

source pollution. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is fairly extensive, extending along approximately 47% of the reach. In addition, 4.5% of the reach has overhanging vegetation, which helps provide shading of aquatic habitat and bank stability. Besides two types of priority habitat, the reach provides habitat for eight species of fish. This aquatic habitat is impaired by a relatively small number of docks (7) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

**Reach 25 Shoreline Characterization Summary**

| <b>Hazard Potential</b>                         | <b>Habitat Conditions</b>   | <b>Public Access</b> | <b>Key Modifications</b>        |
|---|---|----------------------|---------------------------------|
| Steep Slopes: 18.1%<br>Rapid permeability: 100% | Wetlands: 14.8%<br>Undeveloped: 100%<br>Species of concern: 4<br>Fish Species: 13 |                      | Principal land use: undeveloped |

Ecological functions on Reach 25 are relatively intact. The shoreline within this reach is entirely made up of undeveloped sand dunes, providing potential habitat for a wide variety of wildlife and fish species, including wetland habitat, which comprises 14.8% of the reach. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution is relatively limited, primarily comprised of an average width between 2-5 m extending along 22.6% of the reach (though this might be in part due to the relatively steeper nearshore found along this reach). The reach provides habitat for thirteen species of fish, the greatest diversity of any of the reaches. The riparian and aquatic habitat is impaired by exotic weed species such as Russian olive, Yellow flag iris, Eurasian water milfoil and curly-leaf pondweed.

**Reach 26 Shoreline Characterization Summary**

| <b>Hazard Potential</b>                        | <b>Habitat Conditions</b>   | <b>Public Access</b> | <b>Key Modifications</b>   |
|--|---|----------------------|--|
| Steep slopes: 3.1%<br>Rapid permeability: 100% | Wetlands: 7.1%<br>Undeveloped: 20.3%<br>Riparian tree cover: 33.9%<br>Priority habitats: 3<br>Species of concern: 4<br>Fish Species: 13 | Public land: 3.7%    | Principal land use: residential-1 family<br>Imperviousness: 16.4%<br>Roads: 1710 m<br>Bulkheads: 21.7%<br>Storm drains: 10<br>Dock: 83 |

Ecological functions along Reach 26 are impaired by residential development, which covers the majority of the jurisdiction (65.9%), though 20.3% of the land is still undeveloped along the reach. Riparian vegetation has been removed and replaced with buildings and lawns, both of which can promote increased runoff and nonpoint source pollution. Roadways, which cover 1710 m of the jurisdiction, may be an additional source of nonpoint source pollution. Ten storm sewer outfalls are also found along this reach. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is fairly limited, extending along 16% of the reach. In addition, 7.1% of the reach is classified as wetland habitat, while over one-third of the

reach has overhanging vegetation, which helps provide shading of aquatic habitat and bank stability. The riparian vegetation includes Russian olive, a highly invasive exotic species. The reach is associated with three types of priority habitat. Despite a limited windward fetch, a substantial portion of the reach has shoreline hardening (21.7%), which increases wave reflectivity, thereby affecting aquatic vegetation and the habitat for the thirteen fish species typically found along this reach (the high diversity of any reach). This aquatic habitat is further impaired by the extremely high number of docks (83) found in this reach, as well as exotic weed species such as Eurasian water milfoil, curly-leaf pondweed, and yellow flag iris typically found along this shoreline type.

**Reach 27 Shoreline Characterization Summary**

| <b>Hazard Potential</b>                         | <b>Habitat Conditions</b>   | <b>Public Access</b>                               | <b>Key Modifications</b>                    |
|---|---|--|---|
| Steep Slopes: 19.8%<br>Rapid permeability: 100% | Wetlands: 2.1%<br>Undeveloped: 60.9%<br>Riparian tree cover: 33.9%<br>Priority habitats: 2<br>Species of concern: 4<br>Fish Species: 13 | Public land: 87.9%<br>Parks: 1<br>Boat launches: 1 | Principal land use: undeveloped<br>Docks: 1 |

Ecological functions along Reach 27 are impaired by recreational development within a park, which covers 39.1% of the jurisdiction, while the majority of the jurisdiction is still undeveloped along the reach (60.9%). Riparian vegetation has been removed and replaced with lawns, and parking lots, which can promote increased runoff and nonpoint source pollution. While only 2.1% of the reach is classified as wetland habitat, emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is fairly extensive, extending along over half of the reach, though primarily at widths less than 2 m. The reach is associated with two types of priority habitat. In addition, 33.9% of the reach has overhanging vegetation, which helps provide shading of aquatic habitat and bank stability. The riparian vegetation includes Russian olive, a highly invasive exotic species. The reach provides habitat for twelve species of fish. This aquatic habitat is impaired by one dock found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type. Moses Lake Community Park, found along this reach, is a 78-acre park with 3 restrooms, a playground area, picnic shelters, boat launch, and an unsupervised swimming area.

**Reach 28 Shoreline Characterization Summary**

| <b>Hazard Potential</b>                          | <b>Habitat Conditions</b>  | <b>Public Access</b> | <b>Key Modifications</b>  |
|--|--|----------------------|---|
| Steep slopes: 26.9%<br>Rapid permeability: 92.6% | Wetlands: 7.3%<br>Undeveloped: 6.5%<br>Riparian tree cover: 45.5%<br>Priority habitats: 2<br>Species of concern: 4<br>Fish Species: 12 |                      | Principal land use: residential-1 family<br>Imperviousness: 27.8%<br>Bulkheads: 61.3%<br>Storm drains: 1<br>Docks: 25 |

Ecological functions along Reach 28 are impaired by residential development, which covers the majority of the jurisdiction (81.7%), though 6.5% of the land is still undeveloped along the reach. Riparian vegetation has been removed and replaced with buildings and lawns, both of which can promote increased runoff and nonpoint source pollution. One storm sewer outfall is also found along this reach. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is relatively limited, extending along 8.5% of the reach. On the other hand, over 45% of the reach has overhanging vegetation, which helps provide shading of aquatic habitat and bank stability. The riparian vegetation includes Russian olive, a highly invasive exotic species. In addition, 7.3% of the reach is classified as wetland habitat, while two types of priority habitat are also associated with this reach. Despite limited windward fetch and an erosion-resistant substrate of mixed alluvium, the majority of the reach has shoreline hardening (61.3%), which increases wave reflectivity, thereby affecting aquatic vegetation and the habitat for the twelve fish species typically found along this reach (the second highest diversity of any reach). This aquatic habitat is further impaired by the relatively high number of docks (25) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

#### Reach 29 Shoreline Characterization Summary

| Hazard Potential                                | Habitat Conditions   | Public Access | Key Modifications   |
|---|--|---------------|---|
| Steep slopes: 42.8%<br>Rapid permeability: 1.2% | Undeveloped: 7.1%<br>Riparian tree cover: 62.5%<br>Priority habitats: 2<br>Species of concern: 5<br>Fish Species: 12 |               | Principal land use: residential-1 family<br>Imperviousness: 11.9%<br>Roads: 3987 m<br>Bulkheads: 17.9%<br>Docks: 49 |

Ecological functions along Reach 29 are impaired by residential development, which covers the majority of the jurisdiction (54.2%), though 7.1% of the land is still undeveloped along the reach. Riparian vegetation has been removed and replaced with buildings and lawns, both of which can promote increased runoff and nonpoint source pollution. Based on land use, imperviousness of this reach is estimated to be approximately 11.9%. Roadways occupy 3987 meters of SMP jurisdiction land in Reach 29, may be an additional source of nonpoint pollutants. While no wetlands are located in this reach, emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is relatively extensive, extending along approximately three-quarters of the reach, though at average widths of less than 2 m (this might be in part due to the relatively steeper nearshore found along this reach). In addition, over 62.5% of the reach has overhanging vegetation, which helps provide shading of aquatic habitat and bank stability. The riparian vegetation includes Russian olive, a highly invasive exotic species. Two types of priority habitat are found along this reach. Despite limited windward fetch and an erosion-resistant substrate of mixed alluvium, a substantial portion of the reach has shoreline hardening (17.9%), which increases wave reflectivity, thereby affecting aquatic vegetation and the habitat for the twelve fish species typically

found along this reach (the second highest diversity of any reach). This aquatic habitat is further impaired by the extremely high number of docks (49) found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.

**Reach 30 Shoreline Characterization Summary**

| <b>Hazard Potential</b> | <b>Habitat Conditions</b>  | <b>Public Access</b> | <b>Key Modifications</b>  |
|-------------------------|--|----------------------|---|
| Steep slopes: 12%       | Wetlands: 8.1%<br>Undeveloped: 47.7%<br>Riparian tree cover: 57.4%<br>Priority habitats: 3<br>Species of concern: 4<br>Fish Species: 8 |                      | Principal land use: undeveloped<br>Imperviousness: 2.1%<br>Roads: 67 m<br>Bulkheads: 8.5%<br>Docks: 4 |

Ecological functions along Reach 30 are impaired by residential and recreational development, though much of the land is still undeveloped along the reach (47.7%). Riparian vegetation has been removed and replaced with buildings, lawns and a golf course, all of which can promote increased runoff and nonpoint source pollution. Based on land use, imperviousness of this reach is estimated to be approximately 2.1%. Emergent vegetation in the littoral zone, which is both an important habitat and buffer for nonpoint pollution, is relatively extensive, extending along approximately three-quarters of the reach, though at average widths of less than 2 m (this might be in part due to the relatively steeper nearshore found along this reach). In addition, 8.1% of the reach is classified as wetland habitat, while over 62.5% of the reach has overhanging vegetation, which helps provide shading of aquatic habitat and bank stability. The riparian vegetation includes Russian olive, a highly invasive exotic species. Besides wetland habitat, the reach is also associated with two other types of priority habitat and 5 Natural heritage locations. Despite limited windward fetch and an erosion-resistant substrate of mixed alluvium, a relatively small portion of the reach has shoreline hardening (8.5%), which increases wave reflectivity, thereby affecting aquatic vegetation and the habitat for the eight fish species typically found along this reach. This aquatic habitat is further impaired by the four docks found in this reach, as well as exotic weed species such as Eurasian water milfoil and curly-leaf pondweed typically found along this shoreline type.