5.0 Watershed Analysis on ODF Lands

This chapter addresses conditions described in the assessment phase as they relate to the functionality and quality of aquatic and riparian habitat. Select parameters identified in the ODF Watershed Analysis Manual (ODF 2004) are used to analyze aquatic and riparian habitats to determine if they are functioning properly. The distribution of properly functioning conditions (PFC) in the project area is determined, and conversely so are the areas where conditions are not functioning properly. Areas where functions are impaired or limited represent potential management opportunities to enhance and promote PFC in the long-term. As with the assessment, this analysis is based on interpretation of existing data.

Four primary topics were assessed to determine if aquatic and riparian resources are functioning properly: Limiting Factors, Alternative Vegetation Management, Slope Stability, and Roads. Under each topic, the set of Key Questions specified in the ODF contract are addressed.

5.1 Limiting Factors

Objective: Identify specific conditions within the project area that are limiting the attainment of properly functioning conditions of aquatic habitats; and then evaluate whether stream restoration projects or other management activities (for example, those related to slope stability, recreation trails, roads, or upland conditions) are likely to remedy the limiting factor(s). The key analysis questions are addressed below.

5.1.1 Are there subwatersheds where the current level of in-stream wood is a limiting factor for achieving properly functioning aquatic systems?

For this analysis, the levels of in-stream wood are considered a function of what currently exists in the channel (measured during ODFW aquatic habitat surveys) and the recruitment potential from streamside forests (based on vegetation cover types).

In-stream Wood

Large wood adds needed complexity to the stream channel. It produces and maintains pool habitat, provides cover, and dissipates stream energy retaining gravels and sediment. Overall, the current levels of in-stream large woody debris in all subwatersheds are likely limiting the attainment of a properly functioning aquatic system in the short term (in the next 25 to 50 years). Additionally, there are stream segments where “properly functioning” may only be achieved in the long term (100+ years). The attainment of properly functioning conditions for aquatic resources is discussed in section 5.2.

It should be noted that the analysis of in-stream levels of wood has relied on data from streams with ODFW aquatic habitat surveys, which are only done on fish bearing streams. No data exists for the other streams in the watershed, specifically headwater streams (type N). Therefore, interpretations about in-stream conditions can only be inferred from streamside forest characteristics. On ODF lands in the Miami watershed, a total of 9.2 miles of streams were surveyed from 330 total miles (about 3%). Over all

ownerships, 20.5 miles of stream were surveyed out of 563 total miles in the watershed (total miles include fish and non-fish bearing; type N and F streams).

Of the nearly 9 miles of streams surveyed on ODF lands, only one reach (NC1878) contained the number of key pieces (12 per 100 meters; 3.6 per 100 feet) and volume (125m^3 per 100 meters; 1350 ft^3 per 100 feet) considered high by ODFW (2005). This 0.62 mile reach was surveyed in 2002 and is located on the mainstem Miami River near Bluff Creek (Upper Miami Subwatershed) (see Figure 27 for location). Note that 1993 surveys of the same approximate area show a significantly lower number of key pieces (0.5/100m). The increase measured in 2002, may be attributed to wood recruitment as a result of the 1996 floods and manual placement for instream enhancement purposes. The degree to which similar changes may have occurred within the watershed is unknown since subsequent habitat surveys have not been conducted.

Additionally, the South Fork Miami River (reach 13, 1.7 miles) contained a fair amount of volume (58 m^3 per 100 meters; 628 ft^3 per 100 feet), but had low numbers of key pieces (1.3 per 100 meters; 0.4 per 100 feet). ODFW (2005) considers volumes greater than 58 m^3 per 100 meters to be high based on reference reach measurements.

As a comparison, consider how levels of in-stream wood on ODF lands in the Miami compare to the findings documented in the Elliott State Forest Watershed Analysis. In the Elliott analysis, the overall mean wood volume on ODF lands was 193 cu. ft^3 per 100 ft., and the mean number of key pieces was 0.33 per 100 feet of stream (97 reaches represented (ODF 2003A, page 7-18). The mean wood volume on ODF lands in the Miami was 385 ft^3 per 100 ft., and the mean number of key pieces was 0.7 per 100 feet of stream (7 reaches represented, ODFW 2005). If you remove the one reach with high volume and key pieces (reach NC1878) from the calculation, the mean wood volume is 225 ft^3 per 100 ft., and the mean number of key pieces is 0.1 per 100 feet of stream. This simply illustrates the weight and importance this one reach has on the overall in-stream wood levels. It further illustrates the importance of this reach as critical habitat for salmonids since habitat quality far exceeds that of other mainstem reaches. As previously noted, the 1996 flood may have accomplished significant changes in other reaches resulting in increased habitat quality.

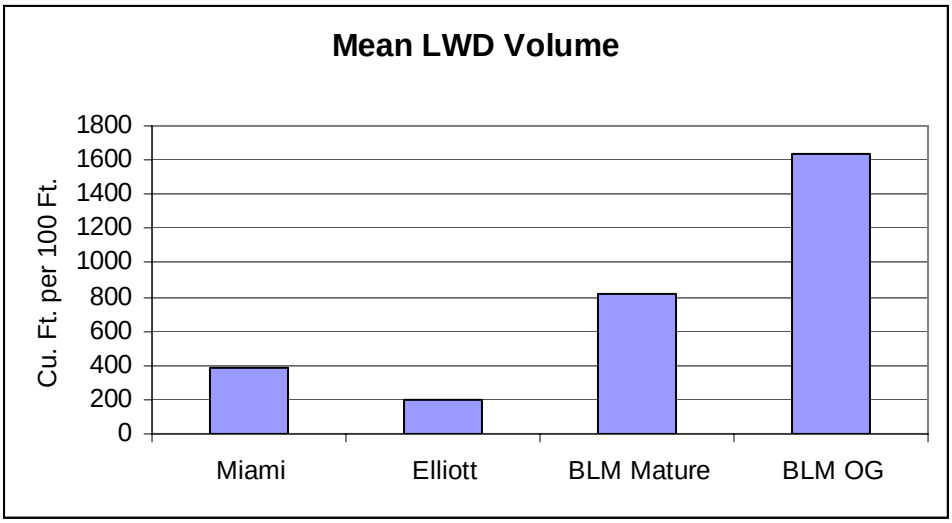

Figure 1. A comparison of large wood volumes in the Miami River Watershed to the Elliott State Forest and BLM mature and old-growth stands.

The Elliott analysis also determined the volume of instream wood for adjacent BLM lands consisting of old-growth and mature timber stands. Instream wood volume averaged 816 cu. ft. per 100 ft. for mature stands and 1634 cu. ft. per 100 ft. for old growth stands (ODF 2003A, page 7-18). The two reaches identified above have volumes of 1350 and 628 ft^3 per 100 ft., respectively. This lends further evidence that the level of instream wood is not currently a limiting factor for these two reaches. Overall large wood volumes in the Miami were greater than those documented for the Elliott, but still nearly 50% and 25% of the volume reported for mature and old-growth conditions (Figure 33).

Since, no habitat surveys have been conducted on ODF lands in the Lower Miami or Tillamook Bay Frontal Subwatersheds, the level of in-stream wood is not known. However, habitat surveys have been conducted on approximately 5 miles (8000 meters) of private industrial lands and 5.6 miles (9000 meters) of private non-industrial lands (ODFW 2005). A comparison of the large wood and shade survey variables on ODF lands versus private industrial and non-industrial lands is presented in Figure 34. Data represent the length-weighted value for all surveyed reaches. From this, we can infer that variables related to large wood and riparian condition on ODF lands and private industrial lands are essentially in the same overall condition.

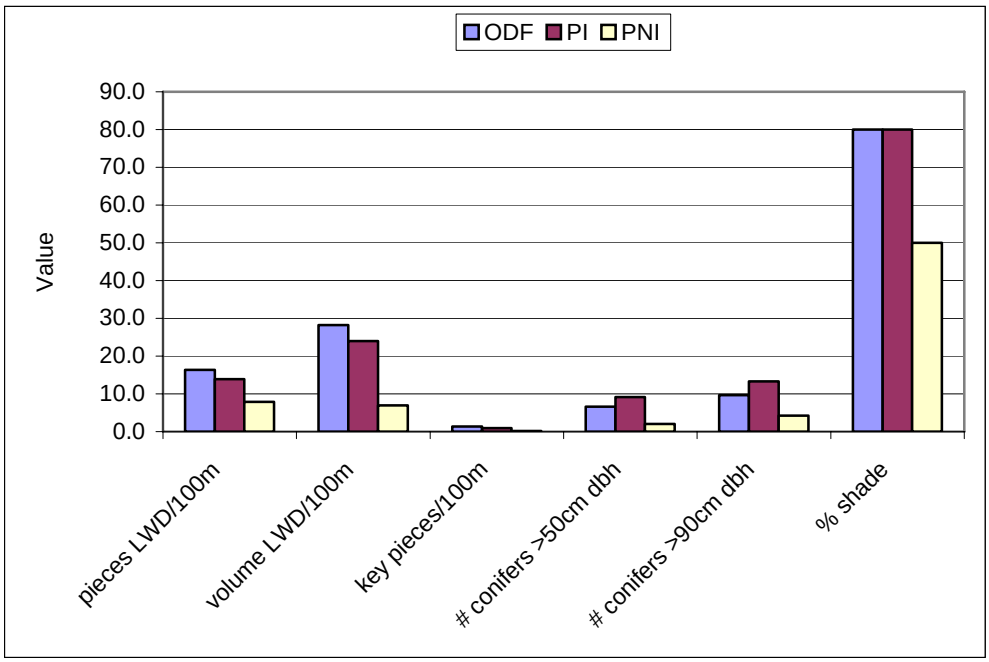

Figure 2. A comparison of large wood and shade variables (from ODFW 2005) between surveys conducted on ODF, private industrial and non-industrial lands

LWD Recruitment from Streamside Forests

The preceding discussion regarding levels of in-stream wood is not surprising, considering that the current large woody debris (LWD) recruitment potential is poor throughout the Miami River Watershed. The lack of recruitment potential is limiting the attainment of “properly functioning” condition for aquatic and riparian systems in the short and long term.

There are three ways that large woody debris is deposited in streams: 1) it falls directly in or across a stream from the adjacent riparian area, 2) it is transported into a stream

segment by a landslide or debris flow, or 3) it is manually placed in the stream. The majority of large wood present in a stream is from the adjacent riparian area, and the majority of that originates from a distance less than 100 feet (Robison and Beschta 1990, Murphy and Koski 1989). For analysis purposes, only that distance within 100 feet of a stream (RA1 and RA2) was considered in detail. This is not to say that wood inputs beyond 100 feet are not important. These inputs provide floodplain structure and habitat for terrestrial species. However, in terms of in-stream habitat, the probability of reaching the stream is diminished.

Large woody debris can also be transported into a particular reach from up-channel, in-stream sources during high flow events. It is the large conifer pieces (usually defined as key pieces >24 inches) that provide the in-stream anchor points in which smaller pieces of wood are accumulated. Without these anchor points, the smaller wood pieces are simply “flushed” through the system and never accumulate into complex log and debris jams essential for complex aquatic habitats. The potential for debris flow prone channels to deliver LWD is discussed later in this chapter.

As described earlier in the assessment, only 6% (424 acres) of the mapped riparian (RA1 and RA2) acres administered by ODF currently exhibit a high likelihood of producing large wood to the adjacent stream (Figure 35)(see Figure 11 for mapped spatial distribution of riparian corridors). The majority of acres exhibit a moderate or low recruitment potential (52% and 43%, respectively). Obviously, the lack of large conifer pieces entering stream channels will continue until conifer riparian forest stands are established and mature or other sources are introduced (i.e. manual placement).

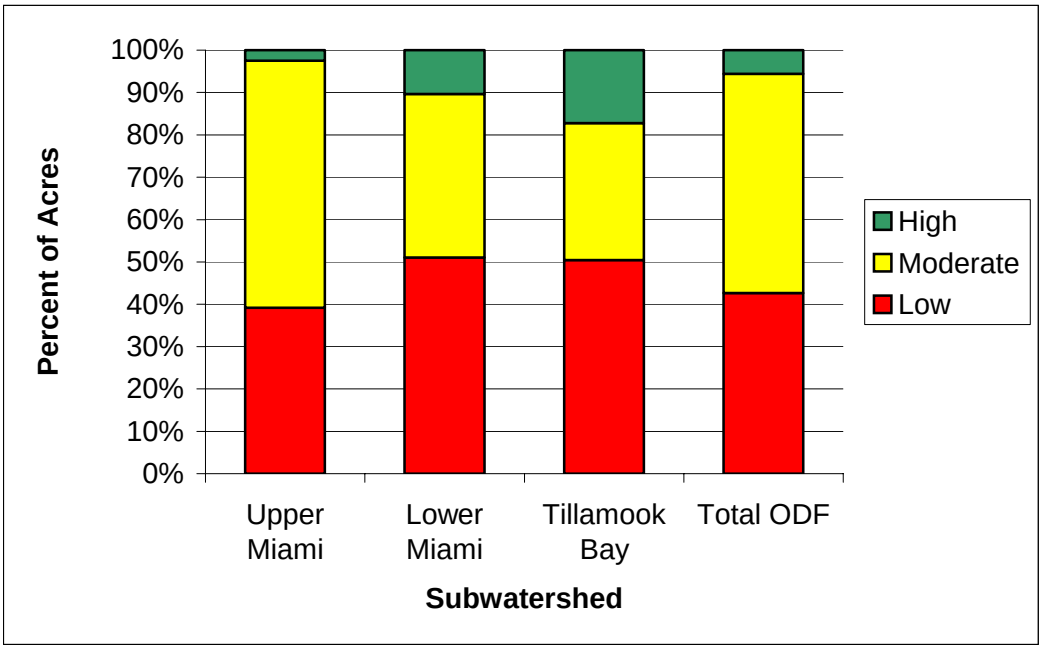

Figure 3. Estimated levels of LWD recruitment potential as a percent of total ODF lands in mapped riparian buffers (RA1+RA2).

To evaluate future LWD recruitment potential from streamside forests, the current vegetation types were rated as low, moderate or high for the 50- and 100-year timeframes (Table 25) based on general stand dynamics and criteria described in

OWAM. These provide an estimate of the future recruitment potential based solely on the vegetation cover type (i.e. presence of large conifers in a particular forest stand). For analysis purposes, it is assumed that currently identified hardwood stands remain hardwood throughout and beyond the 100-year timeframe.

Table 1. Large wood recruitment potential in 50- and 100-years for vegetation cover types in the Miami River Watershed.

	LWD Recruitment Potential Over Time		
Vegetation Cover Type*	**Current**	**50-Years**	**100-Years**
AG	Low	Low	Low
BNN	Low	Low	Low
CLD	High	High	High
CLS	Moderate	Moderate	Moderate
CMD	Moderate	High	High
CMS	Moderate	Moderate	Moderate
CRD	Low	Moderate	High
CRS	Low	Moderate	Moderate
CSD	Low	Moderate	High
CSS	Low	Moderate	Moderate
DV	Low	Low	Low
GNN	Low	Low	Low
HMD	Moderate	Moderate	Moderate
HMS	Low	Low	Low
HRD	Low	Moderate	Moderate
HRS	Low	Moderate	Moderate
HSD	Low	Moderate	Moderate
HSS	Low	Low	Low
MLD	High	High	High
MLS	Moderate	Moderate	Moderate
MMD	Moderate	High	High
MMS	Moderate	Moderate	Moderate
MRD	Low	Moderate	High
MSD	Low	Moderate	High
MSS	Low	Moderate	Moderate
NNN	Low	Low	Low
RNN	Low	Low	Low
ROW	Low	Low	Low
SNN	Low	Low	Low

*See Table 10 for cover type code definitions.

The overall amount of “High” LWD recruitment potential on ODF lands (RA1 and RA2) increased from 6% to 33% (424 acres to 2516 acres) in 50 years, and from 6% to 58% (424 acres to 4385 acres) in 100 years. The largest gain, in terms of acres, was in the Upper Miami Subwatershed where the amount of “High” recruitment potential increased from 132 acres (2%) to 2733 acres (51%) in 100 years. The Lower Miami and Tillamook Bay Subwatersheds showed significant increases in the percent of area in the “High” recruitment potential category, from 10% to 69% and from 17% to 80%, respectively. However, due to the low amount of ODF ownership in these subwatersheds, the amount of acres was relatively small (Table 26, Figure 36, 37, and 38).

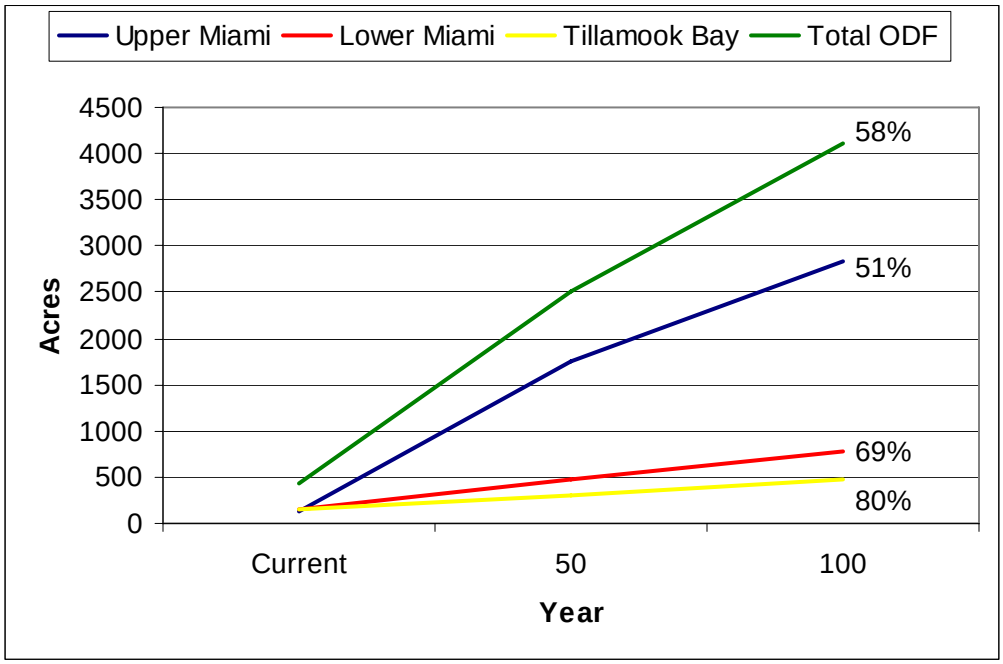

Figure 4. The amount of "High" LWD recruitment potential for ODF lands (RA1+RA2) in the current, 50-, and 100-year timeframes. Percentages indicate amount of ODF land (compared to total ODF ownership) in the subwatershed.

The presence of large conifers in riparian forest does not ensure the delivery of such wood to the stream channel. The delivery of these trees to the stream channel is dependent on factors affecting stand conditions and succession dynamics through time. In the absence of a naturally occurring large-scale disturbance (i.e. windthrow), LWD inputs will be dependent on tree mortality and the probability of that tree falling in the direction of the stream channel. In short, it may take a significant amount of time to realize LWD inputs once streamside forest stands develop large conifers.

Table 2. LWD recruitment potential on ODF lands (acres) for the current, 50-year, and 100-year timeframes. Totals for RA1 + RA2 (outlined in bold) were used in this analysis.

		Current -- LWD Recruitment Potential on ODF Lands							
		Low		Moderate		High		Total	
	Subwatershed	acres	%	acres	%	Acres	%	acres	%
RA1	Upper Miami	578	41%	809	57%	34	2%	1421	100%
	Lower Miami	196	52%	145	38%	37	10%	378	100%
	Tillamook Bay	112	50%	77	34%	34	15%	222	100%
	Total	885	44%	1031	51%	106	5%	2022	100%
RA1+RA2	Upper Miami	2084	39%	3102	58%	132	2%	5318	100%
	Lower Miami	728	51%	549	39%	148	10%	1425	100%
	Tillamook Bay	423	50%	271	32%	144	17%	838	100%
	Total	**3235**	**43%**	**3923**	**52%**	**424**	**6%**	**7582**	**100%**
ODF170	Upper Miami	3145	39%	4747	59%	205	3%	8097	100%
	Lower Miami	1151	50%	887	39%	243	11%	2282	100%
	Tillamook Bay	637	49%	424	33%	232	18%	1293	100%
	Total	4933	42%	6059	52%	680	6%	11672	100%

		50-Year LWD Recruitment Potential on ODF Lands							
		Low		Moderate		High		Total	
	Subwatershed	acres	%	acres	%	Acres	%	acres	%
RA1	Upper Miami	46	3%	959	68%	416	29%	1421	100%
	Lower Miami	6	1%	261	69%	112	29%	378	100%
	Tillamook Bay	5	2%	145	65%	73	33%	222	100%
	Total	56	3%	1366	68%	600	30%	2022	100%
RA1+RA2	Upper Miami	116	2%	3452	65%	1750	33%	5318	100%
	Lower Miami	17	1%	937	66%	471	33%	1425	100%
	Tillamook Bay	14	2%	530	63%	295	35%	838	100%
	Total	**146**	**2%**	**4919**	**65%**	**2516**	**33%**	**7582**	**100%**
ODF170	Upper Miami	156	2%	5101	63%	2840	35%	8097	100%
	Lower Miami	26	1%	1471	64%	785	34%	2282	100%
	Tillamook Bay	20	2%	796	62%	478	37%	1293	100%
	Total	201	2%	7368	63%	4103	35%	11672	100%

		100-Year LWD Recruitment Potential on ODF Lands							
		Low		Moderate		High		Total	
	Subwatershed	acres	%	acres	%	Acres	%	acres	%
RA1	Upper Miami	39	3%	729	51%	653	46%	1421	100%
	Lower Miami	4	1%	134	35%	241	64%	378	100%
	Tillamook Bay	4	2%	50	22%	168	76%	222	100%
	Total	47	2%	913	45%	1062	53%	2022	100%
RA1+RA2	Upper Miami	98	2%	2488	47%	2733	51%	5318	100%
	Lower Miami	13	1%	429	30%	983	69%	1425	100%
	Tillamook Bay	11	1%	158	19%	669	80%	838	100%
	Total	**122**	**2%**	**3075**	**41%**	**4385**	**58%**	**7582**	**100%**
ODF170	Upper Miami	135	2%	3545	44%	4418	55%	8097	100%
	Lower Miami	21	1%	647	28%	1614	71%	2282	100%
	Tillamook Bay	15	1%	232	18%	1046	81%	1293	100%
	Total	171	1%	4423	38%	7077	61%	11672	100%

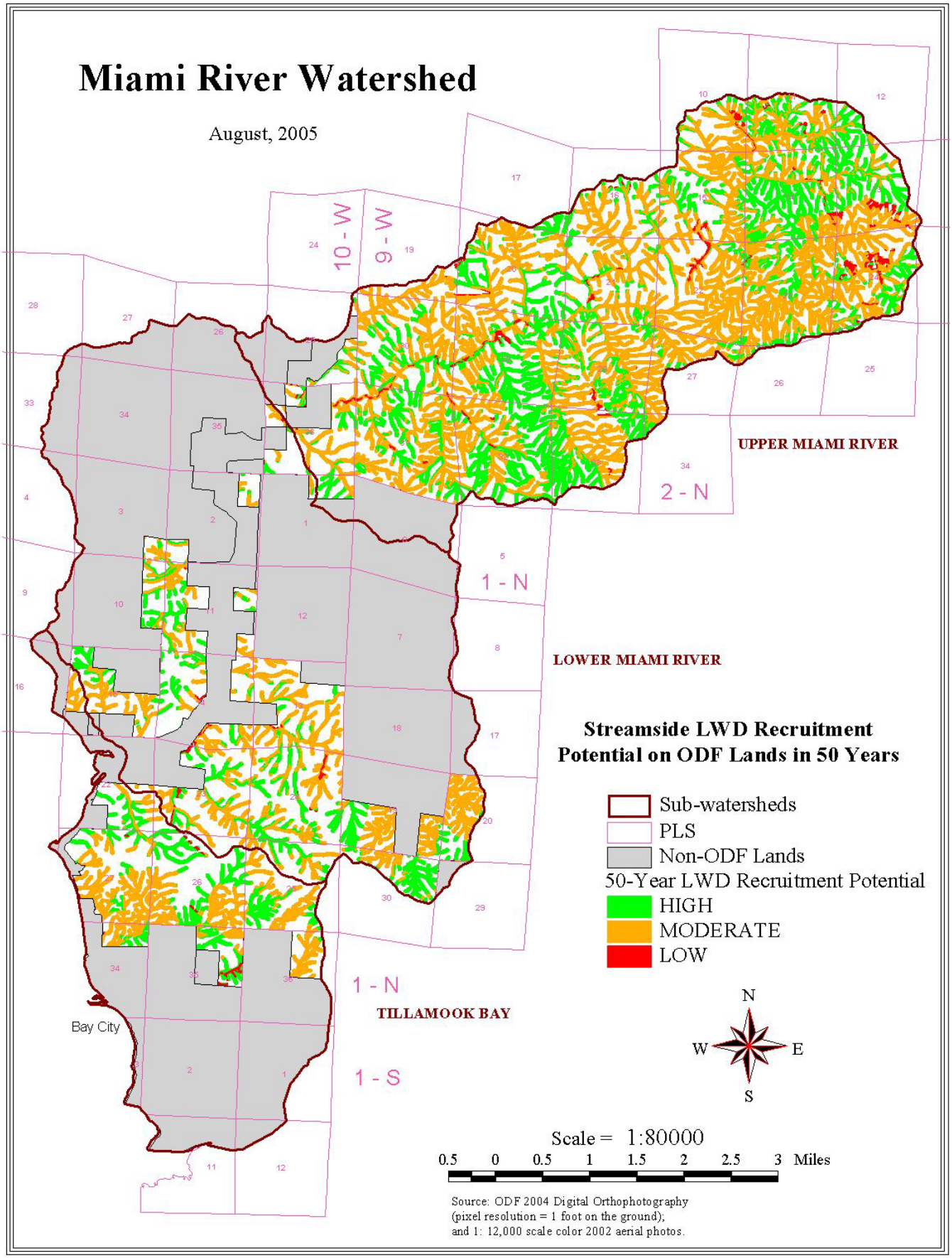

Figure 5. Estimated large woody debris recruitment potential in 50 years for the Miami River Watershed Project Area.

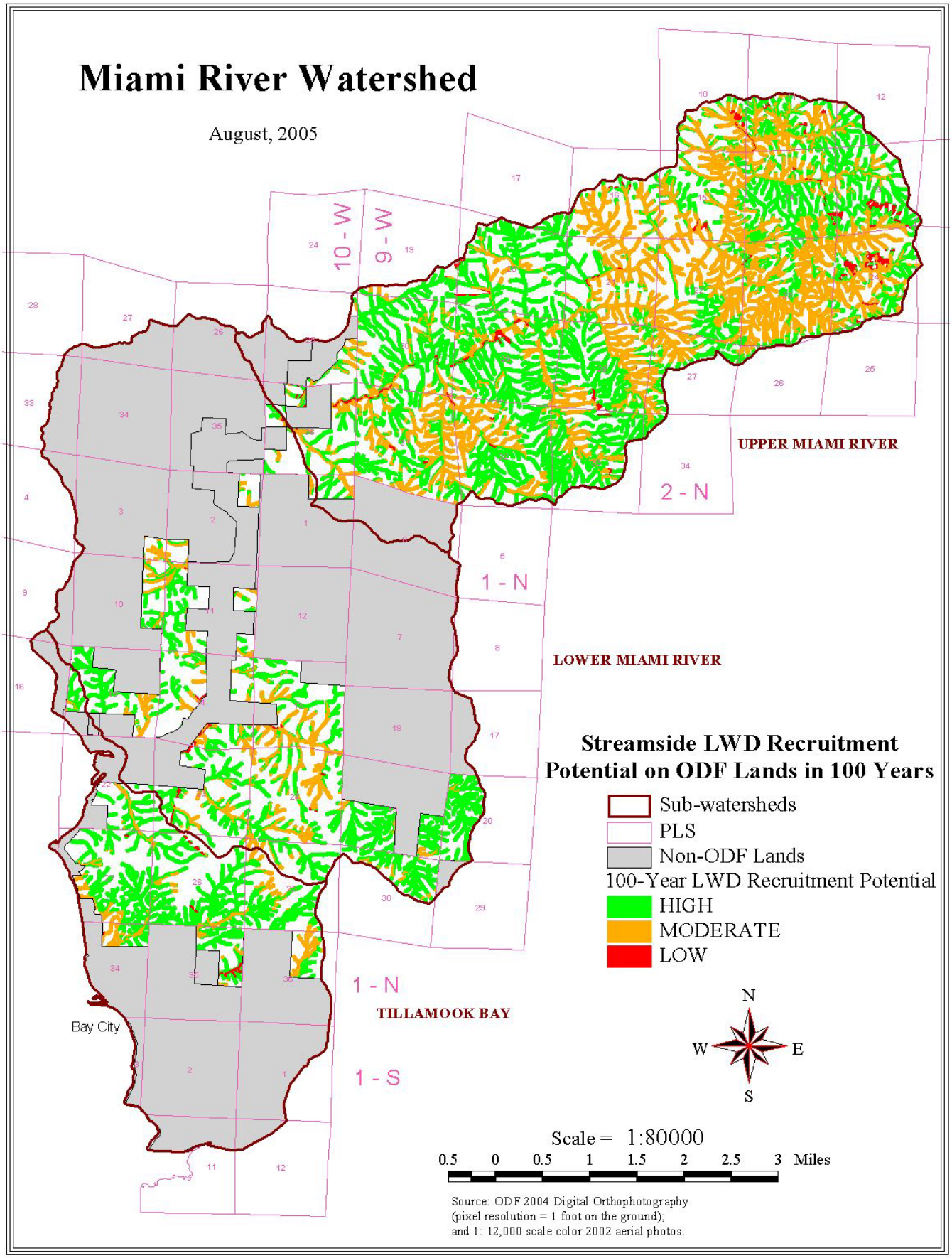

Figure 6. Estimated large woody debris recruitment potential in 100 years for the Miami River Watershed Project Area.