STREAM INVENTORY REPORT

Dewarren Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1999 on Dewarren Creek. The survey began at the confluence with the North Fork Noyo River and extended upstream 8,603 feet. A stream inventory and subsection to this report were also completed for one unnamed tributary to Dewarren Creek.

The Dewarren Creek inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Dewarren Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Dewarren Creek is a tributary to the North Fork Noyo River, a tributary to the Noyo River, located in Mendocino County, California (Map 1). Dewarren Creek's legal description at the confluence with the North Fork Noyo River is T19N R15W S29. Its location is 39°28′36″ north latitude and 123°33′35″ west longitude. Dewarren Creek is a first order stream and has approximately 0.6 miles of blue line stream according to the USGS Northspur 7.5 minute quadrangle. Dewarren Creek drains a watershed of approximately 1.68 square miles. Elevations range from about 600 feet at the mouth of the creek to 2,100 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned by the Mendocino Redwoods Company and is managed for timber production. Vehicle access exists via Irmulco Road, six miles west of Willits, off of Hwy. 20.

METHODS

The habitat inventory conducted in Dewarren Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Dewarren Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and stadia rod.

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Dewarren Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean

wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics were measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Dewarren Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, a bedrock tail-out, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Dewarren Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulder and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Dewarren Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or deciduous trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Dewarren Creek, the dominant composition type and the dominant

vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Dewarren Creek. In addition, eight sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE 4.2 data entry program developed by Tim Curtis, California Department of Fish and Game. This program processes and summarizes the data, and produces the following six tables:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Dominant substrates by habitat types
- Mean percent shelter by habitat types

Graphics are produced from the tables using Quattro Pro. Graphics developed for Dewarren Creek include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length
- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in low gradient riffles
- Mean percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

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HABITAT INVENTORY RESULTS

The habitat inventory of August 31, 1999 to September 7, 1999, was conducted by Christine Ramsey and Toni Beaumont (WSP/AmeriCorps). The total length of the stream surveyed was 8,603 feet.

Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.026 cfs on August 31, 1999.

Dewarren Creek is an F4 channel type for the entire 8,603 feet of the stream surveyed. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 55 to 59 degrees Fahrenheit. Air temperatures ranged from 63 to 77 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 4% dry units, 10% riffle units, 36% flatwater units, and 50% pool units (Graph 1). Based on total length of Level II habitat types there were 3% dry units, 7% riffle units, 60% flatwater units, and 30% pool units (Graph 2).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were runs, 24%; mid-channel pools, 16%; lateral scour pools - log enhanced and step runs, 13% each (Graph 3). Based on percent total length, runs made up 36%, step runs 24%, and mid-channel pools 10%.

A total of 114 pools were identified (Table 3). Scour pools were the most frequently encountered, at 66%, and comprised 65% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Fifteen of the 114 pools (13%) had a depth between two and three feet and four (4%) had a depth between three and four feet (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 114 pool tail-outs measured, 2 had a value of 1 (2%); 76 had a value of 2 (67%); 7 had a value of 3 (6%); and 29 had a value of 5 (25%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The dominant substrate composition for the 29 pool tail-outs that had an embeddedness value of 5 was 17% sand and 83% small gravel.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 6, flatwater habitat types had a mean shelter rating of 8, and pool habitats had a mean shelter rating of 16 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 19. Scour pools had a mean shelter rating of 16 (Table 3).

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Table 5 summarizes mean percent cover by habitat type. Undercut banks, small woody debris, and large woody debris are the dominant cover types in Dewarren Creek. Graph 7 describes the pool cover in Dewarren Creek. Large woody debris is the dominant pool cover type followed by undercut banks.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 88% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 7%.

The mean percent canopy density for the surveyed length of Dewarren Creek was 93%. The mean percentages of deciduous and coniferous trees were 54% and 46%, respectively. Graph 9 describes the mean percent canopy in Dewarren Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 88%. The mean percent left bank vegetated was 89.5%. The dominant elements composing the structure of the stream banks consisted of 36% cobble/gravel, and 60% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 50% of the units surveyed, while 48% had coniferous trees as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Eight sites were electrofished for species composition and distribution in Dewarren Creek on October 10, 1999. Water temperatures taken during the electrofishing period of 12:25 and 1:15pm ranged from 47 to 48 degrees Fahrenheit. The air temperature was 58 degrees Fahrenheit. The sites were sampled by Michelle Gilroy (DFG) and Toni Beaumont (WSP/AmeriCorps).

The first site sampled included habitat unit 2, a mid-channel pool, approximately 73 feet from the confluence with the North Fork Noyo River. The site yielded no fish.

The second site included habitat unit 3, a lateral scour pool - root wad enhanced, located approximately 121 feet upstream of the creek mouth. The site yielded one young-of-the-year age class steelhead.

The third site sampled included habitat unit 5, a lateral scour pool - root wad enhanced, located approximately 274 feet upstream of the creek mouth. The site yielded one young-of-the-year and one one-plus age class steelhead.

The fourth site sampled included habitat unit 6, a channel confluence pool, located approximately 293 feet upstream of the creek mouth. The site yielded no fish.

The fifth site sampled included habitat unit 7, a run, located approximately 306 feet upstream of the creek mouth. The site yielded no fish.

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The sixth site sampled included habitat unit 8, a lateral scour pool - log enhanced, located approximately 324 feet upstream of the creek mouth. The site yielded 1 young-of-the-year and 1 one-plus age class steelhead.

The seventh site sampled included habitat unit 10, a lateral scour pool - root wad enhanced, located approximately 474 feet upstream of the creek mouth. The site yielded no fish.

The eighth site sampled included habitat unit 13, a plunge pool, located approximately 549 feet upstream of the creek mouth. The site yielded 1 young-of-the-year age class steelhead.

The following chart displays the information yielded from these sites:

Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead		
							YOY	1+	2+
10/19/99	1	73	0002	4.2	1	F4	0	0	0
10/19/99	2	121	0003	5.3	1	F4	1	0	0
10/19/99	3	274	0005	5.3	1	F4	0	1	0
10/19/99	4	293	0006	4.3	1	F4	0	0	0
10/19/99	5	306	0007	3.3	1	F4	0	0	0
10/19/99	6	324	0008	5.2	1	F4	1	1	0
10/19/99	7	474	0010	5.3	1	F4	0	0	0
10/19/99	8	549	0013	5.6	1	F4	1	0	0

DISCUSSION

Dewarren Creek is an F4 channel type for the entire 8,603 feet of stream surveyed. The suitability of F4 channel types for fish habitat improvement structures is as follows: good for bank placed boulders; fair for plunge weirs, single and opposing wing deflectors, channel constrictors, and log cover; poor for boulder clusters.

The water temperatures recorded on the survey days of August 31, 1999 to September 7, 1999, ranged from 55 to 59 degrees Fahrenheit. This is a favorable water temperature range for salmonids. Air temperatures ranged from 63 to 77 degrees Fahrenheit. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 60% of the total length of this survey, riffles 7%, pools 30%, and dry units 3%. Nineteen of the 114 (17%) pools had a maximum depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase the size and/or depth of existing pool habitat is recommended.

Two of the 114 pool tail-outs measured had an embeddedness rating of 1. Seventy-six of the pool tail-outs had an embeddedness rating of 2. Seven of the pool tail-outs had an embeddedness rating of 3. Twenty-nine of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. All of the 29 pool tail-outs with a rating of 5 were unsuitable for spawning due to the dominant substrate being sand or gravel too small to be suitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Dewarren Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating in the flatwater habitats was 8. The shelter rating for pools was 16. A pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by undercut banks, small woody debris, and large woody debris in most habitat types. Log and root wad cover structure in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

One-hundred of the 114 pool tail-outs measured had gravel, while eight had small cobble as the dominant substrate. Twenty-four percent of the gravel in those pool tail-outs was considered unsuitable spawning substrate for salmon and steelhead due to the small size of the gravel.

The mean percent canopy density for the stream was 93%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 88% and 89.5%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Dewarren Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

3) Where feasible, design and engineer pool enhancement structures to increase the size of existing pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

4) Increase the large wood component in the pools and flatwater habitat units. Most of the existing cover is from undercut banks. Adding high quality complexity with woody

cover is desirable.

5) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

6) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Position (ft):	Comment:
0'	Begin survey at confluence with the North Fork Noyo River. Channel type is F4.
73'	Electrofishing site #1.
121'	Electrofishing site #2.
274'	Electrofishing site #3.
293'	Electrofishing site #4.
306'	Electrofishing site #5.
324'	Electrofishing site #6.
339'	Thirty piece log debris accumulation, 5 feet wide x 5 feet long.
474'	Electrofishing site #7.
549'	Electrofishing site #8.
564'	Ten piece log debris accumulation, 5 feet high x 10 feet wide.
604'	Log debris accumulation on right bank. Approximately 100 feet long and retaining sediment.
888'	Bridge is 7.2 feet above the creek and spans 13 feet across channel.
1,433'	Left bank failure, 10 feet long x 10 feet high.

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1,447'	Log debris accumulation on right bank, 5 feet high x 5 feet wide.
1,461'	Ephemeral tributary enters from left bank.
1,544'	Ephemeral tributary enters from right bank.
1,617'	Five piece log debris accumulation, 10 feet wide x 10 feet high, retaining sediment. Left bank failure, 20 feet long x 15 feet wide.
1,703'	Ephemeral tributary enters from right bank.
1,774'	Ephemeral tributary enters from left bank.
1,843'	Left bank failure, 15 feet long x 5 feet high. Log debris accumulation, 8 feet wide x 8 feet high, retaining sediment.
2,014'	Left bank failure, 10 feet long.
2,082'	Left bank failure, 20 feet long x 10 feet high.
2,214'	Five logs spanning channel.
2,393'	Right bank failure, 10 feet wide x 20 feet long.
2,556'	Left bank failure, 20 feet wide x 20 feet long.
2,586'	Left bank failure, 20 feet wide x 20 feet long.
2,705'	“Fish ‘96" flag.
2,918'	Left bank failure, 10 feet long x 10 feet wide.
3,153'	Ephemeral tributary enters from right bank.
3,214'	Left bank failure, 17 feet long x 5 feet high.
3,242'	Log debris accumulation, 10 feet long x 10 feet high.
3,744'	Log debris accumulation, 5 feet long x 5 feet high.
3,860'	Ten piece log debris accumulation, 3 feet high x 5 feet long.
3,866'	Second right bank tributary. See Subsection report.
4,125'	Two foot plunge.

4,231'	Twenty piece log debris accumulation, 10 feet long x 10 feet wide x 5 feet high, retaining sediment.
4,422'	Two logs in channel retaining sediment.
4,474'	Old bridge posts.
4,588'	Twenty-five piece log debris accumulation, 15 feet long x 15 feet high, retaining approximately 3 feet of sediment.
4,665'	Log debris accumulation, 15 feet long x 15 feet high, constricting flow.
4,813'	First left bank tributary, 57 degrees Fahrenheit water temperature.
5,086'	Ephemeral tributary enters from left bank.
5,101'	Ephemeral tributary enters from left bank.
5,508'	Log debris accumulation, 10 feet long x 10 feet high.
5,644'	Right bank failure, 30 feet high x 70 feet wide.
5,935'	Left bank failure, 15 feet high x 10 feet wide.
5,998'	Right bank failure, 25 feet high x 25 feet wide.
6,028'	Left bank failure, 10 feet high x 10 feet wide.
6,137'	Two foot plunge.
6,355'	Log debris accumulation, 10 feet long x 10 feet high, retaining sediment.
6,369'	Right bank failure, 10 feet high x 10 feet wide.
6,665'	“Noyo River Watershed Analysis #160”, white flag.
7,018'	Twenty-five piece log debris accumulation, 15 feet long x 15 feet high, retaining approximately 3 feet of sediment.
7,198'	Subsurface stream flow.
7,298'	Twenty-five piece log debris accumulation, 10 feet long x 10 feet high.
7,420'	Three foot plunge over log accumulation.

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7,866'	Log debris accumulation, 5 feet long x 5 feet high.
7,905'	Log debris accumulation, 15 feet long x 15 feet high, retaining sediment.
8,196'	Two foot plunge.
8,247'	Ephemeral tributary enters from left bank.
8,343'	Six foot plunge.
8,433'	Log debris accumulation, 20 feet wide x 15 feet long x 5 feet high.
8,525'	Fifteen foot plunge. Probable fish barrier.
8,553'	Ephemeral tributary enters from right bank.
8,603'	End of survey due to probable barrier noted at 8,525'.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat restoration manual,* 3rd edition. California Department of Fish and Game, Sacramento, California.

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LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE			
Low Gradient Riffle	(LGR)	[1.1]	{ 1}
High Gradient Riffle	(HGR)	[1.2]	{ 2}
CASCADE			
Cascade	(CAS)	[2.1]	{ 3}
Bedrock Sheet	(BRS)	[2.2]	{24}
FLATWATER			
Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}
MAIN CHANNEL POOLS			
Trench Pool	(TRP)	[4.1]	{ 8}
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}
SCOUR POOLS			
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9}
BACKWATER POOLS			
Secondary Channel Pool	(SCP)	[6.1]	{ 4}
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5}
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6}
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7}
Dammed Pool	(DPL)	[6.5]	{13}
ADDITIONAL UNIT DESIGNATIONS			
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

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