MISC. ADDENDUMS

SECTION V

SECTION V INDEX

ESTIMATED SURFACE SOIL EROSION HAZARD

SOIL FACTORS soil names	FACTOR
A- 120W Dehaven Hotel -Unit #1	RATING
B- 221W Cottaneva Loam- Unit #1	BY AREA
C- 220W Big River Loamy Sand - Units 1, 2, 3	

A. SOIL	Fine	Medium	Coarse	A	B	C
1. DETACHABILITY	Low	Moderate	High			
Rating	1-9	10-18	19-30	17	20	25
2. PERMEABILITY	Slow	Moderate	Rapid			
Rating	5-4	3-2	1	3	1	1
B. DEPTH TO RESTRICTIVE LAYER OR BEDROCK						
	Shallow	*Moderate*	*Deep*			
	1"- 19"	*20"-39"*	*40"-60"(+)*			
Rating	15-9	8-4	3-1	5	1	1
C. PERCENT SURFACE COARSE FRAGMENTS GREATER THAN 2 MM IN SIZE INCLUDING ROCKS OR STONES						
	Low	Moderate	High			
	(-) 10-39%	40-70%	71-100%			
Rating	10-6	5-3	2-1	8	10	10

Factor Rating		
A	B	C
33	32	37

II. SLOPE FACTOR									
Slope	5-15%	16-30%	31-40%	41-50%	51-70%	71-80% (+)			
0Rating	1-3	4-6	7-10	11-15	16-25	26-35	7	3	1

III. PROTECTIVE VEGETATIVE COVER REMAINING AFTER DISTURBANCE						
	Low	Moderate	High			
	0-40%	41-80%	81-100%			
Rating	15-8	7-4	3-1	4	4	4

IV. TWO-YEAR, ONE-HOUR RAINFALL INTENSITY (Hundredths Inch)							
	Low	Moderate	High	Extreme			
	(-) 30-39	40-59	60-69	70-80 (+)			
Rating	1-3	4-7	8-11	12-15	12	12	12
EROSION HAZARD RATING					56	51	54
	<50	50-65	66-75	>75			
	LOW (L)	MODERATE (M)	HIGH (H)	EXTREME (E)			
THE DETERMINATION IS-					M	M	M

ESTIMATED SURFACE SOIL EROSION HAZARD

SOIL FACTORS soil names	FACTOR RATING BY AREA
D-341W-Irmulco-Tramway- gentle unit #1	
E-341W-Irmulco-Tramway-steep unit #3	

A. SOIL	Fine	Medium	Coarse	A	B	C
1. DETACHABILITY	Low	Moderate	High			
Rating	1-9	10-18	19-30	17	17	
2. PERMEABILITY	Slow	Moderate	Rapid			
Rating	5-4	3-2	1	3	3	
B. DEPTH TO RESTRICTIVE LAYER OR BEDROCK						
	Shallow	Moderate	Deep			
	1″- 19″	20″-39″	40″-60″(+)			
Rating	15-9	8-4	3-1	3	3	
C. PERCENT SURFACE COARSE FRAGMENTS GREATER THAN 2 MM IN SIZE INCLUDING ROCKS OR STONES						
	Low	Moderate	High			
	(-)10-39%	40-70%	71-100%			
Rating	10-6	5-3	2-1	10	10	

Factor Rating

A	B	C
33	33	

II. SLOPE FACTOR

Slope	5-15%	16-30%	31-40%	41-50%	51-70%	71-80% (+)		
Rating	1-3	4-6	7-10	11-15	16-25	26-35	3	20

III. PROTECTIVE VEGETATIVE COVER REMAINING AFTER DISTURBANCE

	Low	Moderate	High		
	0-40%	41-80%	81-100%		
Rating	15-8	7-4	3-1	4	4

IV. TWO-YEAR, ONE-HOUR RAINFALL INTENSITY (Hundredths Inch)

	Low	Moderate	High	Extreme		
	(-) 30-39	40-59	60-69	70-80 (+)		
Rating	1-3	4-7	8-11	12-15	12	12
EROSION HAZARD RATING					52	69
	<50	50-65	66-75	>75		
	LOW (L)	MODERATE (M)	HIGH (H)	EXTREME (E)		
THE DETERMINATION IS-					M	H

Downstream Landowner List

North Gualala Water Co.
P.O. Box 1000
Gualala, CA 95445-8554

4/4/18

Dear Sirs,

The Forest Practice Regulations require that I provide notice by letter, of proposed timber operations, to all landowners within 1,000 feet downstream of a proposed THP boundary, whose ownership adjoins or includes a class I, II, or IV watercourse that receives drainage from the proposed timber operations.

A timber harvest plan is proposed in the following watershed; Doty Creek. The legal description is Sec 4 , 9, 10, 11, 14, 15, 23 T11N R15W M.D.B.M. Mendocino County. The plan area is approximately 2 miles northeast of the town of Gualala. This plan is located on the U.S.G.S. 7.5 min map Gualala. The following watercourses receive drainage from the proposed timber operation: the Little North Fork of the Gualala River, Doty Creek and Log Cabin Creek and several smaller unnamed watercourses in the same area. If you have knowledge of any domestic water supply whose source is in the above watercourses or that may be affected by the operations please contact me at the following address in writing within ten (10) days of the date of this notice.
Art Haschak 387 Pacific Blvd. Arcata, CA 95521.

If domestic water supplies are noted, the THP will contain mitigations necessary to protect those water supplies.

Thank you for your assistance.

Sincerely,

Art Haschak RPF #2423

To Independent Coast Observer

Dear Sirs,

Please run the following notice in your newspaper one (1) day only, to appear as soon as possible.

Notice

A timber harvest plan is proposed in the following watershed; Doty Creek watershed. The legal description is Sec 4 , 9, 10, 11, 14, 15, 23 T11N R15W M.D.B.M. Mendocino County. The southernmost part of the plan area starts approximately 2 miles northeast of the town of Gualala. This plan is located on the U.S.G.S. 7.5 min map Gualala. The following watercourses receive drainage from the proposed timber operation: The Little North Fork of the Gualala River, Doty Creek and Log Cabin Creek and several smaller unnamed watercourses in the same area. If you have knowledge of any domestic water supply whose source is in the above watercourses or that may be affected by the operations please contact me at the following address in writing within ten (10) days of the date of this notice.
Art Haschak 387 Pacific Blvd. Arcata, CA 95521.

Please send a notice of publication and an invoice to my address. Thank you for your attention to this matter. If you have any questions please do not hesitate to call.

Sincerely,

Art Haschak 387 Pacific Blvd Arcata, CA 95521.

Independent Coast Observer
P.O. Box 1200
Gualala, CA 95445

(707) 884-3501
(707) 884-1710 fax
www.mendonoma.com

Proof of Publication of NOTICE

APRIL 13, 2018

Public Notice

NOTICE

A timber harvest plan is proposed in the following watersheds; Doty Creek watershed. The legal description is Sec 4, 9, 10, 11, 14, 15, 23 T11N R15W M.D.B.M. Mendocino County. The southernmost part of the plan area starts approximately 2 miles northeast of the town of Gualala. This plan is located on the U.S.G.S. 7.5 min maps Gualala. The following watercourses receive drainage from the proposed timber operation: The Little North Fork of Gulala River, Doty Creek and Log Cabin Creek, and several smaller unnamed watercourses in the same area. If you have knowledge of any domestic water supply whose source is in the above watercourses or that may be affected by the operations please contact me at the following address in writing within ten (10) days of the date of this notice.

Art Haschak 387 Pacific Blvd. Arcata, CA 95521.

(7369) April 13, 2018

I, the undersigned say:
That I am over the age of eighteen and am not a party to or interested in the above entitled matter of proceeding; and am, and at all times embraced in the publication herein mentioned, was the principal clerk of the editor and publisher of the INDEPENDENT COAST OBSERVER, a weekly newspaper printed, published and circulated in the County of Mendocino, and adjudged a newspaper of general circulation by the Superior Court of California, Proceeding #15294, that the above NOTICE of which is annexed a true printed copy, was printed in type not smaller than nonpareil and published in said newspaper on the following date(s), to wit: April 13, 2018.

I certify (or declare) under penalty of perjury that the foregoing is true and correct.
Executed and dated at Gualala, California, this June 26, 2018

Signature__________________________

(ICO Ad number 7369)

Erosion Control Plan (ECP) Little THP

This document addresses the requirements of California Water Quality Control Board Order R1-2009-0038 for Erosion Control Plans related to timber harvest activities on Non-Federal lands in the North Coast Region. This ECP is submitted for Gualala Redwood Timber LLC Little THP.

The RPF has conducted an inventory of controllable sediment discharge sources within the Project area concentrating especially on the areas that have the potential to affect the Gualala River. Controllable sediment discharge source (CSDS) means sites or locations, both existing and those created by proposed timber harvest activities, within the Project area that meet all the following conditions:

1. is discharging or has the potential to discharge sediment to waters of the state in violation of applicable water quality requirements or other provisions of these General WDRs,
2. was caused or affected by human activity, and
3. may feasibly and reasonably respond to prevention and minimization management measures.

Method Used to Inventory Sediment Sites- The inventory method consisted of an appurtenant road inventory and ground assessment of the harvest units, and a complete ground assessment of all watercourses, and associated stream protection zones. During the road assessment the following items were looked for 1- Road fill with the potential to fail and deliver, 2- Landing fill with the potential to fail and deliver, 3- Watercourse crossings with the potential to fail and deliver, 4- Wet areas that could saturate the road prism and cause it to fail and deliver, 5- Places where the road is dumping water onto unstable areas, 6- Places where unstable banks are diverting inside ditches, 7- Places where inadequate waterbars or rolling dips are causing surface erosion of the road, 8- Places where insloped roads can be converted to outsloped roads, 9- Instream landings, 10- WLPZ landings, roads or skid trails.

The assessment of the watercourses was done by walking the centerline and /or the WLPZ lines on both sides of the watercourses. The following items were looked for 1- watercourse diversions 2- skid trail crossings that were not adequately pulled or are likely to divert water out of the natural channel or into unstable banks 3- Perched fill on skid trails that are likely to deliver 4- Mounds at the end of skid trails that could collect water and then breach thereby delivering sediment. 5- Skid trails that are inadequately waterbarred and are having surface erosion. 6- Skid trails that are directing water onto unstable slopes 7- WLPZ skid trails that are causing problems.

Hillslopes were also assessed during the course of plan layout (although not as completely as roads and watercourses) and skid trails or other man-caused potential sediment sources were noted and beneficial actions developed if feasible.
The schedule for implementing the prevention and minimization management measures for the controllable sediment sources will be consistent with the life of the Timber Harvest Plan. The plan will be to implement these measures in accordance with the priority level assigned to the site (lower priority sites may be repaired while repairing the high priority sites if the sites are in the same area and if this will result in the most efficient use of the equipment but generally high priority sites will be repaired first). Work at all sites will be accomplished prior to plan expiration (assuming other agency permits are approved, i.e. 1600, NSO no-take etc.). The general prevention and minimization measures will be implemented concurrent with operations.

Section I.
Inventory and Treatment of Controllable Sediment Sources

During layout of the THP although most of the road system has been recently stormproofed there was still several culverts that needed replacing. These points are listed below in the work order.

The following is the methodologies that are used for this erosion control plan when new CSDS points are discovered.
1-The method used to estimate the potential sediment volume.
The methods used to estimate potential sediment volume were developed by Jack Monschke and are quick to use and provide answers that are accurate to within 10% of more intense methods developed by Pacific Watershed Associates (PWA). Some estimators (e.g. McCanless or PWA employees) working for the landowner may use PWA methodology.

2-The method used to estimate the relative potential for sediment delivery.
Relative potential for sediment delivery is a percentage of the sediment volume estimated at the site that has the potential to enter a watercourse. This estimation is affected by the following factors. #1- The distance to the watercourse #2- The steepness of the intervening slopes #3- Other factors such as a bench between the sediment and the watercourse, thick vegetation versus no vegetation or highly erodible soil also may affect this number.

3-The method used to determine the priority of a site.
The priority is shown under Priority/Schedule in the attached Erosion Control Plan Road Work Order database. High priority items are scheduled to be

repaired prior to the first winter period after start of operations while medium and low priority items are scheduled to be repaired prior to completion of the plan. Priority is determined by the following method. Highest priority is given to sites that are likely to deliver sediment during the next five year storm event. These are normally sites that appear to be close to failure and are proximate to a class I or class II watercourse. Medium sites may be close to watercourses but do not appear to be in danger of failing soon or are farther from watercourses but appear less stable. Low priority sites are not close to watercourses and do not appear to be in danger of failing but could deliver sediment to a watercourse if they do eventually fail. The proximity of the erosion site, size of the potential delivery, type of watercourse (Class I, Class II, and lass III), distance to a class I if the watercourse is a class II or III, and whether the Class I watercourse is listed as impaired are all also considered in evaluating priority.

Section II.

General Prevention and Minimization Measures for Controllable Sediment Discharge

In addition to the site specific measures (when CSDS points are discovered), the general measures proposed in this project, either as required by CDF under the Forest Practice Rules, by another State or Federal regulating agency, or as a matter of landowner policy, will prevent or minimize future sediment delivery. These measures are included in Section II of the THP under items 18, 23, 26, 27 and 38 and are not repeated here.

- Roads

Practices related to the construction, reconstruction, and maintenance of truck roads are key factors in the control of sediment that could be produced from timber harvesting operations. To address this concern, landowner has focused considerable effort on the proper construction of forest roads. Landowner has directed its road construction program towards developing roads that avoid steep slopes and unstable areas. In circumstances where it has been necessary to construct roads on steep slopes, full bench and minimum width roads have been built using end-haul equipment and appropriate construction techniques.

Landowner's road construction, re-construction, and maintenance standards and techniques have been developed in conjunction with the Handbook For Forest And Ranch Roads (Weaver and Hagans), and Designing Watercourse Crossings for Passage of 100-year Flood Flows, Wood and Sediment (Cafferata, Spittler, Wopat, Bundros, and Flanagan).

- New construction/re-construction
    - Emphasize erosion control by outsloping, utilizing critical dips over crossings, and rolling dips and/or water bars to avoid concentrating water on the road surface. Emphasize proper placement and sizing of culverts. When water is present during culvert/bridge installations use pump around techniques to minimize sedimentation. Utilize riprap, seed and mulch, and energy dissipaters on culvert installations.

    - Emphasize disconnecting road systems from watershed hydrology through outsloping and rolling dips.

    - Minimize number of roads.

    - Minimize road widths.

    - Use temporary roads where appropriate.

    - Abandon all temporary roads proposed for construction after use. Abandonment includes crossing removal and road surface treatment, including large dips spaced at intervals not less than those required for the assigned erosion hazard rating, and/or obliterating the road by pulling fill materials and incorporating the fill into the road for outsloping. All entrances will be blocked to standard four-wheel drive vehicles. At crossing sites where abandonment is prescribed, fills will be pulled back to a 2:1 ratio (two feet horizontal and 1 foot vertical).

    - Limit construction/re-construction activities to times of the year when soils are not saturated.

    -Treatment of sidecast or fill material extending more than 20 feet in slope distance from the outside edge of the roadbed that has access to a watercourse or lake which is protected by a WLPZ may include, but need not be limited to, mulching, rip-rapping, or grass seeding. Where straw, mulch, or slash is used, the minimum coverage will be 90%, and any treated area that has been subject to reuse or has less than 90% surface cover will be treated again prior to the end of timber operations. The RPF may implement alternative treatments that will achieve the same level of erosion control and sediment discharge prevention.

    - Road related operations focus on maintenance during the winter period.

- Maintenance

Landowner compliments proper road design and construction with a strong program to ensure that roads are adequately maintained, particularly in regard to drainage structures and erosion control. Landowner implements the following road maintenance program in its operating areas to ensure that potentially significant impacts from erosion processes related to road maintenance are avoided:

-Access on these roads during the winter period will be limited. Incidental use may include timber falling, hazard abatement burning, road maintenance inspections, reforestation, wildlife surveys, botanical surveys, and/or timber harvest plan layout. Where appropriate, such access will be restricted to the use of low ground pressure all-terrain vehicles.

- Periodically, and prior to the onset of the winter period, landowner's forestry staff will inspect all roads appurtenant to timber harvest plans operated that year. The inspection will assess the effectiveness and quality of all newly installed and existing erosion control structures, and will identify areas needing additional maintenance prior to the winter period. A list will be prepared of those areas identified as needing additional work or repair. Items to be assessed as part of the road inspection program include the following:

    - Waterbars will be inspected to insure proper spacing, depth and complete diversion of water flow from the road surface.

    - Ditches will be inspected to insure that they are properly functioning and free of debris that could plug the ditch or a culvert and cause diversion of water onto the road surface.

    - Culverts will be inspected to insure that they are properly placed and functioning, and that downspouts are correctly installed.

    - The road prism will be inspected to identify areas exhibiting ponding, inadequately breached outside berms, unprotected fresh fill slopes, or other sites that exhibit a potential for cut bank or fill failure.

- All newly constructed and reconstructed roads will be inspected prior to the winter period to insure that they were properly constructed, that they are in compliance with the Forest Practice Rules, and that mitigation measures included in THPs were properly applied.

- After the pre-winter inspection is completed all observed problems will be corrected prior to the winter period.

- Newly constructed or reconstructed roads will be inspected during the winter period. Special attention will be given to road conditions during and after significant storm events so that problems can be promptly identified and corrected. Repairs will be made at the time of inspection if possible. If a larger crew or heavy equipment is necessary to repair a problem, the location will be noted and the repair will be carried out as soon as conditions allow.

- Yarding

Landowner emphasizes the use of low impact yarding systems and that yarding systems are in conformance with the Forest Practice Rules.

Cable yarding, which achieves less ground disturbance than tractor yarding, is used when feasible.

To minimize sediment discharges during the wetter times of year the Forest Practice Rules apply seasonal restrictions on yarding operations.

Erosion control structures shall be installed on all constructed skid trails and tractor roads prior to the end of the day if the U.S. Weather Service forecast is a "chance" (30% or more) of rain before the next day, and prior to any shutdown periods. Loading, hauling, and maintenance activities will be restricted to "dry, rainless periods but shall not be conducted on saturated soil conditions that may produce sediment in quantities sufficient to cause a visible increase in turbidity of downstream waters in receiving Class I, II, III or IV waters or that violate Water Quality Requirements", and shall further be guided by diligence and prudence in achieving the goals of 14CCR 914.

Tractor operations are excluded from unstable areas. If an unstable area is found during operations an Equipment Exclusion Zone will be implemented around the unstable area, or if operations within the unstable area are necessary, an amendment to the THP will be sent to CDF.

- Log Hauling

Log hauling will only occur on haul roads that have a stable operating surface.

Log hauling will be suspended if a significant storm event occurs that would cause saturated soil conditions on haul roads regardless of time of year. Hauling will not be resumed until it is determined that the road surface can withstand truck traffic without causing significant rutting of the road surface, loss of surface material, or generate waterborne sediment in amounts sufficient to cause a visible turbidity increase in downstream Class I, II, III, or IV waters.

- Burning

Broadcast burning is not proposed for this THP.

- Winter Operations

"Winter period" means the period between November 15 and April 1.

Winter operations are not proposed for this harvest plan.

Fuel Management Plan:

If applicable, a fuel management plan will be prepared to protect water quality from the use and storage of petroleum products and to assure that all State and Federal regulations pertaining to the handling and storage of fuel are adhered to during logging operations. This project does not meet the minimum requirements as stated in Order # R1-2004-0030 for a fuel management plan to be prepared.

Inspection Plan:

The intent will be to inspect all those points identified in the inventory included in the Erosion Control Plan. Any new sites found during these inspections will be noted and addressed in accordance with the provisions of section III.B.3.

Section III-
Site Inspections

Qualified professionals shall conduct all specified inspections of the Project site to identify areas causing or contributing to a violation of applicable water quality requirements or other provisions of these General WDRs.

Site inspections shall be conducted by the forestry staff of Delta Pacific, Inc. as managers of landowner. Contact at 707-884-3521.

The following inspection requirements shall begin once the startup of timber harvest activities begin within Project areas.

a. Project Areas where Timber Harvest Activities have not yet Commenced;

No inspections are required.

b. Project Areas where Timber Harvest Activities have Commenced and No Winter Period Timber Harvest Activities have Occurred;

At a minimum, conduct inspections each year and throughout the duration of the Project while Timber Harvest Activities occur and the Project is covered under General WDRs as follows:

1. By November 15 to assure Project areas are secure for the winter; and

2. Once following ten (10) inches of cumulative rainfall commencing on November 15 and prior to March 1, as worker safety and access allows; and

3. After April 1 and before June 15 to assess the effectiveness of management measures designed to address controllable sediment discharges and to determine if any new controllable sediment discharges sources have developed.

c. Project Areas With Winter Period Timber Harvest Activities;

Project areas with timber harvest activities during the winter period shall, at a minimum, conduct inspections of such Project areas while Timber Harvest Activities occur and the Project is covered under General WDRs as follows:

1. Immediately following the cessation of winter period timber harvest activities to assure areas with winter timber harvest activities are secure for the winter;

2. Once following ten (10) inches of cumulative rainfall commencing on November 15 and prior to March 1, as worker safety and access allows; and

3. After April 1 and before June 15 to assess the effectiveness of management

measures designed to address controllable sediment discharges and to determine if any new controllable sediment discharges sources have developed.

d. Inspection reports prepared shall identify where management measures have been ineffective and when landowner will implement repairs or design changes to correct management measure failures.

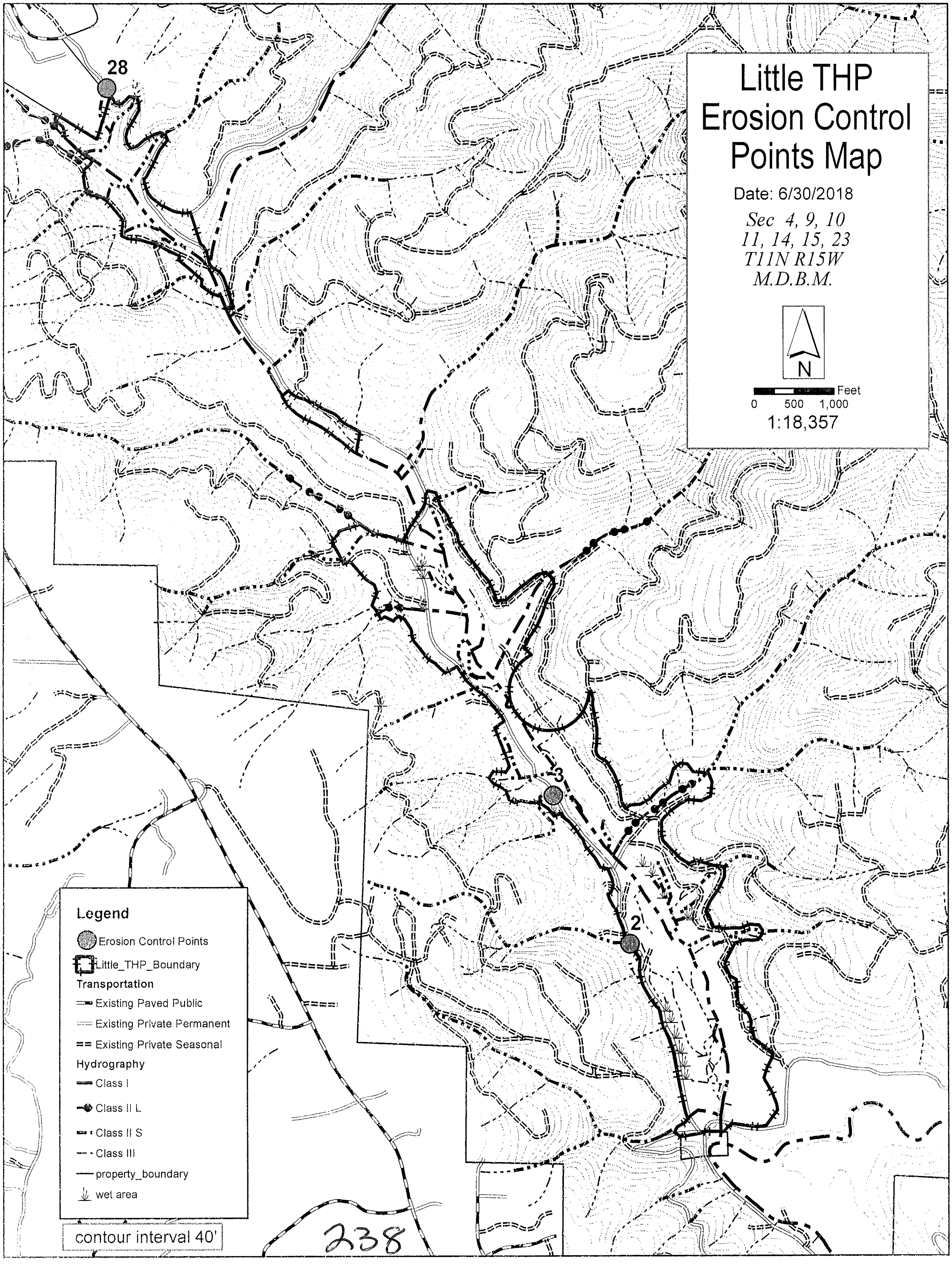
e. If any new controllable sediment discharge sources are identified, such sites shall be addressed in accordance with the provisions of section III.B.3.

f. Equipment, materials, and workers shall be available for rapid response to failures and emergencies, and implement, as feasible, emergency management measures depending upon field conditions and worker safety for access.

Reporting Requirements:

If during any inspection or during the course of conducting timber harvest activities, a violation of an applicable water quality requirement or conditions of these General WDRs is discovered, the provisions of section III.B.3. shall be followed.

For all other inspections where violations are not discovered, landowner shall submit a summary report to the Executive Officer by June 30th for each year of coverage under these General WDRs or upon termination of coverage. The summary report shall at a minimum include the date of each inspection, the inspector's name, the location of each inspection, and the title and name of the person submitting the summary report.



Little THP Erosion Control Points Map

Date: 6/30/2018

Sec 4, 9, 10
11, 14, 15, 23
T11N R15W
M.D.B.M.

*Landslides**

PART OF PLAN

RECEIVED
AUG 08 2019
COAST AREA OFFICE
RESOURCE MANAGEMENT

Planning Watershed *Doty Creek*

Map#	*ID #*	*Inspector*	*Year***	*Source*	*Slide Type*	*Slope Type*	*Slope Form*	*Association*	*Slope*	*Stream*	*Total Yds*	*Delivered*
8	8	Best CEG	1970	Photos	Hill Slope	Headwall Swale	Convergent	Natural	50-64	NA	222	55
10	10	Best CEG	1930	Photos	Hill Slope	Headwall Swale	Convergent	Natural		NA	5,369	4,026
12	12	Best CEG	1970	Photos	Landing	Headwall Swale	Convergent	Mgt. Relate	30-49	NA	2,370	1,777
13	13	Best CEG	1970	Photos	Road	Headwall Swale	Convergent	Mgt. Relate	50-64	NA	1,481	740
14	14	Best CEG	1970	Photos	Road	Headwall Swale	Convergent	Mgt. Relate	50-64	NA	1,481	370
15	15	Best CEG	1970	Photos	Road	Headwall Swale	Convergent	Mgt. Relate	50-64	NA	1,481	370
22	22	Best CEG	1970	Photos	Road	Headwall Swale	Convergent	Mgt. Relate	50-64	NA	648	486
37	37	Best CEG	1970	Photos	Skid Trail	Headwall Swale	Convergent	Mgt. Relate	30-49	NA	2,370	1,777
55	55	Best CEG	1970	Photos	Road	Headwall Swale	Convergent	Mgt. Relate	50-64	NA	1,481	740
57	57	Best CEG	1959	Photos	Road	Headwall Swale	Convergent	Mgt. Relate	30-49	NA	2,370	1,185
58	58	Best CEG	1970	Photos	Skid Trail	Headwall Swale	Convergent	Mgt. Relate	50-64	NA	1,481	370
60	60	Best CEG	1970	Photos	Skid Trail	Headwall Swale	Convergent	Mgt. Relate	75-84	NA	389	97
61	61	Best CEG	1970	Photos	Skid Trail	Headwall Swale	Convergent	Mgt. Relate	50-64	NA	389	97
68	68	Best CEG	1984	Photos	Road	Headwall Swale	Convergent	Mgt. Relate	50-64	NA	1,037	777
74	74	Best CEG	1998	Photos	Skid Trail	Headwall Swale	Convergent	Mgt. Relate	65-74	NA	6,519	4,888
78	78	Best CEG	1959	Photos	Hill Slope	Headwall Swale	Convergent	Natural	75-84	NA	648	486
79	79	Best CEG	1959	Photos	Hill Slope	Headwall Swale	Convergent	Natural	30-49	NA	648	486
80	80	Best CEG	1959	Photos	Hill Slope	Headwall Swale	Convergent	Natural	85+	NA	648	486
89	89	Best CEG	1930	Photos	Hill Slope	Headwall Swale	Convergent	Natural		NA	648	162
90	90	Best CEG	1930	Photos	Hill Slope	Headwall Swale	Convergent	Natural		NA	648	162
94	94	Best CEG	1930	Photos	Hill Slope	Headwall Swale	Convergent	Natural	30-49	NA	6,519	4,888
95	95	Best CEG	1930	Photos	Hill Slope	Headwall Swale	Convergent	Natural	50-64	NA	6,519	4,888
96	96	Best CEG	1930	Photos	Hill Slope	Headwall Swale	Convergent	Natural	30-49	NA	6,519	4,888
97	97	Best CEG	1984	Photos	Hill Slope	Headwall Swale	Convergent	Natural	50-64	NA	2,370	1,777
98	98	Best CEG	1930	Photos	Hill Slope	Headwall Swale	Convergent	Natural	65-74	NA	2,370	1,777
103	103	Best CEG	1930	Photos	Hill Slope	Headwall Swale	Convergent	Natural	65-74	NA	6,519	3,259
114	114	Best CEG	1900	Photos	Translational Slide		N/A	Natural		NA	1,790,426	0
131	131	Best CEG	1970	Photos	Landing	Inner Gorge	Plannar	Mgt. Relate	30-49	Ukn	389	194
132	132	Best CEG	1970	Photos	Landing	Inner Gorge	Plannar	Mgt. Relate	75-84	NA	222	111
134	134	Best CEG	1970	Photos	Road	Inner Gorge	Convergent	Mgt. Relate	30-49	NA	389	97
135	135	Best CEG	1970	Photos	Road	Inner Gorge	Convergent	Mgt. Relate	50-64	NA	389	97
136	136	Best CEG	1970	Photos	Road	Inner Gorge	Convergent	Mgt. Relate	30-49	Ukn	222	166
137	137	Best CEG	1970	Photos	Road	Inner Gorge	Convergent	Mgt. Relate	30-49	Ukn	67	49
139	139	Best CEG	1970	Photos	Road	Inner Gorge	Plannar	Mgt. Relate		NA	8,475	6,356
140	140	Best CEG	1970	Photos	Road	Inner Gorge	Plannar	Mgt. Relate	50-64	NA	389	97
148	148	Best CEG	1970	Photos	Road	Inner Gorge		Mgt. Relate	0-29	Ukn	2,370	1,777
149	149	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Convergent	Mgt. Relate	30-49	Ukn	389	194
150	150	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Convergent	Mgt. Relate	65-74	NA	389	292
151	151	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Convergent	Mgt. Relate	65-74	NA	1,481	740
155	155	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	50-64	NA	389	194
156	156	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	0-29	Ukn	7,407	5,555
157	157	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate		Ukn	10,920	5,460
158	158	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate		Ukn	16,895	12,671
159	159	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate		Ukn	1,778	1,333
160	160	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	75-84	NA	222	55
161	161	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	85+	NA	389	97
162	162	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	85+	Ukn	889	222
163	163	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	30-49	NA	389	97
165	165	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate		Ukn	222	55

238.1

ADDED 8/6/19

Planning Watershed *Doty Creek*

Map#	*ID #*	*Inspector*	*Year***	*Source*	*Slide Type*	*Slope Type*	*Slope Form*	*Association*	*Slope*	*Stream*	*Total Yds*	*Delivered*
168	168	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	65-74	NA	648	324
169	169	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	75-84	NA	648	324
170	170	Best CEG	1959	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	50-64	NA	1,481	1,110
171	171	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	0-29	NA	1,481	1,110
175	175	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	65-74	NA	1,481	370
182	182	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	75-84	Ukn	1,481	740
185	185	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	50-64	NA	6,519	4,888
192	192	Best CEG	1970	Photos	Stream Bank Failure	Inner Gorge	Convergent	Natural	50-64	NA	2,444	611
193	193	Best CEG	1970	Photos	Stream Bank Failure	Inner Gorge	Divergent	Natural	85+	NA	1,481	1,110
196	196	Best CEG	1970	Photos	Stream Bank Failure	Inner Gorge	Plannar	Natural	30-49	NA	889	222
199	199	Best CEG	1970	Photos	Stream Bank Failure	Inner Gorge		Natural	50-64	Ukn	1,037	777
200	200	Best CEG	1970	Photos	Stream Bank Failure	Inner Gorge	N/A	Natural		NA	5,138	3,853
204	204	Best CEG	1984	Photos	Landing	Inner Gorge	Convergent	Mgt. Relate	0-29	Ukn	1,037	777
205	205	Best CEG	1984	Photos	Landing	Inner Gorge	Plannar	Mgt. Relate	0-29	Ukn	389	194
206	206	Best CEG	1947	Photos	Landing	Inner Gorge	Plannar	Mgt. Relate	0-29	NA	222	55
207	207	Best CEG	1970	Photos	Landing	Inner Gorge	Plannar	Mgt. Relate	0-29	NA	1,481	370
218	218	Best CEG	1970	Photos	Road	Inner Gorge	Plannar	Mgt. Relate	0-29	NA	1,481	740
219	219	Best CEG	1947	Photos	Road	Inner Gorge	Plannar	Mgt. Relate	65-74	NA	648	324
223	223	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	30-49	NA	4,074	2,037
225	225	Best CEG	1998	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	50-64	NA	2,370	1,777
226	226	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	30-49	NA	67	16
227	227	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	75-84	NA	222	55
228	228	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	30-49	NA	222	55
229	229	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	30-49	NA	648	324
244	244	Best CEG	1970	Photos	Hill Slope	Inner Gorge	Convergent	Natural	65-74	Ukn	1,481	740
245	245	Best CEG	1930	Photos	Hill Slope	Inner Gorge	Convergent	Natural	85+	NA	648	162
259	259	Best CEG	1959	Photos	Hill Slope	Inner Gorge	Plannar	Natural	75-84	Ukn	7,407	3,703
263	263	Best CEG	1947	Photos	Stream Bank Failure	Inner Gorge	Plannar	Natural	50-64	Ukn	1,481	1,110
264	264	Best CEG	1947	Photos	Stream Bank Failure	Inner Gorge	Plannar	Natural	85+	Ukn	1,481	1,110
268	268	Best CEG	1947	Photos	Stream Bank Failure	Inner Gorge	Plannar	Natural	75-84	Ukn	6,519	4,888
269	269	Best CEG	1970	Photos	Stream Bank Failure	Inner Gorge	Plannar	Natural	30-49	Ukn	2,444	1,833
274	274	Best CEG	1959	Photos	Hill Slope	Inner Gorge	Plannar	Natural	65-74	Ukn	222	111
275	275	Best CEG	1959	Photos	Hill Slope	Inner Gorge	Plannar	Natural	0-29	Ukn	222	111
276	276	Best CEG	1970	Photos	Hill Slope	Inner Gorge	Plannar	Natural	0-29	Ukn	222	111
277	277	Best CEG	1998	Photos	Hill Slope	Inner Gorge	Plannar	Natural	85+	Ukn	222	55
287	287	Best CEG	1970	Photos	Hill Slope	Inner Gorge	Plannar	Natural	85+	Ukn	648	324
291	291	Best CEG	1959	Photos	Hill Slope	Inner Gorge	Plannar	Natural	50-64	Ukn	2,370	1,185
299	299	Best CEG	1970	Photos	Landing	Inner Gorge	Convergent	Mgt. Relate	75-84	NA	648	324
300	300	Best CEG	1970	Photos	Landing	Inner Gorge	Plannar	Mgt. Relate	30-49	NA	1,481	370
303	303	Best CEG	1959	Photos	Landing	Inner Gorge	Convergent	Mgt. Relate	0-29	NA	1,481	1,110
305	305	Best CEG	1970	Photos	Landing	Inner Gorge	Plannar	Mgt. Relate	85+	Ukn	648	324
306	306	Best CEG	1970	Photos	Landing	Inner Gorge		Mgt. Relate		Ukn	6,519	4,888
352	352	Best CEG	1900	Photos	Translational Slide		N/A	Natural		NA	165,826	0
413	413	Best CEG	1970	Photos	Road	Inner Gorge		Mgt. Relate	30-49	NA	889	444
434	434	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Convergent	Mgt. Relate	85+	NA	11,852	2,962
533	533	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	0-29	Ukn	1,481	1,110
534	534	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	85+	Ukn	7,407	5,555
535	535	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	0-29	Ukn	7,407	5,555
536	536	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	50-64	Ukn	7,407	5,555
537	537	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	65-74	Ukn	4,074	3,055
562	562	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	0-29	NA	7,407	5,555
563	563	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	65-74	NA	1,481	1,110
564	564	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	0-29	NA	4,074	2,037
573	573	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	50-64	NA	4,074	2,037

238.2

ADDED 8/6/19

Planning Watershed *Doty Creek*

Map#	ID #	Inspector	Year**	Source	Slide Type	Slope Type	Slope Form	Association	Slope	Stream	Total Yds	Delivered
579	579	Best CEG	1970	Photos	Skid Trail	Inner Gorge		Mgt. Relate	85+	Ukn	1,481	1,110
580	580	Best CEG	1970	Photos	Skid Trail	Inner Gorge		Mgt. Relate	65-74	NA	1,481	1,110
581	581	Best CEG	1970	Photos	Skid Trail	Inner Gorge		Mgt. Relate	75-84	Ukn	389	292
582	582	Best CEG	1970	Photos	Skid Trail	Inner Gorge		Mgt. Relate	50-64	NA	2,444	1,833
584	584	Best CEG	1970	Photos	Skid Trail	Inner Gorge		Mgt. Relate	50-64	Ukn	4,074	3,055
621	621	Best CEG	1959	Photos	Hill Slope	Inner Gorge		Natural	85+	Ukn	648	486
622	622	Best CEG	1970	Photos	Landing	Inner Gorge		Mgt. Relate	50-64	NA	6,519	4,888
675	675	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate		NA	11,188	8,391
684	684	Best CEG	1970	Photos	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	0-29	Ukn	6,519	4,888
685	685	Best CEG	1970	Photos	Skid Trail	Inner Gorge		Mgt. Relate		NA	12,128	6,064
686	686	Best CEG	1970	Photos	Skid Trail	Inner Gorge		Mgt. Relate	0-29	Ukn	222	111
693	693	Best CEG	1970	Photos	Stream Bank Failure	Inner Gorge	Plannar	Natural	85+	Ukn	1,481	740
694	694	Best CEG	1959	Photos	Hill Slope	Inner Gorge	Plannar	Natural	85+	Ukn	222	55
695	695	Best CEG	1959	Photos	Hill Slope	Inner Gorge	Plannar	Natural	0-29	Ukn	222	55
697	697	Best CEG	1970	Photos	Stream Bank Failure	Inner Gorge	Plannar	Natural		Ukn	10,823	8,117
698	698	Best CEG	1970	Photos	Stream Bank Failure	Inner Gorge	Plannar	Natural		Ukn	5,885	4,414
699	699	Best CEG	1970	Photos	Stream Bank Failure	Inner Gorge	Plannar	Natural		Ukn	5,757	4,317
700	700	Best CEG	1970	Photos	Stream Bank Failure	Inner Gorge	Plannar	Natural		Ukn	1,006	754
708	708	Best CEG	1970	Photos	Road		Convergent	Mgt. Relate	65-74	NA	889	222
709	709	Best CEG	1970	Photos	Road		Convergent	Mgt. Relate	85+	NA	648	324
711	711	Best CEG	1970	Photos	Road		Plannar	Mgt. Relate	65-74	NA	389	97
713	713	Best CEG	1970	Photos	Road		Plannar	Mgt. Relate	65-74	NA	222	55
714	714	Best CEG	1970	Photos	Road		Plannar	Mgt. Relate	50-64	NA	222	55
716	716	Best CEG	1970	Photos	Road			Mgt. Relate	50-64	NA	222	55
718	718	Best CEG	1970	Photos	Skid Trail		Convergent	Mgt. Relate	65-74	NA	222	111
719	719	Best CEG	1970	Photos	Skid Trail		Convergent	Mgt. Relate	50-64	NA	222	111
721	721	Best CEG	1970	Photos	Skid Trail		Plannar	Mgt. Relate	50-64	NA	222	55
728	728	Best CEG	1970	Photos	Stream Bank Failure		Plannar	Natural	65-74	NA	389	97
742	742	Best CEG	1984	Photos	Road		Divergent	Mgt. Relate	50-64	NA	222	55
744	744	Best CEG	1970	Photos	Road		Plannar	Mgt. Relate	50-64	NA	648	324
751	751	Best CEG	1959	Photos	Hill Slope		Convergent	Natural	0-29	NA	6,519	4,888
764	764	Best CEG	1947	Photos	Hill Slope		Convergent	Natural	75-84	NA	389	0
773	773	Best CEG	1959	Photos	Hill Slope		Convergent	Natural	75-84	NA	7,407	3,703
794	794	Best CEG	1998	Photos	Hill Slope		Plannar	Natural	85+	NA	222	55
874	874	Best CEG	1970	Photos	Road			Mgt. Relate	50-64	Ukn	389	194
875	875	Best CEG	1970	Photos	Road			Mgt. Relate	65-74	Ukn	389	292
876	876	Best CEG	1970	Photos	Road			Mgt. Relate	50-64	NA	1,481	1,110
878	878	Best CEG	1970	Photos	Road			Mgt. Relate	65-74	NA	222	166
879	879	Best CEG	1970	Photos	Road			Mgt. Relate	30-49	NA	389	194
880	880	Best CEG	1984	Photos	Skid Trail		Convergent	Mgt. Relate	30-49	NA	389	97
890	890	Best CEG	1970	Photos	Skid Trail		Convergent	Mgt. Relate	0-29	Ukn	648	324
891	891	Best CEG	1970	Photos	Skid Trail		Convergent	Mgt. Relate	30-49	Ukn	648	324
901	901	Best CEG	1970	Photos	Skid Trail		Convergent	Mgt. Relate	50-64	NA	6,519	4,888
930	930	Best CEG	1970	Photos	Skid Trail		Convergent	Mgt. Relate	50-64	NA	648	324
1007	1007	Best CEG	1959	Photos	Skid Trail		Plannar	Mgt. Relate		NA	2,535	633
1008	1008	Best CEG	1970	Photos	Skid Trail		Plannar	Mgt. Relate	0-29	NA	67	16
1014	1014	Best CEG	1984	Photos	Skid Trail		Plannar	Mgt. Relate	50-64	NA	222	55
1015	1015	Best CEG	1984	Photos	Skid Trail		Plannar	Mgt. Relate	30-49	NA	222	55
1059	1059	Best CEG	1970	Photos	Hill Slope		Convergent	Natural	30-49	NA	648	486
1066	1066	Best CEG	1998	Photos	Hill Slope		Plannar	Natural	0-29	NA	222	55
1142	1142	Best CEG	1900	Photos	Translational Slide		N/A	Natural		NA	185,195	0
1168	1168	Best CEG	1900	Photos	Translational Slide		N/A	Natural		NA	2,828,939	0
1175	1175	Best CEG	1900	Photos	Translational Slide		N/A	Natural		NA	1,493,481	0
1179	1179	Best CEG	1900	Photos	Translational Slide		N/A	Natural		NA	210,481	0

238-3

ADDED 8/6/19

Planning Watershed *Doty Creek*

Map#	ID #	Inspector	Year**	Source	Slide Type	Slope Type	Slope Form	Association	Slope	Stream	Total Yds	Delivered
1180	1180	Best CEG	1900	Photos	Translational Slide		N/A	Natural		NA	198,707	0
1181	1181	Best CEG	1900	Photos	Translational Slide		N/A	Natural		NA	2,271,599	0
1182	1182	Best CEG	1900	Photos	Translational Slide		N/A	Natural		NA	697,816	0
1238	1238	Best CEG	1900	Photos	Translational Slide		N/A	Natural		NA	10,046,250	0
1239	1239	Best CEG	1900	Photos	Translational Slide		N/A	Natural		NA	192,625	0
1240	1240	Best CEG	1900	Photos	Translational Slide		N/A	Natural		NA	18,100	0
1241	1241	Best CEG	1900	Photos	Translational Slide		N/A	Natural		NA	197,821	0
1255	1255	Best CEG	1998	Photos	Road	Headwall Swale	Convergent	Mgt. Relate		NA	11,852	8,889
1256	1256	Best CEG	1998	Photos	Hill Slope	Headwall Swale	Convergent	Natural		NA	1,481	1,110
1416	1416	Fisher	2004	Field	Hill Slope	Headwall Swale	N/A	Natural	0-29	II	278	278
1417	1417	Fisher	1959	Field	Stream Bank Failure	Inner Gorge		Natural	50-64	II	67	67
1418	1418	Fisher	1959	Field	Stream Bank Failure	Inner Gorge		Natural	50-64	II	67	67
1419	1419	Fisher	1959	Field	Hill Slope			Natural		II	0	0
1420	1420	Fisher	1959	Field	Hill Slope			Natural		II	0	0
1421	1421	Fisher	1959	Field	Hill Slope			Natural		II	0	0
1422	1422	Fisher	1959	Field	Stream Bank Failure	Inner Gorge		Natural	75-84	II	0	0
1423	1423	Fisher	2004	Field	Stream Bank Failure	Inner Gorge		Natural	75-84	II	400	400
1424	1424	Fisher	1984	Field	Hill Slope			Natural		II	89	89
1425	1425	Fisher	1970	Field	Hill Slope			Natural		II	0	0
1426	1426	Fisher	1959	Field	Hill Slope			Natural		II	0	0
1428	1428	Fisher	1984	Field	Hill Slope			Natural		II	67	33
1429	1429	Fisher	1900	Field	Hill Slope			Natural		II	667	466
1430	1430	Fisher	1959	Field	Hill Slope			Natural		II	0	0
1431	1431	Fisher	1959	Field	Hill Slope			Natural		II	0	0
1432	1432	Fisher	1970	Field	Hill Slope			Natural		II	0	0
1433	1433	Fisher	1984	Field	Hill Slope			Natural		II	0	0
1434	1434	Fisher		Field	Hill Slope			Natural		II	0	0
1435	1435	Fisher		Field	Hill Slope			Natural		II	0	0
1436	1436	Fisher		Field	Hill Slope			Natural		II	0	0
1437	1437	Fisher	1984	Field	Hill Slope			Natural		II	0	0
1438	1438	Fisher	1998	Field	Hill Slope			Natural		II	8,889	8,889
1439	1439	Fisher	1984	Field	Hill Slope			Natural		II	0	0
1440	1440	Fisher	1984	Field	Hill Slope			Natural		II	0	0
1448	1448	Best CEG	2004	Photos	Hill Slope		Convergent	Natural			434	324
1449	1449	Best CEG	2004	Photos	Skid Trail		Plannar	Mgt. Relate			434	108
1450	1450	Best CEG	1998	Field	Stream Bank Failure		Plannar	Natural			144	108
1451	1451	Best CEG	1998	Field	Stream Bank Failure		Plannar	Natural			144	108
1452	1452	Best CEG	1984	Photos	Hill Slope		Convergent	Natural			1,185	888
1453	1453	Best CEG	1998	Field	Road		Plannar	Mgt. Relate			200	100
1454	1454	Best CEG	2004	Field	Stream Bank Failure		Plannar	Natural			144	108
1455	1455	Best CEG	1998	Field	Stream Bank Failure		Plannar	Natural			56	41
1456	1456	Best CEG	1998	Field	Stream Bank Failure		Plannar	Natural			56	41
1457	1457	Best CEG	1998	Field	Stream Bank Failure		Plannar	Natural			144	108
1458	1458	Best CEG	1998	Field	Stream Bank Failure		Plannar	Natural			144	108
1459	1459	Best CEG	1998	Field	Stream Bank Failure		Plannar	Natural			144	108
1460	1460	Best CEG	1998	Field	Stream Bank Failure		Plannar	Natural			144	108
1461	1461	Best CEG	1998	Field	Stream Bank Failure		Plannar	Natural			144	108
1462	1462	Best CEG	1998	Field	Stream Bank Failure		Plannar	Natural			178	133
1463	1463	Best CEG	1998	Field	Stream Bank Failure		Plannar	Natural			400	300
1464	1464	Best CEG	1998	Field	Stream Bank Failure		Plannar	Natural			333	83
1465	1465	Best CEG	2004	Field	Stream Bank Failure		Plannar	Natural			67	49
1466	1466	Best CEG	2004	Field	Stream Bank Failure		Plannar	Natural			67	49
1467	1467	Best CEG	2004	Field	Stream Bank Failure		Plannar	Natural			67	49
1468	1468	Best CEG	2004	Field	Stream Bank Failure		Plannar	Natural			67	49

238.4

ADDED 8/6/19

Planning Watershed *Doty Creek*

Map#	*ID #*	*Inspector*	*Year***	*Source*	*Slide Type*	*Slope Type*	*Slope Form*	*Association*	*Slope*	*Stream*	*Total Yds*	*Delivered*
1469	1469	Best CEG	2004	Field	Stream Bank Failure		Plannar	Natural			67	49
1470	1470	Best CEG	2004	Field	Stream Bank Failure		Plannar	Natural			67	49
1471	1471	Best CEG	2004	Photos	Road		Plannar	Mgt. Relate			100	25
1472	1472	Best CEG	1998	Photos	Stream Bank Failure	Inner Gorge	Plannar	Natural			453	226
1473	1473	Best CEG	2004	Field	Stream Bank Failure	Inner Gorge	Plannar	Natural			417	313
1474	1474	Best CEG	2004	Field	Stream Bank Failure		Plannar	Natural			711	533
1475	1475	Best CEG	2004	Photos	Stream Bank Failure		Convergent	Natural			146	109
1476	1476	Best CEG	2004	Photos	Stream Bank Failure		Plannar	Natural			146	36
1477	1477	Best CEG	2004	Photos	Stream Bank Failure		Plannar	Natural			146	73
1478	1478	Best CEG	2004	Photos	Stream Bank Failure		Plannar	Natural			260	130
1479	1479	Best CEG	2004	Photos	Stream Bank Failure		Plannar	Natural			260	65
1480	1480	Best CEG	2004	Photos	Stream Bank Failure		Plannar	Natural			146	36
1481	1481	Best CEG	2004	Photos	Stream Bank Failure		Plannar	Natural			146	109
1482	1482	Best CEG	2004	Photos	Stream Bank Failure		Plannar	Natural			146	109
1483	1483	Best CEG	2004	Photos	Road		Plannar	Mgt. Relate			434	216
1484	1484	Best CEG	2004	Photos	Stream Bank Failure		Plannar	Natural			146	36
1485	1485	Best CEG	1998	Photos	Stream Bank Failure	Inner Gorge	Divergent	Natural			7,555	5,665
1486	1486	Best CEG	1998	Field	Stream Bank Failure	Inner Gorge	Divergent	Natural			32,519	1,625
1487	1487	Best CEG	1998	Photos	Stream Bank Failure		Plannar	Natural			178	44
1488	1488	Best CEG	1998	Photos	Hill Slope		Plannar	Natural			178	44
1489	1489	Best CEG	1998	Photos	Hill Slope	Headwall Swale	Convergent	Natural			2,066	1,033
1490	1490	Best CEG	2004	Photos	Stream Bank Failure		Plannar	Natural			146	73
1491	1491	Best CEG	2004	Photos	Stream Bank Failure	Inner Gorge	Plannar	Natural			434	324
1492	1492	Best CEG	2004	Photos	Road		Convergent	Mgt. Relate			146	36
1493	1493	Best CEG	1998	Photos	Stream Bank Failure	Inner Gorge	Plannar	Natural			255	127
1494	1494	Best CEG	1984	Photos	Stream Bank Failure		Plannar	Natural			256	191
1495	1495	Best CEG	1959	Field	Stream Bank Failure		Plannar	Natural			144	108
1535	1535	Best CEG	1970	Photos	Stream Bank Failure	Headwall Swale	Convergent	Natural			1,660	1,245
1658	1658		0		THP Site, no data			No Info.			0	0
1659	1659		0		THP Site, no data			No Info.			0	0
1660	1660		0		THP Site, no data			No Info.			0	0
1661	1661		0		THP Site, no data			No Info.			0	0
1662	1662		0		THP Site, no data			No Info.			0	0
1663	1663		0		THP Site, no data			No Info.			0	0
1664	1664		0		THP Site, no data			No Info.			0	0
1665	1665		0		THP Site, no data			No Info.			0	0
1666	1666		0		THP Site, no data			No Info.			0	0
1682	1682		0		THP Site, no data			No Info.			0	0
1683	1683		0		THP Site, no data			No Info.			0	0
1719	1719		0		THP Site, no data			No Info.			0	0
1720	1720		0		THP Site, no data			No Info.			0	0
1728	1728		0		THP Site, no data			No Info.			0	0
1729	1729		0		THP Site, no data			No Info.			0	0
1730	1730		0		THP Site, no data			No Info.			0	0
1797	1797	Haschak	1970	Field	Stream Bank Failure	Inner Gorge	Plannar	Natural	75-84	II	3,333	3,333
1798	1798	Haschak	1970	Field	Hill Slope	Inner Gorge	Plannar	Natural	75-84	II	417	417
1799	1799	Haschak	1959	Field	Stream Bank Failure	Headwall Swale	Convergent	Natural	50-64	III	1,111	1,111
1801	1801	Haschak	1970	Field	Stream Bank Failure	Inner Gorge	Plannar	Natural	75-84	II	694	694
1802	1802	Haschak	1970	Field	Stream Bank Failure	Inner Gorge	Plannar	Natural	75-84	II	833	833
1803	1803	Haschak	1959	Field	Road	Inner Gorge	Plannar	Mgt. Relate	75-84	I	3,125	2,500
1808	1808	Haschak	1984	Field	Road	Inner Gorge	Plannar	Mgt. Relate	85+	I	139	69
1809	1809	Haschak	1984	Field	Road	Inner Gorge	Plannar	Mgt. Relate	65-74	II	833	750
1810	1810	Haschak	2004	Field	Road		Plannar	Mgt. Relate	65-74	NA	139	0
1811	1811	Haschak	1984	Field	Stream Bank Failure	Inner Gorge	Plannar	Natural	50-64	II	278	222

238.5

ADDED 8/6/19

Planning Watershed *Doty Creek*

Map#	ID #	Inspector	Year**	Source	Slide Type	Slope Type	Slope Form	Association	Slope	Stream	Total Yds	Delivered
1812	1812	Haschak	1970	Field	Stream Bank Failure	Inner Gorge	Plannar	Natural	85+	II	1,389	1,250
1813	1813	Haschak	1947	Field	Hill Slope		Plannar	Natural	30-49	NA	5,589	0
1814	1814	Haschak	1998	Field	Hill Slope		Plannar	Natural	65-74	NA	833	0
1815	1815	Haschak	2004	Field	Skid Trail		Convergent	Mgt. Relate	65-74	III	32	32
1816	1816	Haschak	1998	Field	Road		Plannar	Mgt. Relate	65-74	NA	417	0
1817	1817	Haschak	1947	Field	Translational Slide		Plannar	Natural	50-64	NA	833	0
1818	1818	Haschak	2004	Field	Road		Convergent	Mgt. Relate	65-74	III	370	0
1832	1832	Haschak	1984	Field	Skid Trail	Inner Gorge	Convergent	Mgt. Relate	75-84	III	267	200
1928	1928	Haschak	1984	Field	Skid Trail	Inner Gorge	Convergent	Mgt. Relate	65-74	II	139	111
1929	1929	Haschak	1959	Field	Stream Bank Failure	Inner Gorge	Plannar	Natural	75-84		1,481	1,481
1930	1930	Haschak	1984	Field	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	65-74	II	370	278
1932	1932	Haschak	2004	Field	Landing		N/A	Mgt. Relate	50-64	NA	133	0
1933	1933	Haschak	2004	Field	Road		N/A	Mgt. Relate	75-84	NA	9	0
1934	1934	Haschak	2004	Field	Road		N/A	Mgt. Relate	65-74	NA	17	0
1936	1936	Haschak	1998	Field	Road		Divergent	Mgt. Relate	65-74	NA	107	0
1937	1937	Haschak	1901	Field	Translational Slide	Inner Gorge	Convergent	Natural	50-64	II	3,333	2,000
1938	1938	Haschak	1970	Field	Stream Bank Failure	Inner Gorge	Plannar	Natural	75-84	II	4,444	3,778
1939	1939	Haschak	1901	Field	Unknown	Inner Gorge	Plannar	Natural	75-84	II	400	400
1940	1940	Haschak	2004	Field	Unknown	Inner Gorge	Plannar	Natural	85+	II	237	190
1941	1941	Haschak	1901	Field	Translational Slide	Inner Gorge	Plannar	Natural	65-74	II	3,704	1,852
1942	1942	Haschak	1984	Field	Skid Trail	Inner Gorge	Plannar	Mgt. Relate	85+	II	59	18
1943	1943	Haschak	1970	Field	Road	Inner Gorge	Plannar	Mgt. Relate	75-84	II	556	0
1988	1988	Haschak	1970	Field	Hill Slope	Inner Gorge	Plannar	Natural	50-64	I	444	222
1989	1989	Haschak	1970	Field	Hill Slope	Inner Gorge	Plannar	Natural	50-64	I	926	926
1990	1990	Haschak	1984	Field	Hill Slope	Inner Gorge	Convergent	Natural	75-84	II	1,667	1,417
1991	1991	Haschak	1970	Field	Road		Plannar	Mgt. Relate	50-64	NA	556	0
1992	1992	Haschak	1998	Field	Hill Slope	Inner Gorge	Plannar	Natural	65-74	II	100	0
1993	1993	Haschak	1998	Field	Hill Slope	Inner Gorge	Plannar	Natural	65-74	II	100	0
1994	1994	Haschak	1970	Field	Hill Slope		Plannar	Natural	50-64	I	1,111	556
1995	1995	Haschak	1970	Field	Hill Slope		Plannar	Natural	50-64	I	1,111	556
1996	1996	Haschak	1970	Field	Stream Bank Failure	Inner Gorge	Plannar	Natural	65-74	III	1,111	1,111
1997	1997	Haschak	1970	Field	Stream Bank Failure	Inner Gorge	Plannar	Natural	65-74	III	1,111	1,111
1998	1998	Haschak	1959	Field	Unknown	Inner Gorge	N/A	Natural	50-64	II	1,111	1,111
1999	1999	Haschak	1970	Field	Hill Slope	Inner Gorge	Plannar	Natural	65-74	II	1,111	889

Summary for 'PW Name' = Doty Creek (299 detail records)

Delivery **Avg** *977* **Min** *0* **Max** *12,671* **Sum** *292,069*

*Landslide information for this report comes from two main sources, aerial photo analysis or field observations. Information about a landslide is entered into a database and the Slide ID number is entered into GIS and appears on the maps. Information about landslides entered by professionals other than a licensed geologist should be considered as informational until reviewed by a licensed geologist.

**Tim Best, CEG analyzed six sets of aerial photos to identify landslides (1947, 1959, 1970, 1984, 1998 and 2004). The year in this report is usually the year of the photos on which the slide was first observed. If the year is 1900 it means the slide is ancient. If the year is 1930 means the slide was old in the 1947 photos. If the year is 2010 it means the slide occurred after the most recent photos in 2004.

238.6

A00eP 8/6/19

Landslides - Delivery to Watercourses (Yards)

Planning Watershed *Doty Creek*

	Photo year observed	*1900**	*1930***	*1947*	*1959*	*1970*	*1984*	*1998*	*2004*	*Total*
	Natural	0	24,214	7,109	15,865	29,807	2,857	11,398	2,677	93,927
	Mgt. Related			379	4,039	135,966	2,011	15,654	385	158,435
Doty Creek	**Sum**	*0*	*24,214*	*7,488*	*19,904*	*165,773*	*4,868*	*27,052*	*3,063*	*252,362*
	Per Year				*1,659*	*15,070*	*348*	*1,932*	*510*	
	Percent	*0.0%*	*9.6%*	*3.0%*	*7.9%*	*65.7%*	*1.9%*	*10.7%*	*1.2%*	*100.0%*

** Historic Translational Slides ** Slides that were old on the 1947 photos*

238.7

ADDED 8/6/19

Landslides - Total Yards

Planning Watershed *Doty Creek*

Source	*ancient*	*1930***	*1947*	*1959*	*1970*	*1984*	*1998*	*2004*
Natural	20,297,264	35,758	9,870	27,330	43,657	3,811	47,385	4,230
Mgt. Related			870	7,869	217,307	3,519	20,941	1,113
Sum Doty Creek	*20,297,264*	*35,758*	*10,741*	*35,198*	*260,964*	*7,330*	*68,326*	*5,344*
			Per Year	*2,933*	*23,724*	*524*	*4,880*	*891*

** Translational Slides* *** Slides that were old on the 1947 photos*

238.8

ADDEP 8/6/19

Planned Road Work

Hydrologic Unit All
Planning Watershed All
Road # All **From Mi** All **To Mi** All
THP All **From Date** 1/1/1980

Repair type All
Priority All
Road Class All
To Date 6/25/2018

Road #	GIS#	Mile	Plan	Final	THP#	THP Name	Problem	Repair Type	Cr. Class		DRCs	Left D	Exca.	Truck	Gra.	Rock	Cost	Total Yds
Road Class	ID#	End	Crew	Done	Rd Pt	ECP Number	Solution	Priority/Shedule	Old Dia	New Dia	Ln	Right D	Cat	Labor	Com.	Yds	$/FSD	FSD Yds
60.4	1534	0.500	Haschak		18-01	Little	Culv.	THP App. Rd.	III		0	0	8	2	0	0	$5,380	300
Private Seasonal	6619	0.000	Unk		2	Little	Culv. Replace	Medium	-	60"	0	0	0	0	0	0	$18	300
Replace with 60" culvert.																		
60.4	6620	0.870	Haschak		18-01	Little	Culv.	THP App. Rd.	II		0	0	0	0	0	0	$2,184	200
Private Seasonal	6620	0.000	Unk		3	Little	Culv. Replace	Medium	-	48"	40	0	0	0	0	0	$0	0
Replace with 48" culvert.																		
Road Number					60.4	**Grand Total All Sites**	2	**Culvert Costs**	$6,384			0	8	2	0	0	$7,564	500
												0	0	0	0	0	$25	300
80.4	1432	0.130	Haschak		18-01	Little	Surface Drainage	THP App. Rd.	N/A		0	0	0	0	0	0	$0	10
Private Seasonal	6645	0.000	Unk		28	Little	Dip Rolling	Medium	-	-	0	0	0	0	0	0	$0	10
Maintain and enhance if necessary rolling dip at this location.																		
Road Number					80.4	**Grand Total All Sites**	1	**Culvert Costs**	$0			0	0	0	0	0	$0	10
												0	0	0	0	0	$0	10
						Grand Total All Sites	3	**Culvert Costs**	$6,384			0	8	2	0	0	$7,564	510
												0	0	0	0	0	$24	310

239

Road Work

- Road # – This is unique road ID number for each road segment on the property.
- Road Class – This is the type of road.
  - Upgraded – Outsloped and dipped
  - Storm proofed – Outsloped, dipped and culverts repaired.
  - Deactivation – Outsloped, dipped, culverts pulled, and the road will be reused.
  - Abandoned Fixed – Outsloped, dipped, culverts removed and the road will not be reused.
  - Abandoned Legacy – It will do more damage than good to work on the road. The road will not be reused.
- GIS# - Each existing site in the field (like a culvert) has a unique GIS number, usually the first visit ID#. It appears on the road maps. A new visit to an existing site will reference the GIS#. You can look up the history of visits to a particular site by calling up all the records with the same GIS#.
- ID# - Each "new" road site visit has a unique ID number. It is generated when the record is entered into the database.
- Mile – Each numbered road has mileage ticks from 0 to the end of the road. "Mile" is the distance out the road to the site.
- End – If the site is along a length of road, like tipping and dipping, there is a start point (Mile) and "end" mileage.
- Insp. – The name of the inspector that identified the site and made the prescription is listed here. The inspectors are trained to identify potential sediment sources and make prescriptions in accordance with the <u>Handbook for Forest and Ranch Roads</u>, Weaver and Hagans, 1992. Estimates of sediment production and delivery are made by the inspector.
- Crew – These are the initials of contractor that did the work.
- Planned – Date of site identification.
- Done – Date site work was completed.
- THP# - THP Number
- Rd Pt - This is the working number (THP road point) created by the inspector in the field. It is often found on field flagging.
- THP Name – The THP or program the work is associated with.
- ECP Name – The Erosion Control Plan the site is associated with.
- Problem – The type of problem.
- Solution – The type of solution.
- Repair type – Why was the work done.
- Priority – This reflects the urgency of the problem. A high priority site is one that is likely to deliver a significant amount of sediment during the next 5 year storm event. Medium and low priority sites need upgrading, but are unlikely to deliver significant amounts of sediment in the next several years. High priority sites will be scheduled for completion prior to a low or medium priority site. In a THP, the implementation priorities below apply.
  - THP Low – Mitigation applied prior to THP completion.
  - THP Med – Mitigation applied concurrent with operations affecting site.
  - THP High – Mitigations applied in the first year after THP approval or as described in the plan.
- Stream Class – As per the Forest Practice Rules
- Old Dia – The diameter of the old culvert.
- New Dia Ln – The diameter and length of the new culvert if any.
- DRCs – Number of ditch relief culverts needed for the site.
- Rock – Yards of rock needed at the site – rip rap, rock surface, etc.
- Right and Left Ditch – Feet of road to the right and left of the site that is connected and needs treatment.
- Equipment Hours
  - Exca. – Excavator
  - Cat – Caterpillar tractor
  - Labor – Hand labor
  - Truck – Dump truck or water truck
  - Gra. – Grader
  - Com. - Compactor and pilot car if needed.
- Yds - This is the total yardage of soil that must be moved at the site.
- Cost – All the equipment costs plus the culvert costs. This does not include administration or logistic costs.
- $/FSD – This is the total cost divided by the yards of soil prevented form delivery (FSD) to the watercourses.
- Total Yds – This is the estimate of yardage that will be mobilized in a failure if the work is not done.
- FSD (Future Sediment Delivery) PSD (Potential sediment delivery) – This is the amount of soil that will be prevented from being delivered into the watercourses if the project is completed. It is the relative potential for sediment delivery (RPSD). This yardage only appears if the inspector has been trained to estimate this. This also includes road surface erosion that disconnecting the roads from the watercourses will prevent from being delivered. On upgraded roads it is typically 0.2 cubic feet per square foot of road per decade for the portion (typically 50%) that has been disconnected. The road and cut bank width is assumed to be 25 feet.

Doty Creek Road work completed

Road #	GIS#	Mile	Plan	Final	THP#	THP Name	Problem	Repair Type	Cr. Class		DRCs	Rock	Left D	Exca.	Truck	Gra.	Cost	Total Yds
Road Class	ID#	End	Crew	Done	Rd Pt	ECP Number	Solution	Priority/Shedule	Old Dia	New Dia	Ln		Right D	Cat	Labor	Yds	$/FSD	FSD Yds
80.46	1441	0.000	Taylor	Hagans	271 LNF	LNF P01030405A	Slide - Shallow	Storm Proofing	N/A		0	0	0	6	0	0	$1,680	367
Private Seasonal	1441	0.000	GE	10/03/03	23	ECP Not	Other	Medium	-	-	0		0	8	10	305	$46	37

Past landslide 30' x 3' x 30' with 20% delivery to channel below, and cracks that extend to right for a potential future landslide, 110' x 3' x 30'. Future delivery will be minimal, 37 cu yards. Scarps are 120' above class 3 stream.

In place outslope for 110', pulling up potential failure (110' x 3' x 30').

Road #	GIS#	Mile	Plan	Final	THP#	THP Name	Problem	Repair Type	Cr. Class		DRCs	Rock	Left D	Exca.	Truck	Gra.	Cost	Total Yds
Road Class	ID#	End	Crew	Done	Rd Pt	ECP Number	Solution	Priority/Shedule	Old Dia	New Dia	Ln		Right D	Cat	Labor	Yds	$/FSD	FSD Yds
80.46	1653	0.210	Taylor	Hagans	271 LNF	LNF P01030405A	Culv.	Storm Proofing	III		0	0	20	0	0	0	$0	300
Private Seasonal	1653	0.000	GE	10/10/03	22	ECP Not	Remove Crossing	Medium	-	Pull	0		320	0	0	479	$0	300

Humboldt crossing near headwall of swale. Flow is visible 5' down at hole near top. No sign of surface flow above road. A minor spring emerges 35' to the right of CLP, and may have caused fillslope to fail to right of CLP(shown in XS6). Diversion potential is likely, due to slight dip at crossing(plus minor surface flow on road). Flow emerges directly below OBF and the channel below is choked with LWD and sediment. Future erosion will be further erosion of road prism, and channel enlargement below road, and surface collapse from Top to IBR.

Excavate from Top to Bot. Install 24" culvert. Install critical dip. Stockpile spoils 150' to right.

Road #	GIS#	Mile	Plan	Final	THP#	THP Name	Problem	Repair Type	Cr. Class		DRCs	Rock	Left D	Exca.	Truck	Gra.	Cost	Total Yds
Road Class	ID#	End	Crew	Done	Rd Pt	ECP Number	Solution	Priority/Shedule	Old Dia	New Dia	Ln		Right D	Cat	Labor	Yds	$/FSD	FSD Yds
80.46	1440	0.701	Taylor	Hagans	271 LNF	LNF P01030405A	Culv.	Storm Proofing	III		0	0	300	2	0	0	$400	161
Private Seasonal	1440	0.000	GE	10/10/03	21	ECP Not	Other	Medium	-	-	0		365	0	5	607	$2	161

Small 3' x 1' class 3 stream below Fish Rock Road, that begins in swale above 80.46 road. Channel above road has large stump in it. Above stump channel is not well defined, but notched below and gullies across road to OBF and down to channel below. Fillslope below crossing has large logs in it. Water is currently flowing out of log in fill. Lots of fill and debris in channel below BOT.

Install 24" culvert. Lay slopes back 2:1 from Bot to Exc. Bot. Outslope road for 365' to right with 75' of ditch from spring to crossing. Outslope road for 300' to left with no ditch. Install 1 rolling dip to right. Endhual spoils 250' to right to wide landing.

Road #	GIS#	Mile	Plan	Final	THP#	THP Name	Problem	Repair Type	Cr. Class		DRCs	Rock	Left D	Exca.	Truck	Gra.	Cost	Total Yds
Road Class	ID#	End	Crew	Done	Rd Pt	ECP Number	Solution	Priority/Shedule	Old Dia	New Dia	Ln		Right D	Cat	Labor	Yds	$/FSD	FSD Yds
80.6	2932	0.000	Shively	Shively	Maintena	Maintenance	Other	Storm Proofing	N/A		0	0	0	0	0	0	$0	156
Storm Proofed	2932	0.320	Unk	01/01/05		ECP Not	Other	Medium	-	-	0		0	0	0	0	$0	156
80.6042	2933	0.000	Shively	Shively	Maintena	Maintenance	Other	Storm Proofing	N/A		0	0	0	0	0	0	$0	484
Storm Proofed	2933	0.990	Unk	01/01/05		ECP Not	Other	Medium	-	-	0		0	0	0	0	$0	484
80.604238	2934	0.000	Shively	Shively	Maintena	Maintenance	Other	Storm Proofing	N/A		0	0	0	0	0	0	$0	112
Abandoned Fixed	2934	0.230	Unk	01/01/05		ECP Not	Other	Medium	-	-	0		0	0	0	0	$0	112
				Grand Total All Sites		467					110		48,410	2,606	1,063	41	$780,305	72,190
													42,777	2,374	1,022	42,340		62,939

#2

$ spent

yards saved

Gualala River Watershed - Road Upgrading

Owner	Acres	Abandoned		Deacti-vated	Not Connected	Storm Proofed	Upgraded	Improved Total	Miles Total	Percent Disconnected	Road Miles/Square Mile	
		Fixed	Left								Total*	Connected*
WAA Name	*NF Gualala*											
Planning Watershed	*Doty Creek*											
Other	689					0.5		0.5	9.9	5.0%	9.2	8.8
Mendocino Redwood Co	370	0.2				1.0		1.3	5.6	22.7%	9.7	7.5
Gualala Redwood Timb	3,568			2.0	0.6	33.2	0.5	36.3	44.4	81.6%	8.0	1.5
Doty Creek	4,628	0.2		2.0	0.6	34.7	0.5	38.0	60.0	63.4%	8.3	3.0
NF Gualala	4,628	0.2		2.0	0.6	34.7	0.5	38.0	60.0	63.4%	8.3	3.0
Grand Total	4,628	0.2		2.0	0.6	34.7	0.5	38.0	60.0	63.4%	8.3	3.0

** Occasional very high road miles per square mile are the result of a very small acreage owned in a watershed with a road across it.*

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Gualala (3812375) OR Point Arena (3812386) OR Eureka Hill (3812385) OR Zeni Ridge (3812384) OR Saunders Reef (3812376) OR McGuire Ridge (3812374) OR Stewarts Point (3812364))

CNDDB for Little THP as of June 2018

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Abronia umbellata var. breviflora pink sand-verbena	PDNYC010N4	None	None	G4G5T2	S1	1B.1
Agrostis blasdalei Blasdale's bent grass	PMPOA04060	None	None	G2	S2	1B.2
Ammodramus savannarum grasshopper sparrow	ABPBXA0020	None	None	G5	S3	SSC
Aplodontia rufa nigra Point Arena mountain beaver	AMAFA01011	Endangered	None	G5T1	S1	SSC
Arborimus pomo Sonoma tree vole	AMAFF23030	None	None	G3	S3	SSC
Ascaphus truei Pacific tailed frog	AAABA01010	None	None	G4	S3S4	SSC
Astragalus agnicidus Humboldt County milk-vetch	PDFAB0F080	None	Endangered	G2	S2	1B.1
Bombus caliginosus obscure bumble bee	IIHYM24380	None	None	G4?	S1S2	
Bombus occidentalis western bumble bee	IIHYM24250	None	None	G2G3	S1	
Calystegia purpurata ssp. saxicola coastal bluff morning-glory	PDCON040D2	None	None	G4T2T3	S2S3	1B.2
Campanula californica swamp harebell	PDCAM02060	None	None	G3	S3	1B.2
Carex californica California sedge	PMCYP032D0	None	None	G5	S2	2B.3
Carex lyngbyei Lyngbye's sedge	PMCYP037Y0	None	None	G5	S3	2B.2
Carex saliniformis deceiving sedge	PMCYP03BY0	None	None	G2	S2	1B.2
Castilleja ambigua var. humboldtiensis Humboldt Bay owl's-clover	PDSCR0D402	None	None	G4T2	S2	1B.2
Castilleja mendocinensis Mendocino Coast paintbrush	PDSCR0D3N0	None	None	G2	S2	1B.2
Cerorhinca monocerata rhinoceros auklet	ABNNN11010	None	None	G5	S3	WL
Coastal and Valley Freshwater Marsh Coastal and Valley Freshwater Marsh	CTT52410CA	None	None	G3	S2.1	
Coastal Brackish Marsh Coastal Brackish Marsh	CTT52200CA	None	None	G2	S2.1	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Coastal Terrace Prairie Coastal Terrace Prairie	CTT41100CA	None	None	G2	S2.1	
Coptis laciniata Oregon goldthread	PDRAN0A020	None	None	G4?	S3?	4.2
Corynorhinus townsendii Townsend's big-eared bat	AMACC08010	None	None	G3G4	S2	SSC
Cuscuta pacifica var. papillata Mendocino dodder	PDCUS011A2	None	None	G5T1	S1	1B.2
Danaus plexippus pop. 1 monarch - California overwintering population	IILEPP2012	None	None	G4T2T3	S2S3	
Dicamptodon ensatus California giant salamander	AAAAH01020	None	None	G3	S2S3	SSC
Emys marmorata western pond turtle	ARAAD02030	None	None	G3G4	S3	SSC
Erethizon dorsatum North American porcupine	AMAFJ01010	None	None	G5	S3	
Erigeron supplex supple daisy	PDAST3M3Z0	None	None	G2	S2	1B.2
Erysimum concinnum bluff wallflower	PDBRA160E3	None	None	G3	S2	1B.2
Eucyclogobius newberryi tidewater goby	AFCQN04010	Endangered	None	G3	S3	SSC
Fratercula cirrhata tufted puffin	ABNNN12010	None	None	G5	S1S2	SSC
Fritillaria roderickii Roderick's fritillary	PMLIL0V0M0	None	Endangered	G1Q	S1	1B.1
Gilia capitata ssp. pacifica Pacific gilia	PDPLM040B6	None	None	G5T3	S2	1B.2
Gilia capitata ssp. tomentosa woolly-headed gilia	PDPLM040B9	None	None	G5T1	S1	1B.1
Glyceria grandis American manna grass	PMPOA2Y080	None	None	G5	S3	2B.3
Hesperevax sparsiflora var. brevifolia short-leaved evax	PDASTE5011	None	None	G4T3	S2	1B.2
Hesperocyparis pygmaea pygmy cypress	PGCUP04032	None	None	G1	S1	1B.2
Horkelia marinensis Point Reyes horkelia	PDROS0W0B0	None	None	G2	S2	1B.2
Horkelia tenuiloba thin-lobed horkelia	PDROS0W0E0	None	None	G2	S2	1B.2
Kopsiopsis hookeri small groundcone	PDORO01010	None	None	G4?	S1S2	2B.3

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Lasthenia californica ssp. bakeri Baker's goldfields	PDAST5L0C4	None	None	G3T1	S1	1B.2
Lasthenia californica ssp. macrantha perennial goldfields	PDAST5L0C5	None	None	G3T2	S2	1B.2
Lasthenia conjugens Contra Costa goldfields	PDAST5L040	Endangered	None	G1	S1	1B.1
Lathyrus palustris marsh pea	PDFAB250P0	None	None	G5	S2	2B.2
Lavinia symmetricus parvipinnis Gualala roach	AFCJB19025	None	None	G4T1T2	S2S3	SSC
Lilium maritimum coast lily	PMLIL1A0C0	None	None	G2	S2	1B.1
Lycopodium clavatum running-pine	PPLYC01080	None	None	G5	S3	4.1
Microseris paludosa marsh microseris	PDAST6E0D0	None	None	G2	S2	1B.2
Northern Coastal Bluff Scrub Northern Coastal Bluff Scrub	CTT31100CA	None	None	G2	S2.2	
Northern Coastal Salt Marsh Northern Coastal Salt Marsh	CTT52110CA	None	None	G3	S3.2	
Oenothera wolfii Wolf's evening-primrose	PDONA0C1K0	None	None	G2	S1	1B.1
Oncorhynchus gorbuscha pink salmon	AFCHA02010	None	None	G5	S1	
Oncorhynchus kisutch pop. 4 coho salmon - central California coast ESU	AFCHA02034	Endangered	Endangered	G4	S2?	
Oncorhynchus mykiss irideus pop. 16 steelhead - northern California DPS	AFCHA0209Q	Threatened	None	G5T2T3Q	S2S3	
Potamogeton epihydrus Nuttall's ribbon-leaved pondweed	PMPOT03080	None	None	G5	S2S3	2B.2
Rana boylii foothill yellow-legged frog	AAABH01050	None	Candidate Threatened	G3	S3	SSC
Rana draytonii California red-legged frog	AAABH01022	Threatened	None	G2G3	S2S3	SSC
Rhyacotriton variegatus southern torrent salamander	AAAAJ01020	None	None	G3G4	S2S3	SSC
Sidalcea calycosa ssp. rhizomata Point Reyes checkerbloom	PDMAL11012	None	None	G5T2	S2	1B.2
Sidalcea malachroides maple-leaved checkerbloom	PDMAL110E0	None	None	G3	S3	4.2
Sidalcea malviflora ssp. purpurea purple-stemmed checkerbloom	PDMAL110FL	None	None	G5T1	S1	1B.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Speyeria zerene behrensii Behren's silverspot butterfly	IILEPJ6088	Endangered	None	G5T1	S1	
Taricha rivularis red-bellied newt	AAAAF02020	None	None	G4	S2	SSC
Taxidea taxus American badger	AMAJF04010	None	None	G5	S3	SSC
Trifolium buckwestiorum Santa Cruz clover	PDFAB402W0	None	None	G2	S2	1B.1
Trifolium trichocalyx Monterey clover	PDFAB402J0	Endangered	Endangered	G1	S1	1B.1
Usnea longissima Methuselah's beard lichen	NLLEC5P420	None	None	G4	S4	4.2

Record Count: 67

Stream Monitoring Report

Ownerships: All
Visit Purpose: All
Planning Watersheds: Doty Creek

Station Number	Name	Miles Up Stream	Year	Temperature Seasonal Maximum	Temperature MWAT	LWD Bank Full >6 In & >4 Ft or >10 CuFt CuFt/ 1000'	LWD Bank Full Pieces/ 1000'	Substrate >0.85 mm	Substrate D50	Streambed (Thalweg) Slope	Streambed VI	Streambed A/D	Riparian Zone Canopy % WLPZ	Riparian Zone Cr.	Riparian Zone Basal Area	Riparian Zone Tallest Tree	Fish or Redds per Mile Coho	Fish or Redds per Mile SH (1+)	Fish or Redds per Mile Redds	Aquatic Macroinvertebrates Richness	Simpson	Hilsenhoff	Russian R Index	% Dominant
Hydrologic Unit			**NF Gualala**																					
Stream			Doty Creek																					
813	013	0.00	2013														0	122	0					
813	013	0.00	2014														0	154						
813	013	0.00	2015														0	260						
813	013	0.00	2016														0	126						
256	Dot2	0.02	1993					16%																
256	Dot2	0.02	1994	14.1	12.9			11%																
256	Dot2	0.02	1995					17%																
256	Dot2	0.02	1997					17%																
281	Dot1	0.02	1998	14.8	13.7																			
281	Dot1	0.02	2008	14.5	13.4																			
281	Dot1	0.02	2012	13.8	12.7																			
281	Dot1	0.02	2014	14.5	13.5																			
280	Dot3	0.83	2013	12.9	12.9																			
280	Dot3	0.83	2014	13.7	13.5																			
Doty Creek			**Avg**	**14.0**	**13.3**			**16%**									**0**	**165**	**0**					
Stream			Little North Fork Gualala																					
811	011	0.00	2013														0	167	7					
811	011	0.00	2014														0	127	1					
811	011	0.00	2015														0	159	0					
811	011	0.00	2016														0	144						
201	LNF5	0.02	1992					11%																
201	LNF5	0.02	1993					21%																
201	LNF5	0.02	1994	15.8	14.7			20%																
201	LNF5	0.02	1995	16.7	15.1			21%																
201	LNF5	0.02	1996	15.9	14.6																			
201	LNF5	0.02	1997	16.7	15.4			16%																
201	LNF5	0.02	1998	16.3	15.0																			
201	LNF5	0.02	2001	16.5	14.8																			

247

Station Number	Name	Miles Up Stream	Year	Temperature		LWD Bank Full >6 In & >4 Ft or >10 CuFt		Substrate		Streambed (Thalweg)			Riparian Zone				Fish or Redds per Mile			Aquatic Macroinvertebrates				
				Seasonal Maximum	MWAT	CuFt/ 1000'	Pieces/ 1000'	>0.85 mm	D50	Slope	VI	A/D	Canopy % WLPZ	Cr.	Basal Area	Tallest Tree	Coho	SH (1+)	Redds	Richness	Simpson	Hilsenhoff	Russian R Index	% Dominant
201	LNF5	0.02	2003	16.1	15.0																			
201	LNF5	0.02	2004	16.9	15.7																			
201	LNF5	0.02	2005	15.6	14.5																			
201	LNF5	0.02	2008	16.4	15.2																			
201	LNF5	0.02	2009	15.8	14.8																			
201	LNF5	0.02	2010	15.0	13.7																			
201	LNF5	0.02	2011	15.1	14.0																			
201	LNF5	0.02	2012	14.8	13.9																			
201	LNF5	0.02	2013	16.6	15.7																			
201	LNF5	0.02	2014	16.0	15.1																			
201	LNF5	0.02	2015	16.5	15.6																			
201	LNF5	0.02	2016																					
404	LNF3	0.45	1998														16	0						
404	LNF3	0.45	2001			5,250	83		34	0.6%	33		97%	96%	163	121								
404	LNF3	0.45	2003														0	589						
404	LNF3	0.45	2004			5,098	68		33	0.8%	57	-0.61					0	70						
404	LNF3	0.45	2014	15.6	14.7																			
812	012	1.29	2013															297	0					
812	012	1.29	2014														0	297	3					
812	012	1.29	2015														0	565						
812	012	1.29	2016														0	418						
202	LNF2	1.47	1993					11%																
202	LNF2	1.47	1994	16.4	14.6			15%																
202	LNF2	1.47	1995					19%																
202	LNF2	1.47	1997					20%																
202	LNF2	1.47	1998														32	0						
202	LNF2	1.47	2003														0	322						
202	LNF2	1.47	2004														0	391						
202	LNF2	1.47	2013	17.1	15.2																			
202	LNF2	1.47	2016	15.6	14.4																			
274	LNF8	1.68	1995	16.4	14.6																			
274	LNF8	1.68	1996	16.1	14.1																			
203	LNF1	2.27	1993					17%																
203	LNF1	2.27	1994	15.1	13.6			20%																
203	LNF1	2.27	1995	15.8	14.2			12%																

Station Number Name		Miles Up Stream	Year	Temperature		LWD Bank Full >6 In & >4 Ft or >10 CuFt		Substrate		Streambed (Thalweg)			Riparian Zone				Fish or Redds per Mile			Aquatic Macroinvertebrates				
				Seasonal Maximum	MWAT	CuFt/ 1000'	Pieces/ 1000'	>0.85 mm	D50	Slope	VI	A/D	Canopy % WLPZ	Cr.	Basal Area	Tallest Tree	Coho	SH (1+)	Redds	Richness	Simpson	Hilsenhoff	% Dominant	Russian R Index
203	LNF1	2.27	1996	15.3	13.7																			
203	LNF1	2.27	1997	15.8	14.5			19%																
203	LNF1	2.27	1998	15.2	13.9	3,010	65		25	1.5%	23						0	0						
203	LNF1	2.27	1999	15.1	13.8	3,632	73		43	1.5%	21	-0.19	87%	89%	255	143	0	285						
203	LNF1	2.27	2000	15.3	13.9	3,766	71		46	1.5%	21	-0.08					0	143		31	0.85	4.5	19	30
203	LNF1	2.27	2001	15.2	13.5	4,798	119		42	1.5%	20	-0.10					0	148						
203	LNF1	2.27	2002	14.5	13.0	4,964	138		65	1.4%	28	-0.26					0	169						
203	LNF1	2.27	2003	15.2	14.0	4,946	140		60	1.4%	30	-0.40					0	235						
203	LNF1	2.27	2004	15.6	14.2	4,907	139		42	1.5%	32	-0.73					0	666						
203	LNF1	2.27	2005	14.9	13.6	5,075	138		40	1.4%	31	-0.93								30		4.6		41
203	LNF1	2.27	2006			5,385	135		36	1.5%	28	-1.08												
203	LNF1	2.27	2007			5,395	134		31	1.5%	31	-0.38												
203	LNF1	2.27	2008	15.3	13.9	6,004	151		23	1.4%	34	-0.72	86%	88%	475	185	0	58						
203	LNF1	2.27	2009	15.1	13.7	6,110	152		48	1.5%	34	-0.66	89%	91%			0	803						
203	LNF1	2.27	2010	14.5	13.1	6,095	149		42	1.5%	33	-0.62												
203	LNF1	2.27	2011	14.6	13.4	6,043	153		43	1.4%	40	-0.53	77%	89%			0	433						
203	LNF1	2.27	2012	14.1	13.0	8,082	175		37	1.5%	33	-0.56					0	343						
203	LNF1	2.27	2013	15.5	14.2	8,095	173		33	1.5%	34	-0.53					0	238						
203	LNF1	2.27	2014	15.1	14.1	8,088	176		26	1.5%	35	-0.36					0	480						
203	LNF1	2.27	2015	15.5	14.4	7,972	173		34	1.5%	34	-0.40	86%	89%			0	243						
203	LNF1	2.27	2016	14.7	13.6	8,120	178		35	1.5%	31	-0.43	89%	88%			0	259						
203	LNF1	2.27	2017														0	121						
408	LNF7	2.37	2005	14.9	13.7																			
255	LNF6	2.86	1993					19%																
255	LNF6	2.86	1994	15.9	14.3			17%																
255	LNF6	2.86	1995					12%																
255	LNF6	2.86	1997					26%																
255	LNF6	2.86	2013	15.2	14.7																			
255	LNF6	2.86	2014	15.5	14.8																			
Little North Fork Gualala			Avg	15.6	14.3	5,754	132	18%	39	1.4%	32	-0.5	87%	90%	298	150	2	272	2	30	0.85	4.5	19	35
Hydrologic Uni NF Gualala			Avg	15.4	14.2	5,754	132	18%	39	1.4%	32	-0.5	87%	90%	298	150	1	260	2	30	0.85	4.5	19	35

Station Number Name	Miles Up Stream	Year	Temperature		LWD Bank Full >6 In & >4 Ft or >10 CuFt		Substrate		Streambed (Thalweg)			Riparian Zone				Fish or Redds per Mile			Aquatic Macroinvertebrates				
			Seasonal Maximum	MWAT	CuFt/ 1000'	Pieces/ 1000'	>0.85 mm	D50	Slope	VI	A/D	Canopy % WLPZ	Cr.	Basal Area	Tallest Tree	Coho	SH (1+)	Redds	Richness	Simpson	Hilsenhoff	Russian R Index	% Dominant
		Avg	15.4	14.2	5,754	132	18%	39	1.4%	32	-0.5	87%	90%	298	150	1	260	2	30	0.85	4.5	19	35
		Min	12.9	12.7	3,010	65	5%	23	0.6%	20	-1.1	77%	88%	163	121	0	0	0	30	0.85	4.5	19	30
		Max	17.1	15.7	8,120	178	36%	65	1.5%	57	-0.08	97%	96%	475	185	32	803	7	31	0.85	4.6	19	41
Old Growth Watersheds (HRSP)			18.5	16.6			21.6%	62											26.2	0.89			
Poor-Normal-Good										>20									26-35	.8-.89	4.6-3.1	12-17	39-15
NCWQCB Target			18.3	16.8			<14%																

052

Temperature

- Seasonal Maximum – The highest water temperature recorded during the summer.
- Maximum weekly average temperature (MWAT) - The highest average temperature for any seven day rolling average

Large Woody Debris (LWD)

- LWD must be at least 6 inches on the small end and longer than 4 feet.
- Cubic Feet per 1,000 feet – The cubic volume of LWD located between the bankfull lines.
- Pieces per 1,000' – The number of LWD pieces per 1000'

Stream Substrate

- <0.85mm – The percent fines less than 0.85 millimeters in a McNeal sample.
- D50- The pebble size of the median pebble of a 100 pebble sample. Three sample sites on each reach are averaged.

Fish Surveys

- Presence/absence snorkel surveys also estimate fish numbers per mile.
  - Coho – Coho salmon any age.
  - SH (1+) – Steelhead one year old or older.
- Redds - Number of salmon spawning nests found per mile during the season.

Streambed (Thalweg) Survey

- Slope – the slope of the channel
- VI – The variation index is the [(SD of residual depth/bank full depth) *100]. This is a way of quantifying roughness and hence suitability for fish. Greater than 20 is a good indication of recovery.
- A/D – The change in elevation of the channel (aggradation or degradation) relative to the first year of measurement.

Riparian Condition

- Canopy Cover percent as measured with a spherical densiometer. Every 200', canopy percent is measured in the center of the channel. And at bank full and 50' into the riparian zone from bankfull on both sides of the channel. Four measurements are averaged at each point.
- WLPZ (Watercourse and Lake Protection Zone) – The average of all the measurements taken on either side of the channel 50' into the riparial zone.
- Cr. – The average of all the measurements taken in the center of the channel.
- Riparian inventory plots were locate both sides of the channel every 200'
- Basal Area – Is the average basal area in square feet of all the riparian plots
- Tallest Tree – Is the tallest tree measured on the riparian plots.

Macroinvertebrates

- Richness – Total number of Genuses represented.
- Simpson Diversity Index – Measures the evenness of species diversity
- Hilsenhoff – This is a locally modified Hilsenhoff index. It indicates levels of organic pollution
- Russian River Index – A localized index that combines several standard metrics
- Percent Dominant Taxon – this is a species distribution index

Biological Report

Ownerships: *All*
Visit Purpose: *All*
Planning Watersheds: *Doty Creek*

Watershed: NF Gualala

Stream	Station		Year	Distance up Stream (Feet)	Reach Length (Feet)	Purpose	Fish or Redds per Mile				Benthic Macroinvertebrates (BMI)					
	Name	#					Adult Fish SH	Redds	Coho Fry	Steelhead Parr 1+	Richness	Simpson	ETP Taxa	% Dominant	Russian River Index	North Coast IBI
Doty Cr	013	813	2013	0	302	Fish Pool Dive			0.0	122						
Doty Cr	013	813	2013	0	1,400	Spawner Survey	0.0	0.0								
Doty Cr	013	813	2014	0	447	Fish Pool Dive			0.0	154						
Doty Cr	013	813	2015	0	467	Fish Pool Dive			0.0	260						
Doty Cr	013	813	2016	0	378	Fish Pool Dive			0.0	126						
LNF Gualala	011	811	2013	0	4,707	Fish Pool Dive			0.0	167						
LNF Gualala	011	811	2013	0	4,000	Spawner Survey	2.6	6.6								
LNF Gualala	011	811	2014	0	6,800	Spawner Survey	0.8	0.8								
LNF Gualala	011	811	2014	0	3,946	Fish Pool Dive			0.0	127						
LNF Gualala	011	811	2015	0	4,683	Fish Pool Dive			0.0	159						
LNF Gualala	011	811	2015	0	6,800	Spawner Survey	0.8	0.0								
LNF Gualala	011	811	2016	0	4,302	Fish Pool Dive			0.0	144						
LNF Gualala	LNF3	404	1998	2,400	1,000	Fish Reach Dive			15.8	0						
LNF Gualala	LNF3	404	2003	2,400	870	Fish Reach Dive			0.0	589						
LNF Gualala	LNF3	404	2004	2,400	757	Fish Reach Dive			0.0	70						
LNF Gualala	012	812	2013	6,800	2,865	Fish Pool Dive				297						
LNF Gualala	012	812	2013	6,800	4,400	Spawner Survey	0.0	0.0								
LNF Gualala	012	812	2014	6,800	3,376	Fish Pool Dive			0.0	297						
LNF Gualala	012	812	2014	6,800	8,200	Spawner Survey	0.0	2.6								
LNF Gualala	012	812	2015	6,800	3,745	Fish Pool Dive			0.0	565						
LNF Gualala	012	812	2016	6,800	3,798	Fish Pool Dive			0.0	418						
LNF Gualala	LNF2	202	1998	7,780	1,000	Fish Reach Dive			31.7	0						
LNF Gualala	LNF2	202	2003	7,780	770	Fish Reach Dive			0.0	322						
LNF Gualala	LNF2	202	2004	7,780	688	Fish Reach Dive			0.0	391						
LNF Gualala	LNF1	203	1998	12,000	1,000	Fish Reach Dive			0.0	0						
LNF Gualala	LNF1	203	1999	12,000	1,000	Fish Reach Dive			0.0	285						
LNF Gualala	LNF1	203	2000	12,000	1,000	Fish Reach Dive			0.0	143						
LNF Gualala	LNF1	203	2000	12,000	1,000	Riffle BMI					31	0.85	19	30%	19	
LNF Gualala	LNF1	203	2001	12,000	1,000	Fish Reach Dive			0.0	148						
LNF Gualala	LNF1	203	2002	12,000	1,000	Fish Reach Dive			0.0	169						
LNF Gualala	LNF1	203	2003	12,000	561	Fish Reach Dive			0.0	235						
LNF Gualala	LNF1	203	2004	12,000	531	Fish Reach Dive			0.0	666						
LNF Gualala	LNF1	203	2005	12,000	1,000	Riffle BMI					30		17	41%		
LNF Gualala	LNF1	203	2008	12,000	1,000	Fish Reach Dive			0.0	58						
LNF Gualala	LNF1	203	2009	12,000	1,000	Fish Reach Dive			0.0	803						
LNF Gualala	LNF1	203	2011	12,000	1,000	Fish Reach Dive			0.0	433						
LNF Gualala	LNF1	203	2012	12,000	1,000	Fish Reach Dive			0.0	343						
LNF Gualala	LNF1	203	2013	12,000	1,000	Fish Reach Dive			0.0	238						
LNF Gualala	LNF1	203	2014	12,000	1,000	Fish Reach Dive			0.0	480						
LNF Gualala	LNF1	203	2015	12,000	1,000	Fish Reach Dive			0.0	243						
LNF Gualala	LNF1	203	2016	12,000	1,000	Fish Reach Dive			0.0	259						
LNF Gualala	LNF1	203	2017	12,000	1,000	Fish Reach Dive			0.0	121						

Reach length for "fish pool dives" is only the length of the pools actually snorkel surveyed.
Reach length for "spawner surveys" is the longest survey in that reach during that season.

Stream	Station		Year	Distance up Stream (Feet)	Reach Length (Feet)	Purpose	Fish or Redds per Mile				Benthic Macroinvertebrates (BMI)					
	Name	#					Adult Fish SH	Redds	Coho Fry	Steel-head Parr 1+	Rich-ness	Simp-son	ETP Taxa	% Dom-inant	Russian River Index	North Coast IBI

Total Station Visits: 42

Reach length for "fish pool dives" is only the length of the pools actually snorkel surveyed.

Reach length for "spawner surveys" is the longest survey in that reach during that season.

Logs placed in Creeks

Ownerships: All
Planning Watersheds: Doty Creek

			Bank Full								Total			
	D1	D2	Length	Cu Ft	Cu M	Bd Ft	D1	D2	Length	Root Wad	CuFt	CuM	BdFt*	Trucks
Doty Creek														
Logs 39			Total	1,766	49	14,405				635	3,258	91	19,550	4
Jennifer Creek														
Logs 3			Total	139	4	832					277	8	1,663	0
Little North Fork Gualala														
Logs 343			Total	23,988	672	186,997				7,178	41,053	1,149	246,316	49
Log Cabin Creek														
Logs 4			Total			2,905				484	484	14	2,905	1
Roxane Creek														
Logs 4			Total			942				157	157	4	942	0
Grand Total														
Average	31	27	18	86	2	530	31	25	27	92	115	3	691	
Logs 393			Total	25,893	725	206,082				8,454	45,229	1,266	271,376	54

* There are about 5 thousand board feet on a log truck

Change in log water depth after LWD placement

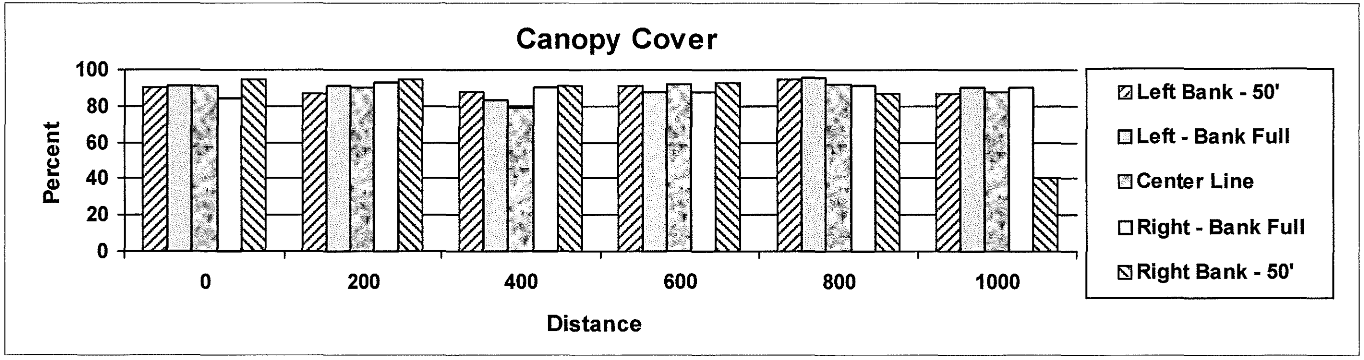
	Distance Moved	*Change in the depth of the water under a log from first depth (Deeper is positive)* 2002	2004	2005	2006	2008	2012
Doty Creek (24 Logs)							
Avg	6				0.1	0.1	0.2
Min	0				-0.6	-0.6	-0.5
Max	48				1.5	1.6	1.8
Little North Fork Gualala (178 Logs)							
Avg	383	0.7	0.3	0.4	0.4	0.5	0.6
Min	0	-2.5	-3.5	-2.5	-3.1	-2.5	-2.8
Max	14,091	2.9	2.9	3.4	3.0	3.5	4.1
Avg Grand Total	338	0.7	0.3	0.4	0.3	0.4	0.5
Min	0	-2.5	-3.5	-2.5	-3.1	-2.5	-2.8
Max	14,091	2.9	2.9	3.4	3.0	3.5	4.1

Canopy Cover

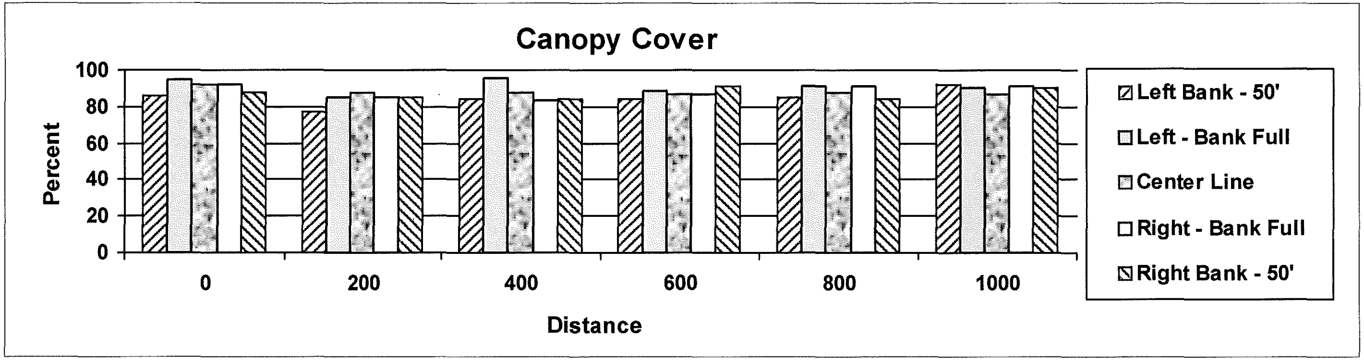
Ownerships: All

Planning Watersheds: Doty Creek

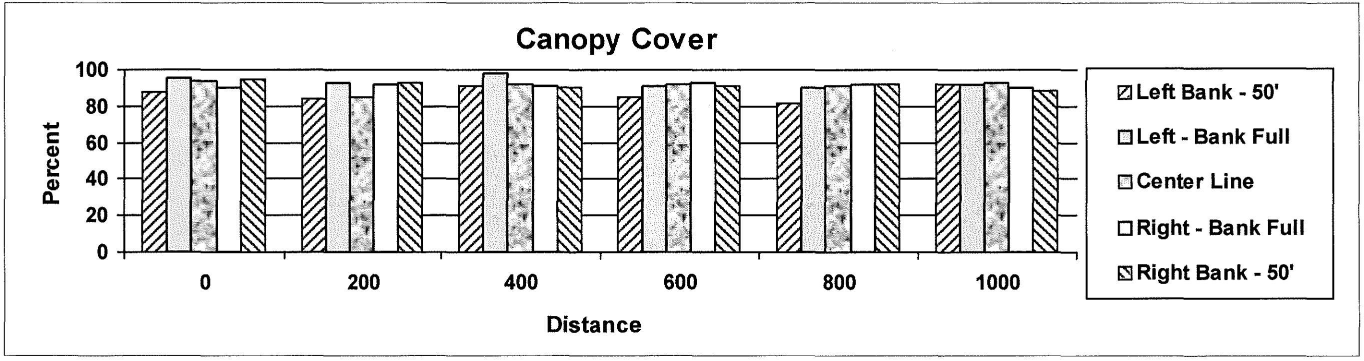
Little North Fork Gualala Watershed Acres 1,963 Bankfull width 29 ' Year 1999 Station LNF1 203 342



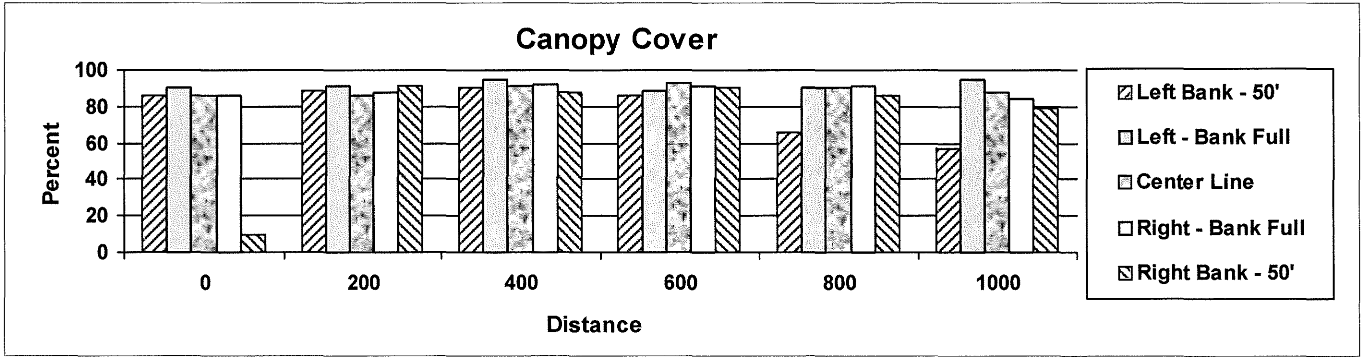
Little North Fork Gualala Watershed Acres 1,963 Bankfull width 29 ' Year 2008 Station LNF1 203 901



Little North Fork Gualala Watershed Acres 1,963 Bankfull width 29 ' Year 2009 Station LNF1 203 1065

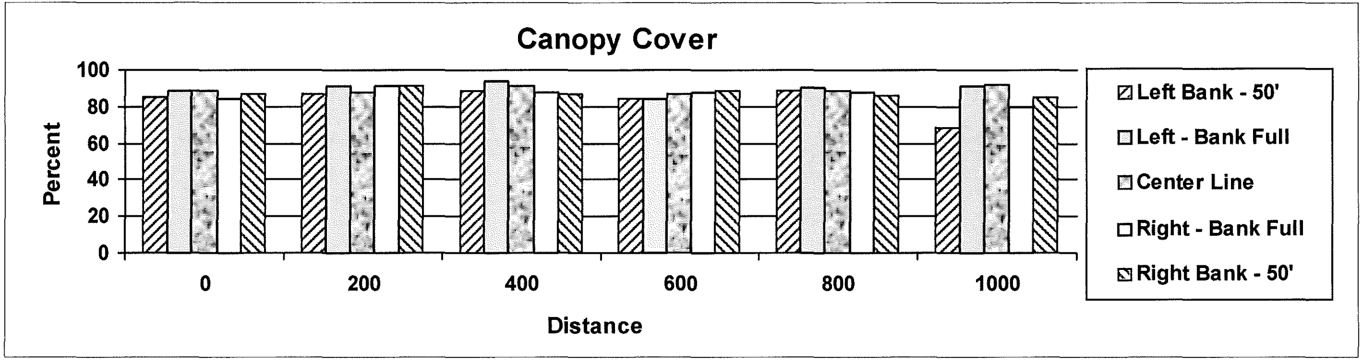


Little North Fork Gualala Watershed Acres 1,963 Bankfull width 29 ' Year 2011 Station LNF1 203 1290

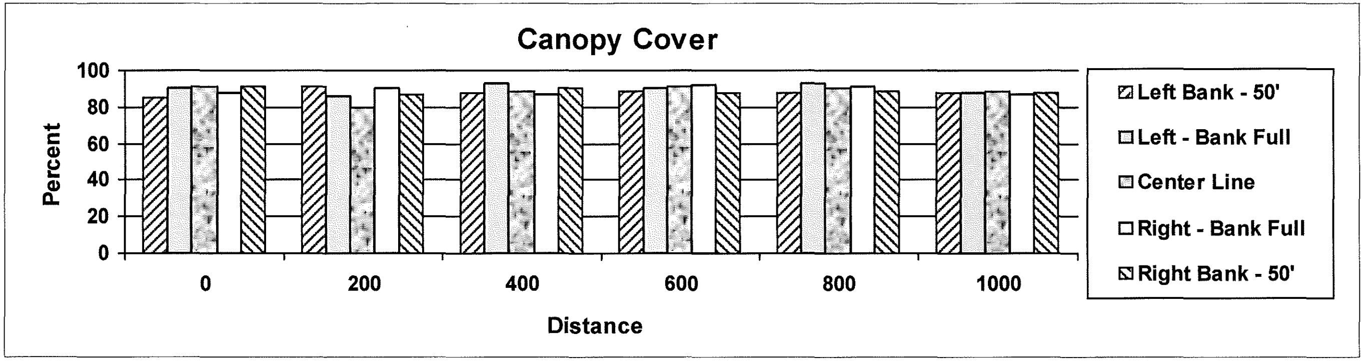


255

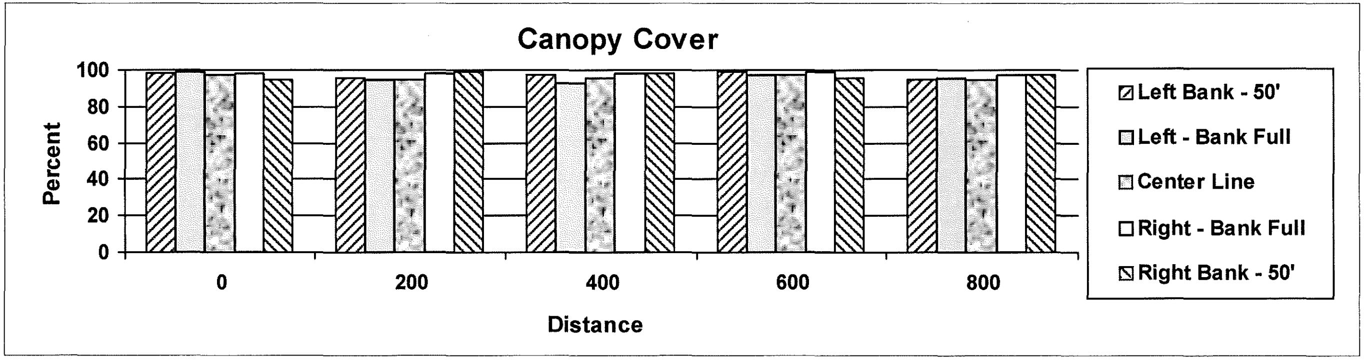
Little North Fork Gualala Watershed Acres 1,963 Bankfull width 29 ' Year 2015 Station LNF1 203 2053



Little North Fork Gualala Watershed Acres 1,963 Bankfull width 29 ' Year 2016 Station LNF1 203 2135



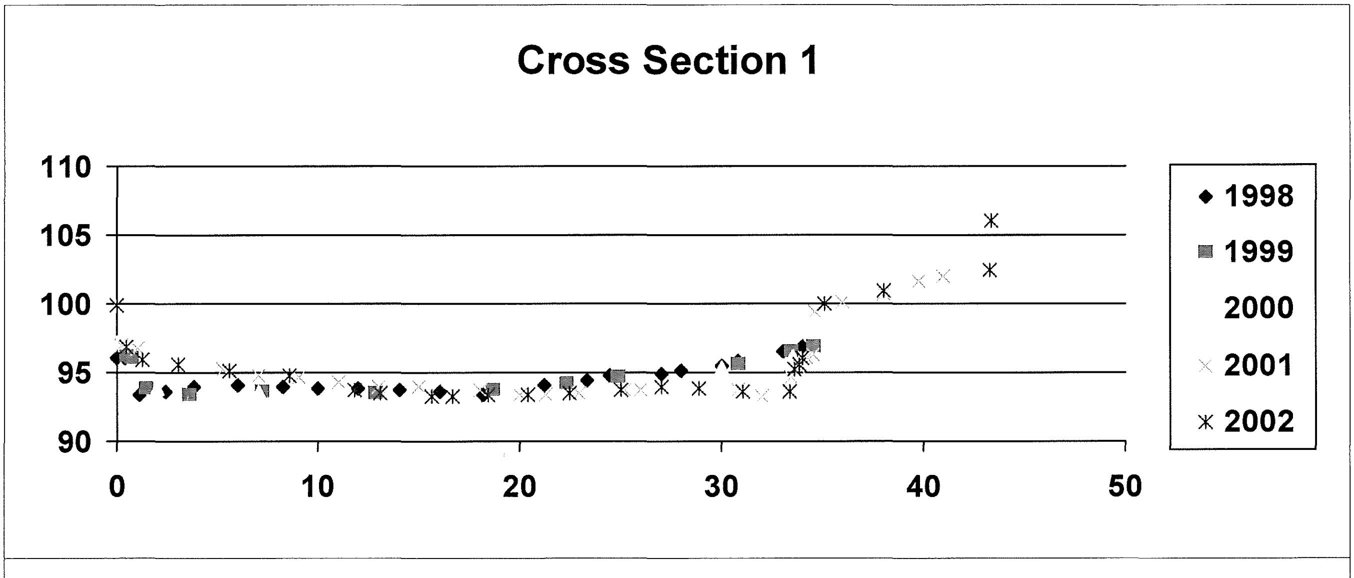
Little North Fork Gualala Watershed Acres 4,217 Bankfull width 24 ' Year 2001 Station LNF3 404 480

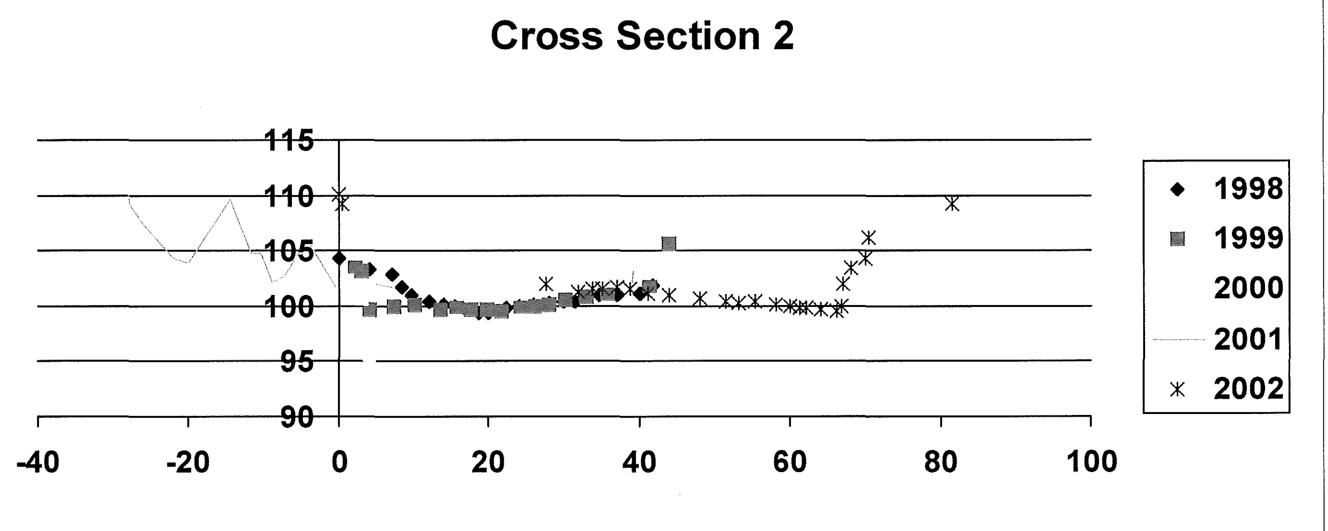


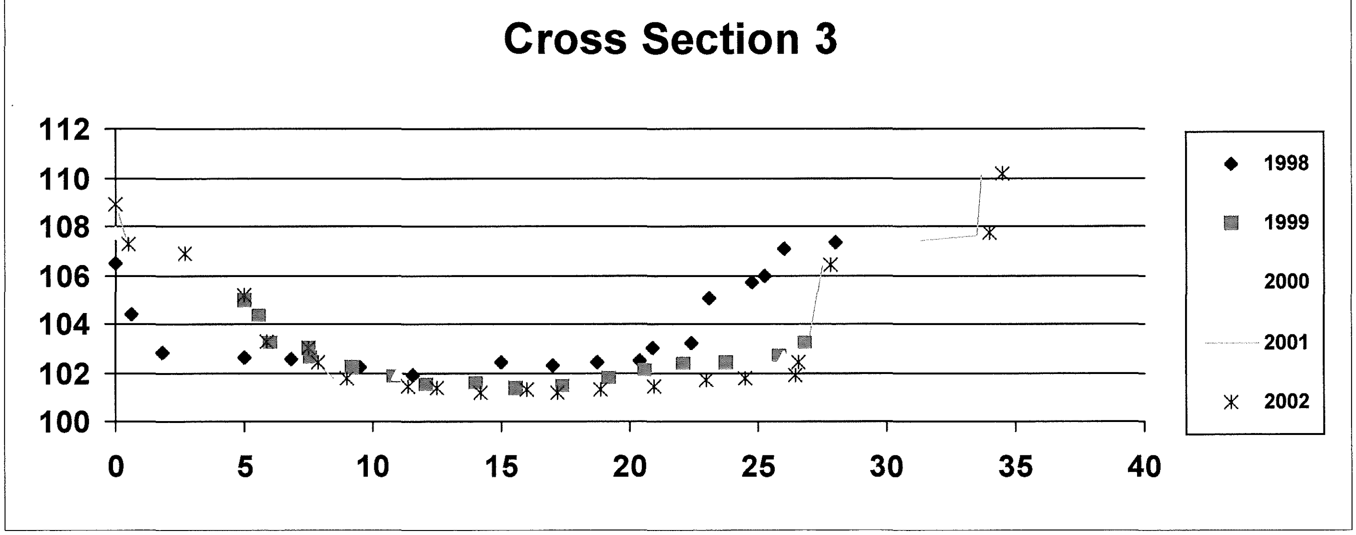
Cross Sections

Planning Watershed: Doty Creek

Station Name LNF1 **Stream:** Little North Fork Gualala



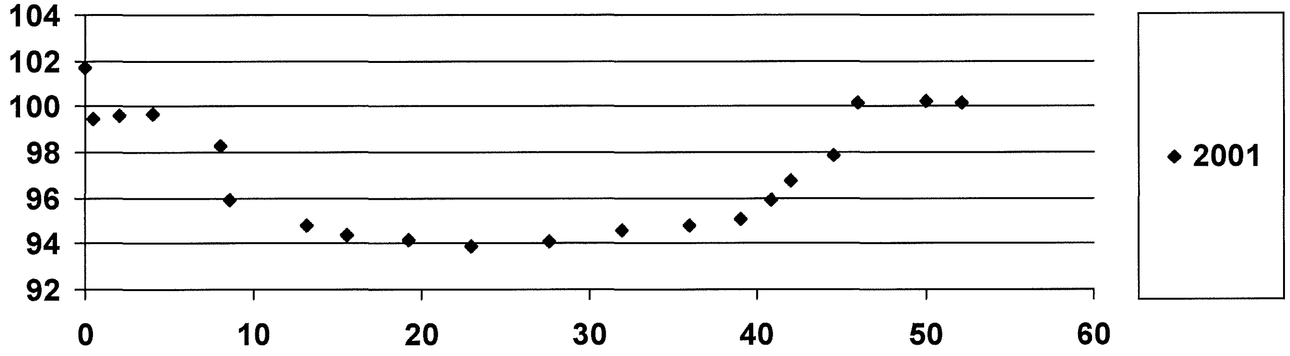




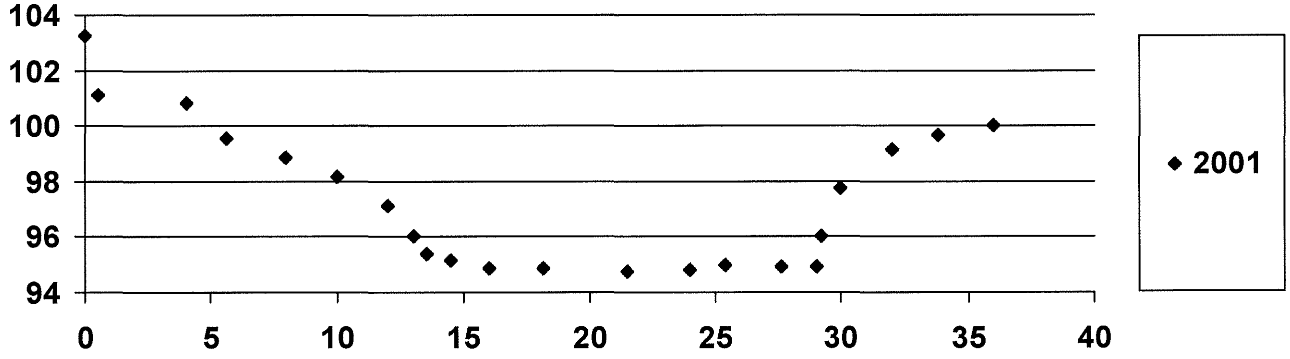
257

Station Name LNF3 **Stream:** Little North Fork Gualala

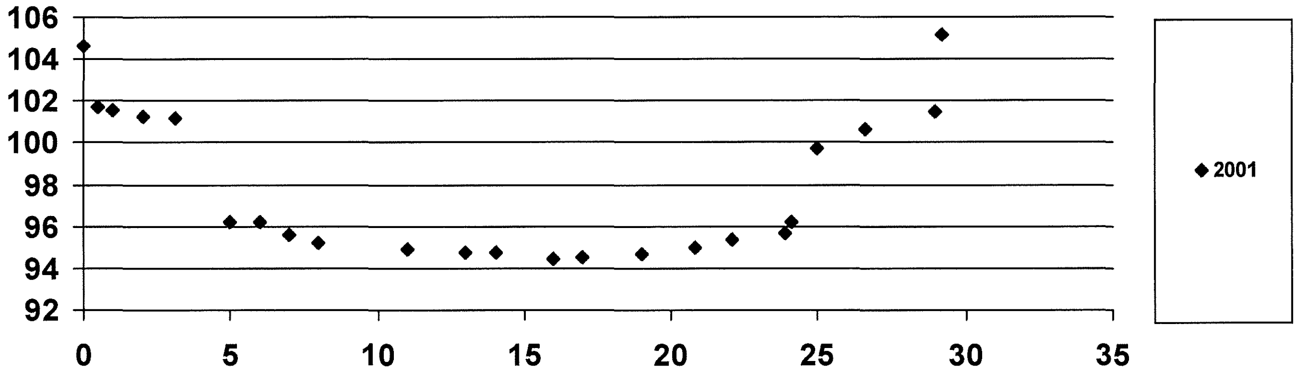
Cross Section 1



Cross Section 2



Cross Section 3



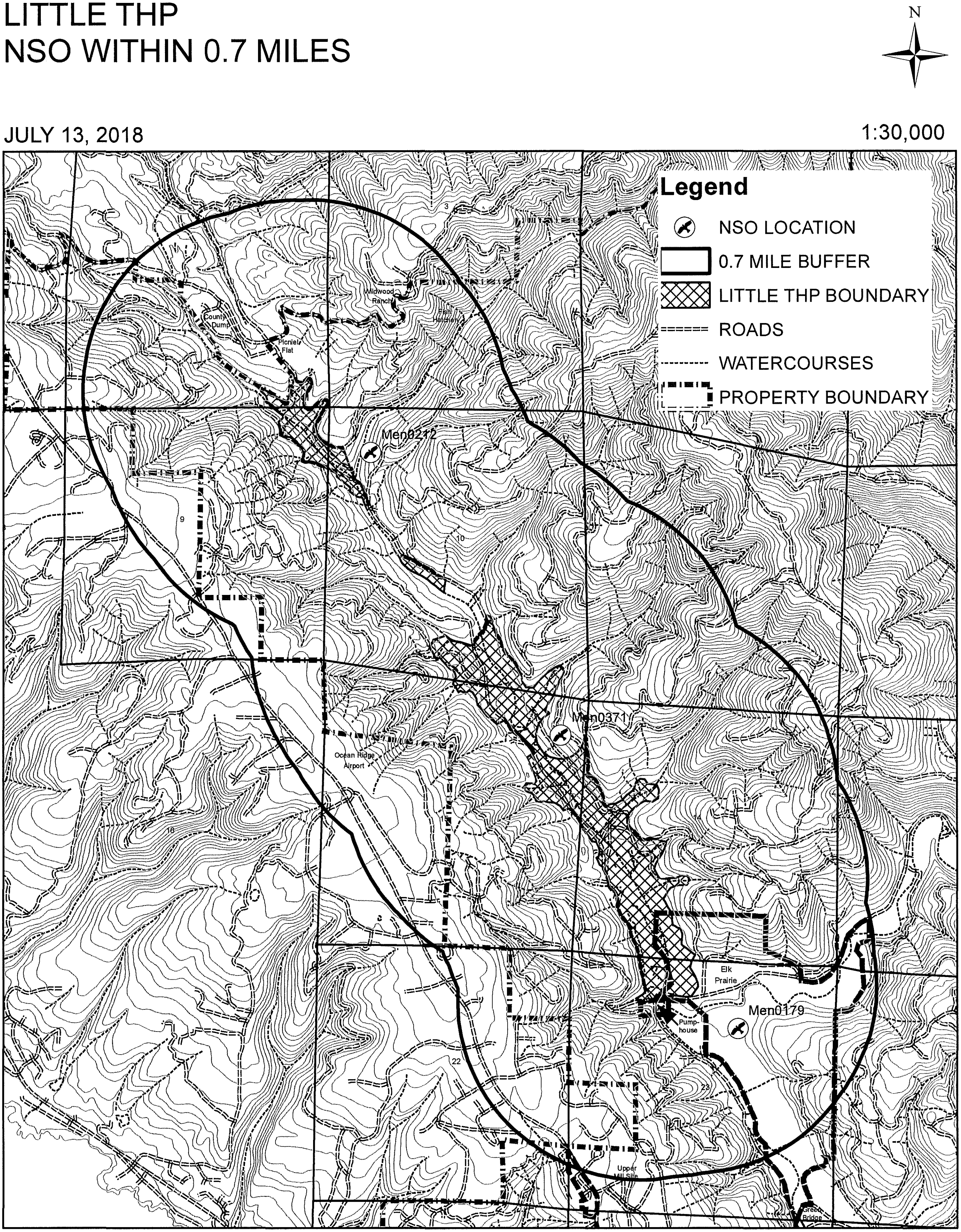
258

NSO Information

LITTLE THP
NSO WITHIN 0.7 MILES

JULY 13, 2018

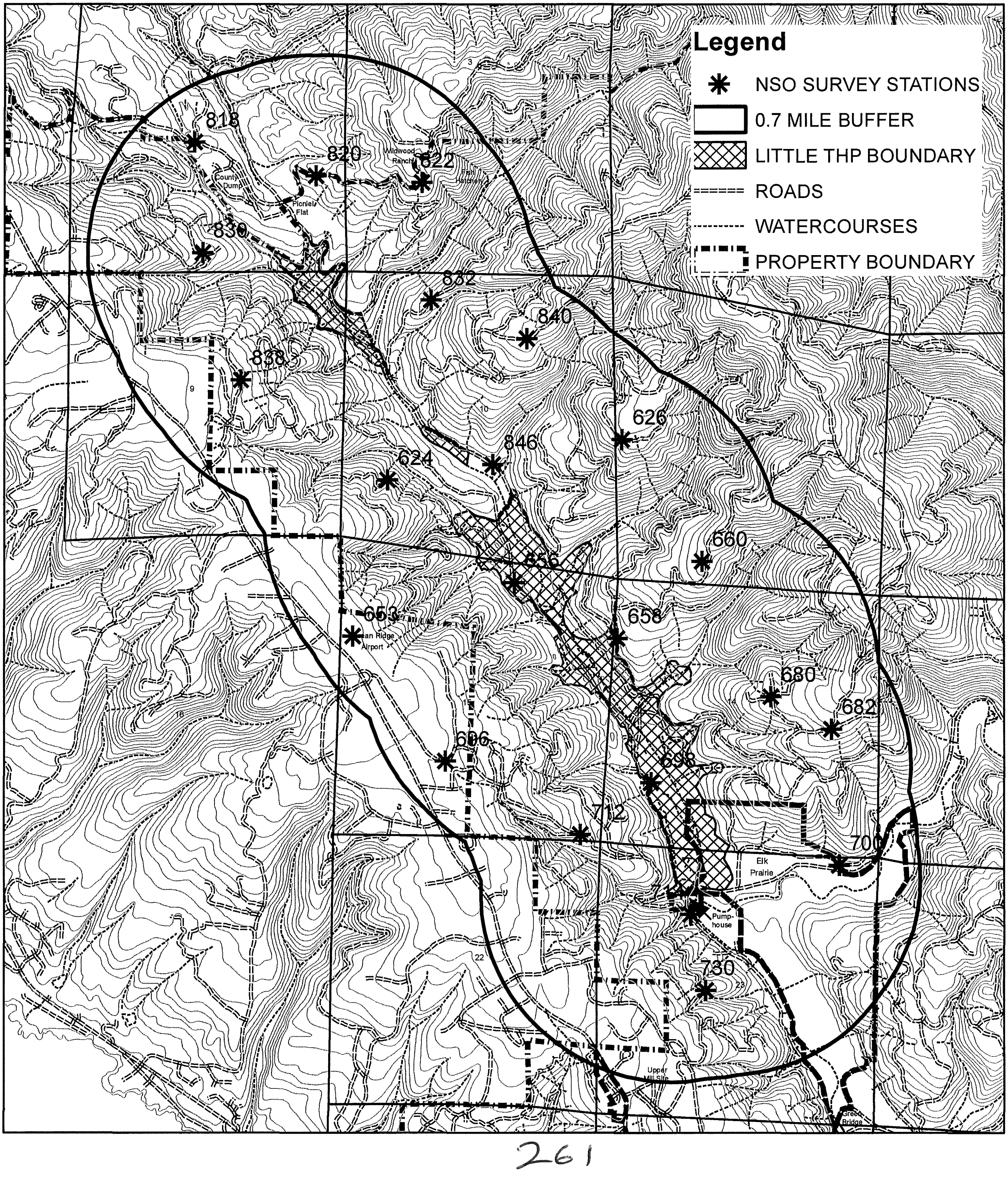
1:30,000



LITTLE THP
NSO SURVEY STATIONS

JULY 13, 2018

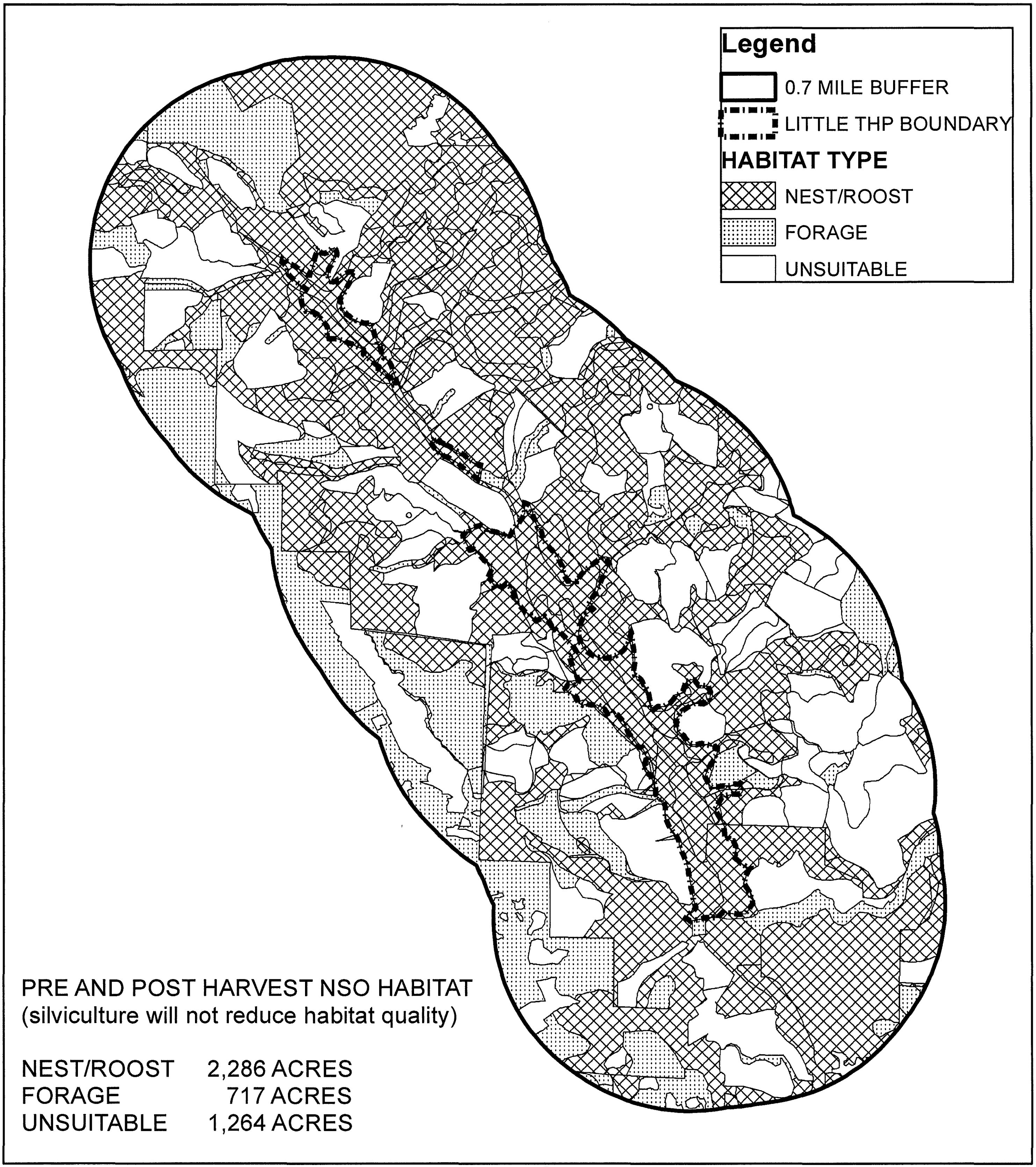
1:30,000



LITTLE THP
PRE AND POST HARVEST NSO HABITAT

JULY 13, 2018

1:30,072



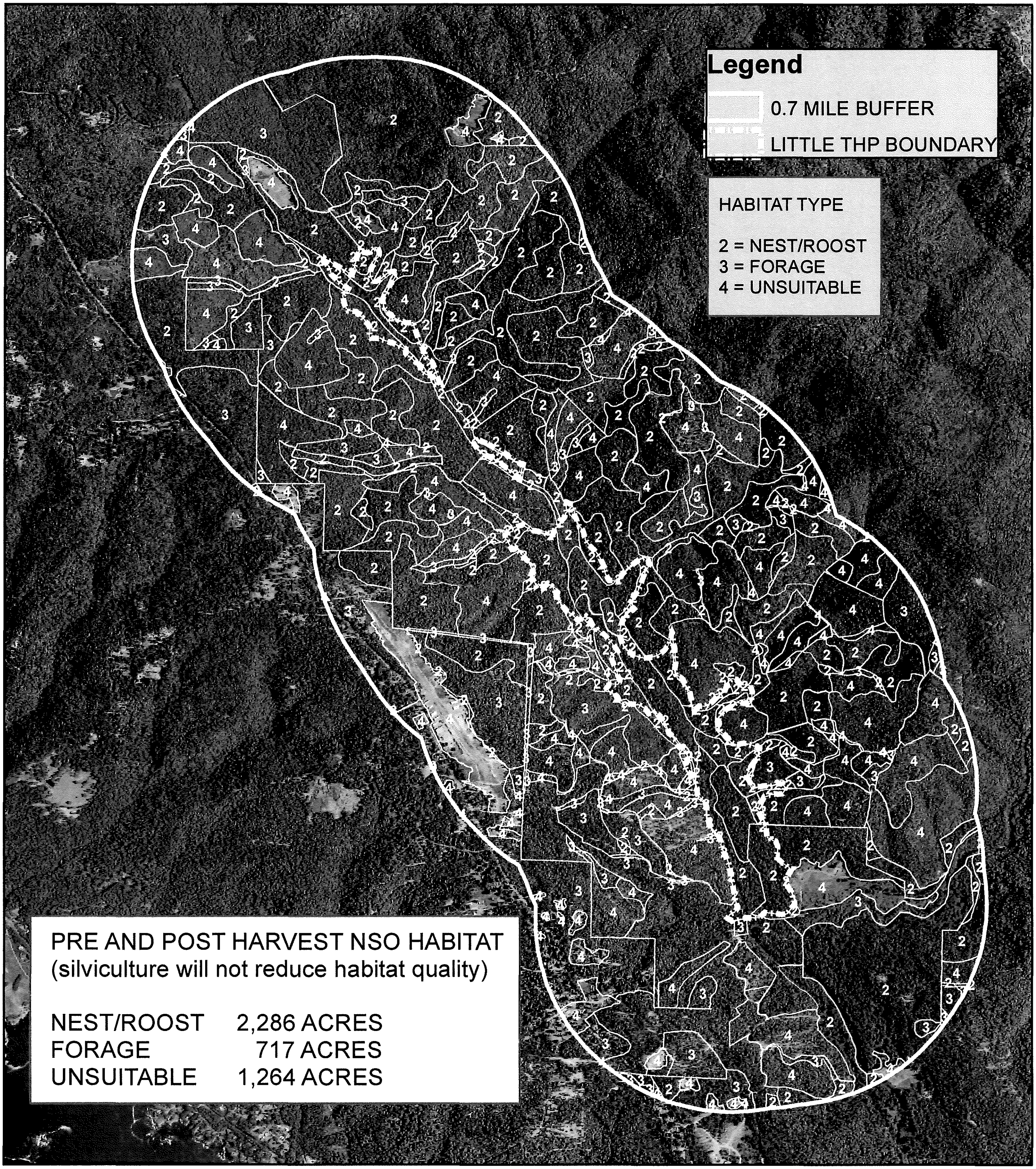
PRE AND POST HARVEST NSO HABITAT
(silviculture will not reduce habitat quality)

NEST/ROOST	2,286 ACRES
FORAGE	717 ACRES
UNSUITABLE	1,264 ACRES

LITTLE THP
PRE AND POST HARVEST NSO HABITAT

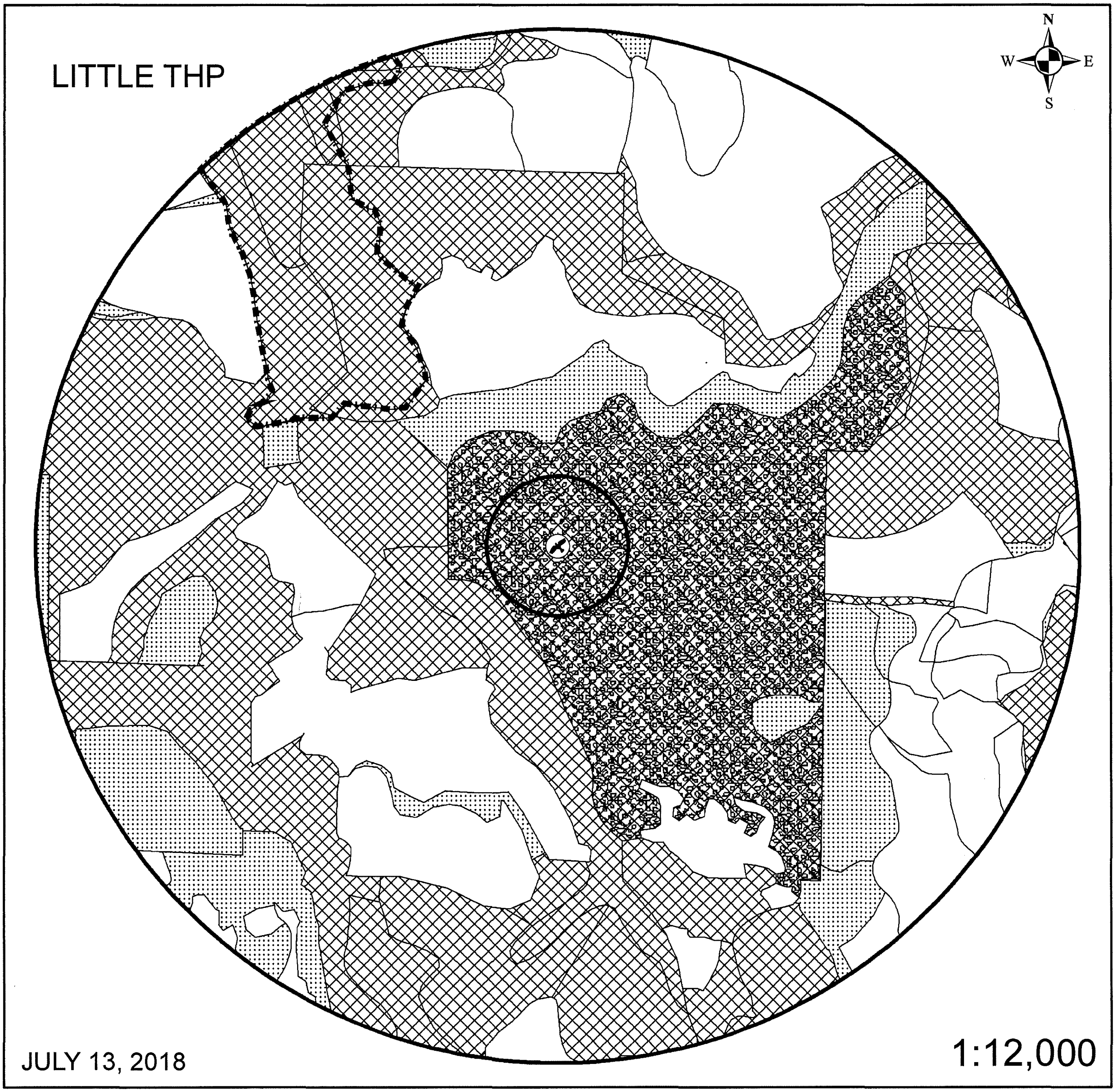
JULY 13, 2018

1:30,072



PRE AND POST HARVEST NSO HABITAT
(silviculture will not reduce habitat quality)

NEST/ROOST	2,286 ACRES
FORAGE	717 ACRES
UNSUITABLE	1,264 ACRES



MEN0179 PRE AND POST HARVEST HABITAT MAP (0.7 MILE)

HABITAT TOTALS

NEST/ROOST	569 ac.
FORAGE	106 ac.
UNSUITABLE	310 ac.
TOTAL ACRES	985 ac.

CORE AREA = 157 ac. N/R

Legend

MEN0179 LOCATION

LITTLE THP

MEN0179 CORE AREA

☐ 500 FOOT BUFFER

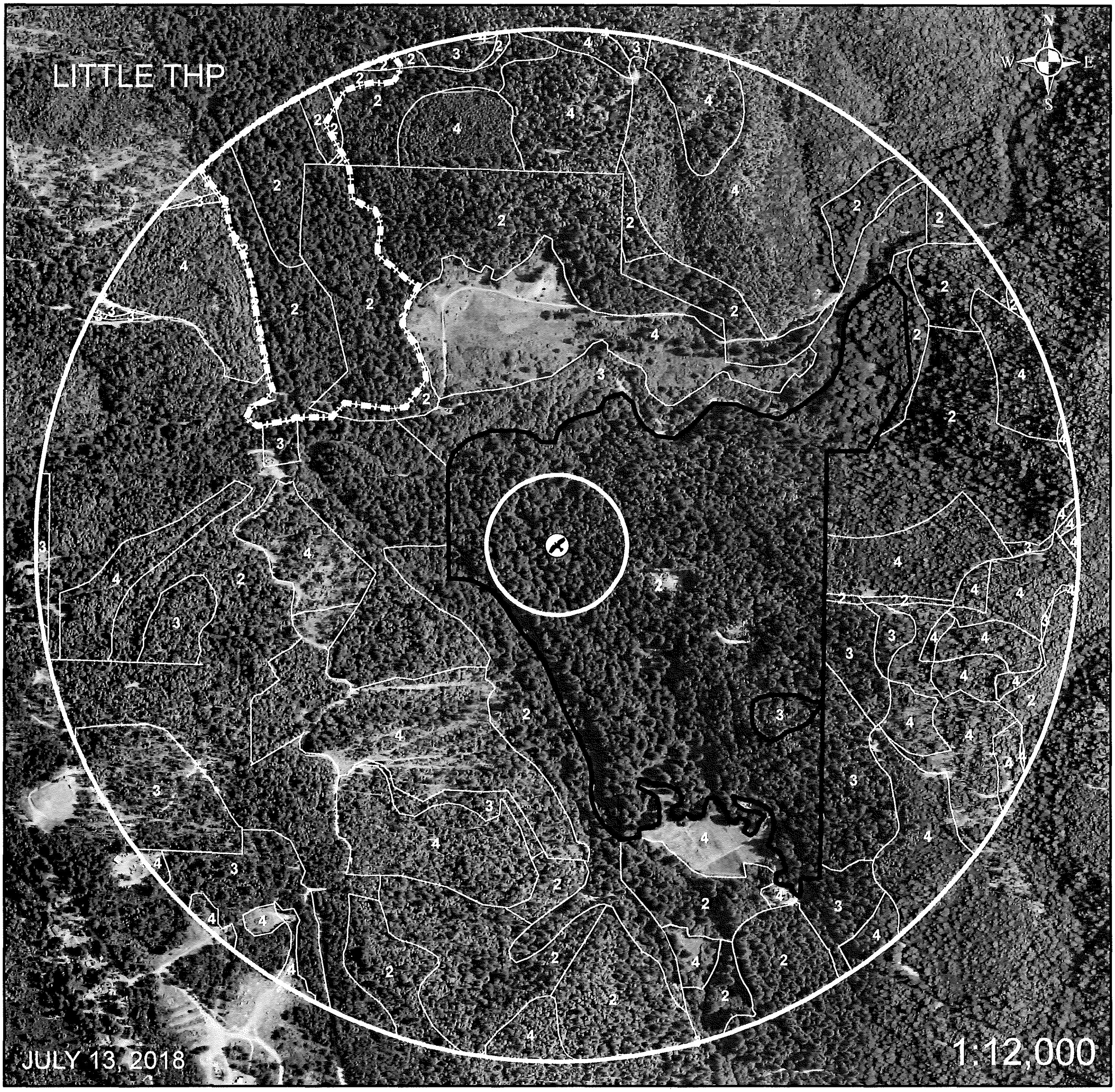
☐ 0.7 MILE BUFFER

HABITAT TYPE

▨ NEST/ROOST

▒ FORAGE

☐ UNSUITABLE



MEN0179 PRE AND POST HARVEST HABITAT MAP (0.7 MILE)

HABITAT TOTALS

NEST/ROOST	569 ac.
FORAGE	106 ac.
UNSUITABLE	310 ac.
TOTAL ACRES	985 ac.

CORE AREA = 157 ac. N/R

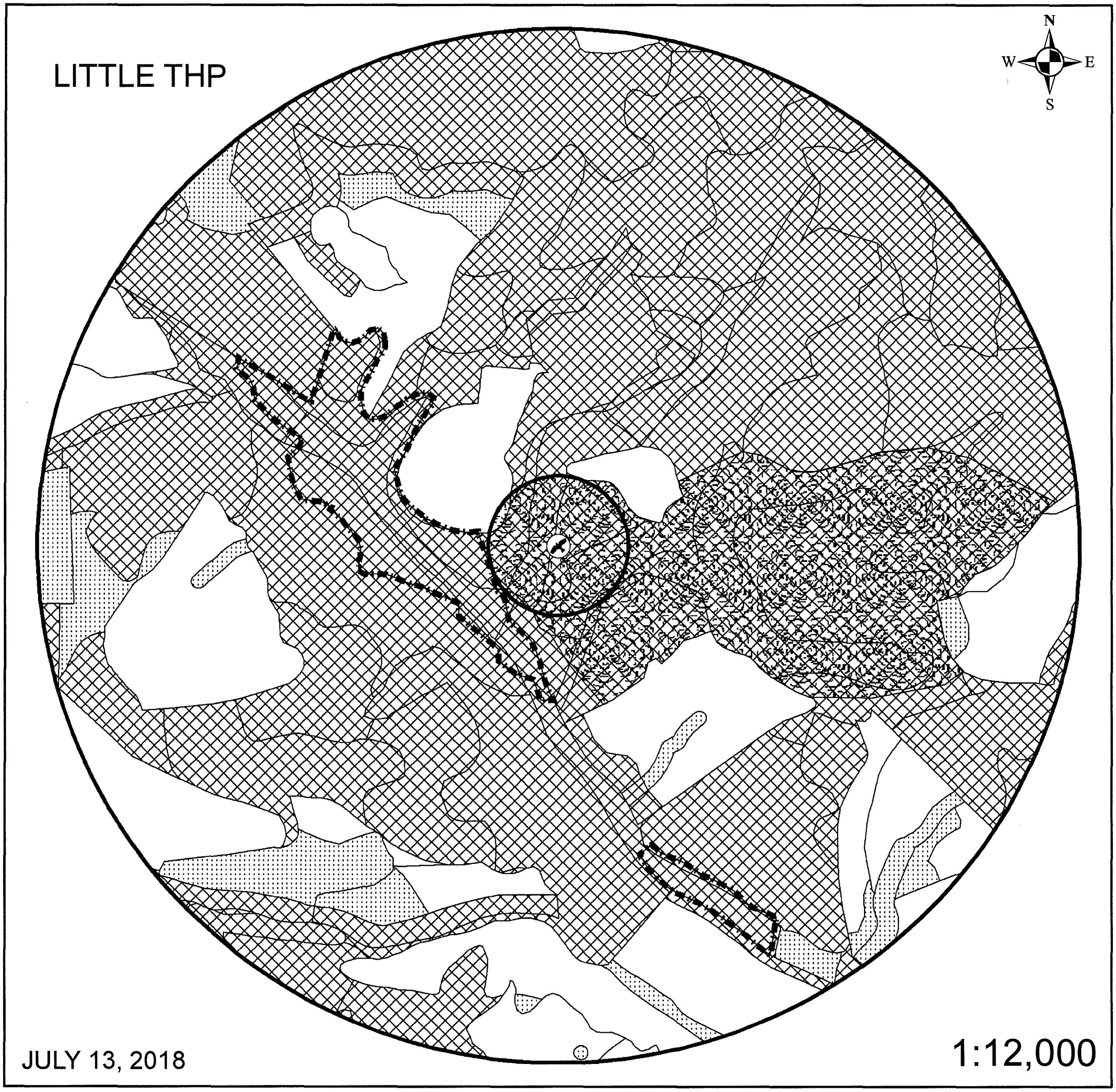
Legend

MEN0179 LOCATION
LITTLE THP
▭ MEN0179 CORE AREA
500 FOOT BUFFER
0.7 MILE BUFFER

HABITAT TYPE

2 = NEST/ROOST
3 = FORAGE
4 = UNSUITABLE

265



MEN0212 PRE AND POST HARVEST HABITAT MAP (0.7 MILE)

HABITAT TOTALS

NEST/ROOST	716 ac.
FORAGE	54 ac.
UNSUITABLE	215 ac.
TOTAL ACRES	985 ac.

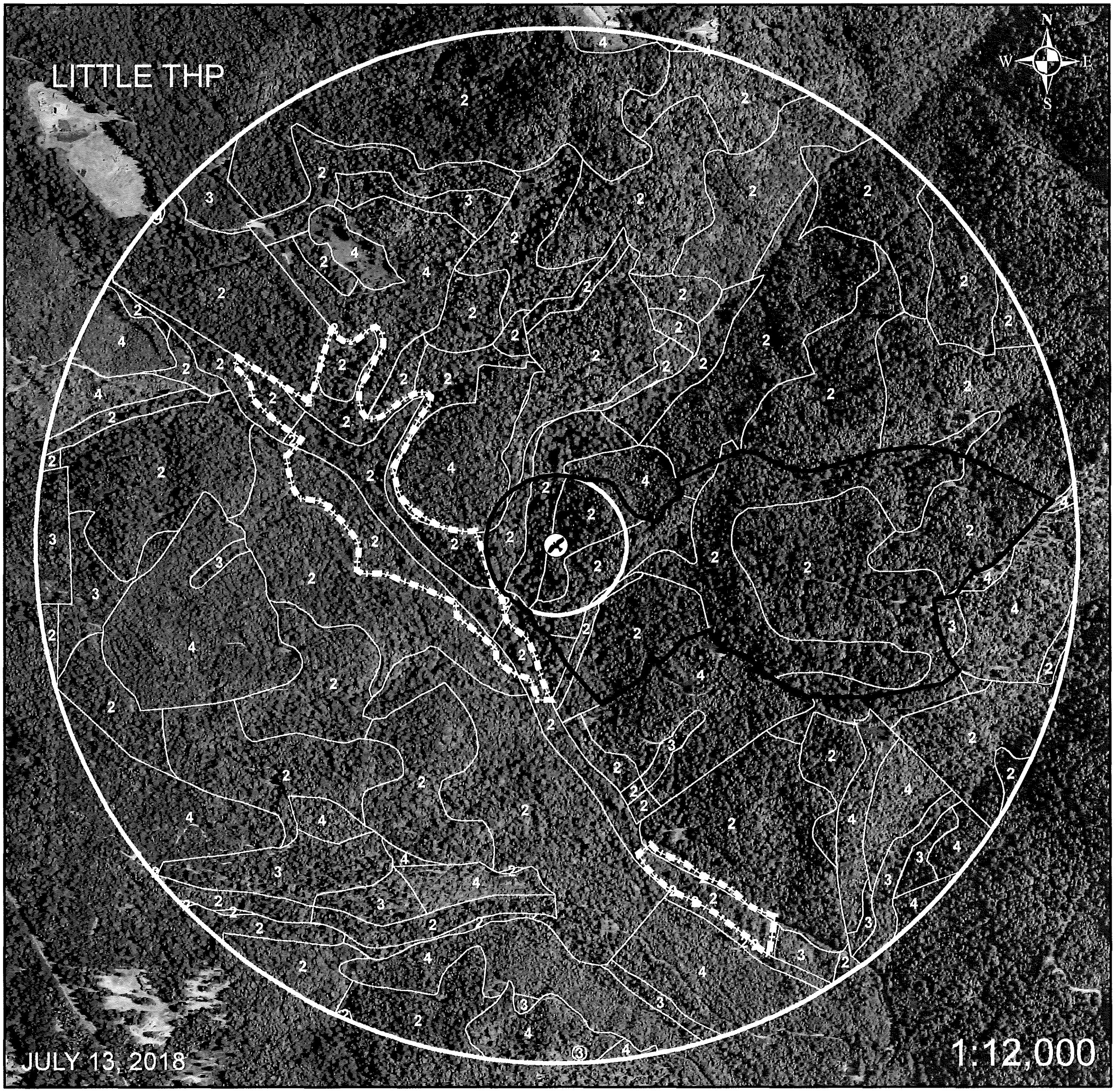
CORE AREA = 113 ac. N/R

Legend

- MEN0212 LOCATION
- ☐ 500 FOOT BUFFER
- ☐ 0.7 MILE BUFFER
- LITTLE THP BOUNDARY
- MEN0212 CORE AREA

HABITAT TYPE

- ▩ NEST/ROOST
- ▒ FORAGE
- ☐ UNSUITABLE



MEN0212 PRE AND POST HARVEST HABITAT MAP (0.7 MILE)

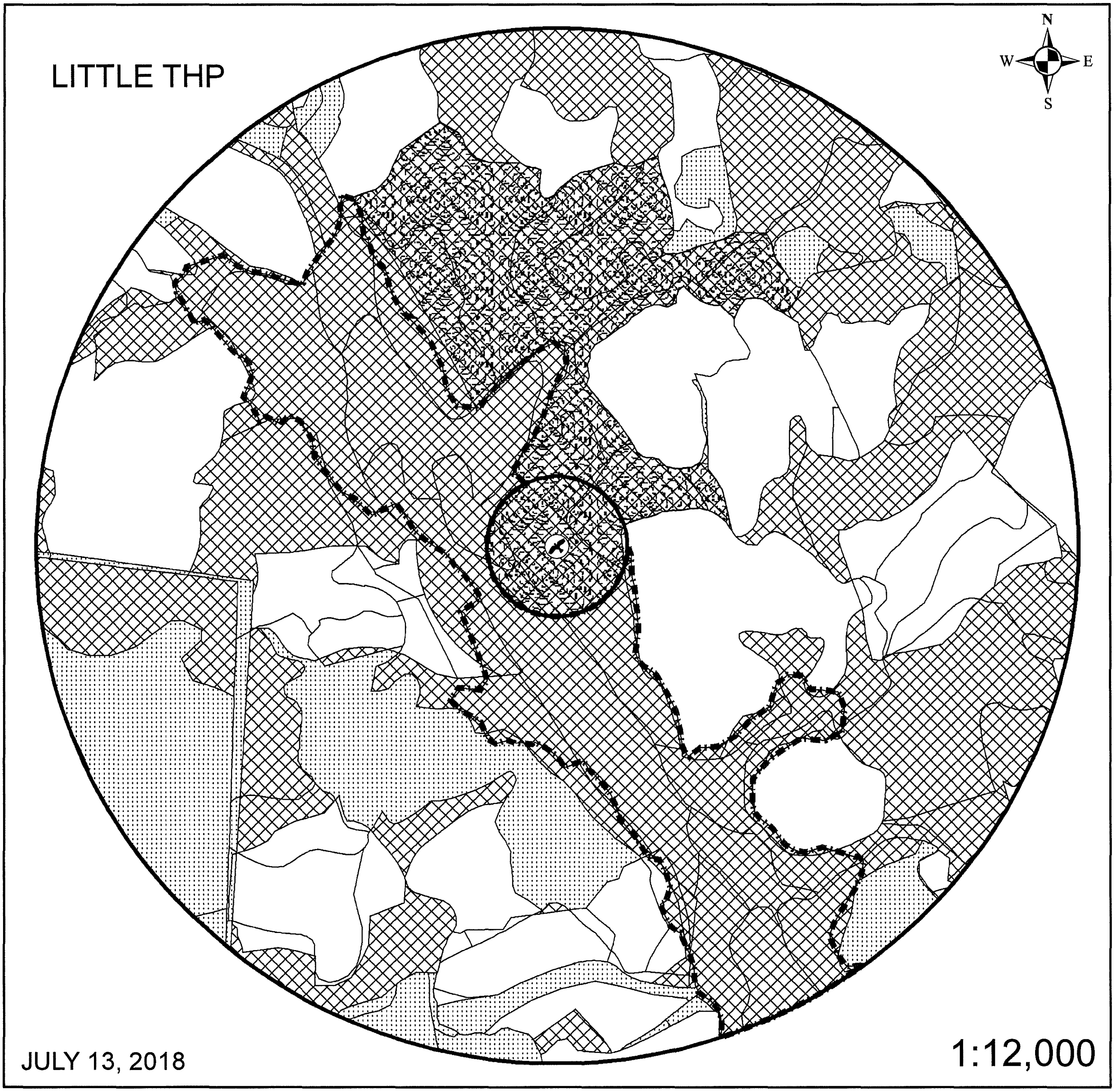
HABITAT TOTALS	
NEST/ROOST	716 ac.
FORAGE	54 ac.
UNSUITABLE	215 ac.
TOTAL ACRES	985 ac.
CORE AREA = 113 ac. N/R	

Legend

MEN0212 LOCATION
500 FOOT BUFFER
0.7 MILE BUFFER
LITTLE THP BOUNDARY
▭ MEN0212 CORE AREA

HABITAT TYPE

2 = NEST/ROOST
3 = FORAGE
4 = UNSUITABLE



MEN0371 PRE AND POST HARVEST HABITAT MAP (0.7 MILE)

HABITAT TOTALS

NEST/ROOST	533 ac.
FORAGE	126 ac.
UNSUITABLE	326 ac.
TOTAL ACRES	985 ac.

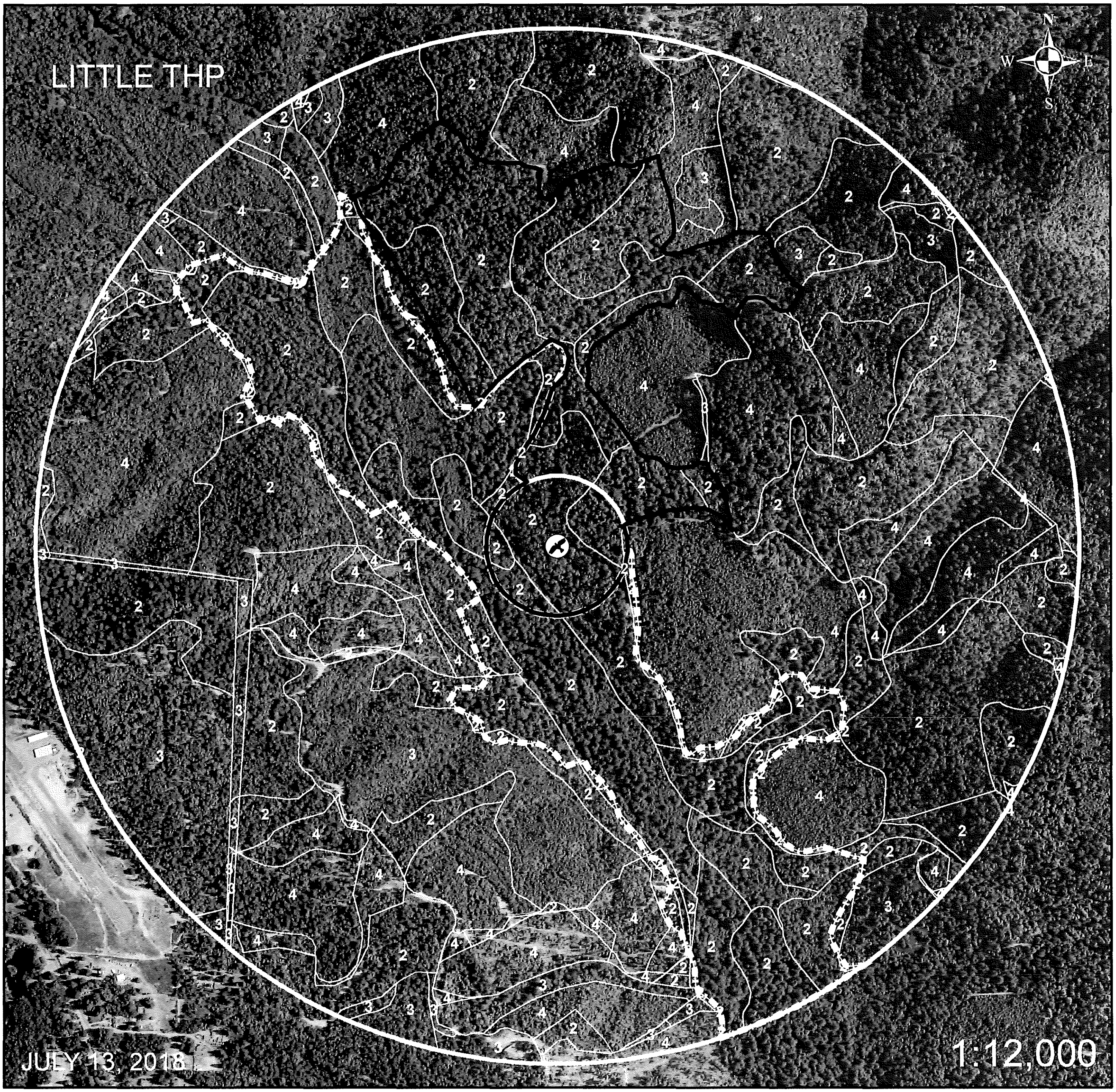
CORE AREA = 103 ac. N/R

Legend

- MD 371 LOCATION
- ▭ 500 FOOT BUFFER
- ▭ 0.7 MILE BUFFER
- ▭ LITTLE THP BOUNDARY
- ▨ MEN0371 CORE AREA

HABITAT TYPE

- ▩ NEST/ROOST
- ▒ FORAGE
- ☐ UNSUITABLE



MEN0371 PRE AND POST HARVEST HABITAT MAP (0.7 MILE)

HABITAT TOTALS

NEST/ROOST	533 ac.
FORAGE	126 ac.
UNSUITABLE	326 ac.
TOTAL ACRES	985 ac.

CORE AREA = 103 ac. N/R

Legend

MD 371 LOCATION
500 FOOT BUFFER
0.7 MILE BUFFER
LITTLE THP BOUNDARY
▭ MEN0371 CORE AREA

HABITAT TYPE

2 = NEST/ROOST
3 = FORAGE
4 = UNSUITABLE

Spotted Owl Walk-In Visit Information

As of: 12/29/14

<table>
<tr><th>Cente</th><th></th><th>Visit</th><th>Sta.</th><th>Date</th><th>Surveyor</th><th>Start</th><th>End</th><th>Wind</th><th>Weather</th><th>Mouse Result</th><th>Occupancy</th><th>T</th><th>R</th><th>Sec</th><th>DBH</th><th>BA</th><th>Visit Type</th></tr>
<tr><td>Men0179</td><td>Elk Prairie</td><td>770</td><td>0</td><td>04/08/15</td><td>Town, Pam</td><td>18:15</td><td>19:15</td><td>1-3 mph</td><td>Clear</td><td>No Contact</td><td>No Contact</td><td></td><td></td><td></td><td>0</td><td></td><td>Walk-in</td></tr>
<tr><td colspan="18">Parked in opening and walked along road past survey station 700, broadcast calling. No detections.

Dog, CAQU, CBCH, frogs, HUMM, DEJU, STJA, AMRO, WIWR.</td></tr>
<tr><td>Men0179</td><td>Elk Prairie</td><td>777</td><td>0</td><td>04/16/15</td><td>Town, Pam</td><td>8:30</td><td>9:05</td><td><1 mph</td><td>Clear</td><td>Vocal</td><td>Unknown</td><td></td><td></td><td></td><td>0</td><td></td><td>Walk-in</td></tr>
<tr><td colspan="18">At station 714 began broadcast calling. Generator going at electric building. At 0840 got aggitated calls. I moved closer and got aggitated calls again at 0844 and STJAs mobbing. Canopy high and dense, could not see owl but at base of redwood tree it was in. Left at 0905. Never saw owl but MEN0179 is back.</td></tr>
<tr><td>Men0179</td><td>Elk Prairie</td><td>781</td><td>0</td><td>05/06/15</td><td>Town, Pam</td><td>18:00</td><td>19:30</td><td>13-18 m</td><td>Clear</td><td>No Contact</td><td>No Contact</td><td></td><td></td><td></td><td>0</td><td></td><td>Walk-in</td></tr>
<tr><td colspan="18">Start at Station 714 and walk up to Station 698, then uphill to Station 712. Look around area in woods where owl was found in April.

No detections.
Periodic high winds may have kept owl quiet.

DEJU, STJA, SWTH.</td></tr>
<tr><td>Men0179</td><td>Elk Prairie</td><td>786</td><td>0</td><td>05/08/15</td><td>Town, Pam</td><td>9:10</td><td>10:35</td><td><1 mph</td><td>Clear</td><td>No Contact</td><td>No Contact</td><td></td><td></td><td></td><td>0</td><td></td><td>Walk-in</td></tr>
<tr><td colspan="18">Start at road junction where heard owl in April. Broadcast around site where saw owl. No response. Walked road toward gate and back. No response.

MODO, CBCH, AMRO, WLWR, STJA, BEKI, YEWA, TRSW, DEJU, pair mallards.</td></tr>
<tr><td>Men0179</td><td>Elk Prairie</td><td>788</td><td>0</td><td>05/13/15</td><td>Town, Pam</td><td>9:55</td><td>11:00</td><td>4-7 mph</td><td>Partly Clo</td><td>No Contact</td><td>No Contact</td><td></td><td></td><td></td><td>0</td><td></td><td>Walk-in</td></tr>
<tr><td colspan="18">Search around where the owl was heard in early april. No detections.</td></tr>
<tr><td>Men0179</td><td>Elk Prairie</td><td>801</td><td>0</td><td>03/01/16</td><td>Town, Pam</td><td></td><td></td><td><1 mph</td><td>Drizzle</td><td>No Contact</td><td>No Contact</td><td></td><td></td><td></td><td>0</td><td></td><td>Walk-in</td></tr>
<tr><td>Men0179</td><td>Elk Prairie</td><td>802</td><td>0</td><td>03/03/16</td><td>Town, Pam</td><td>17:10</td><td>17:45</td><td><1 mph</td><td>Fog</td><td>No Contact</td><td>No Contact</td><td></td><td></td><td></td><td>0</td><td></td><td>Walk-in</td></tr>
<tr><td>Men0179</td><td>Elk Prairie</td><td>805</td><td>0</td><td>03/30/16</td><td>Town, Pam</td><td>16:45</td><td>19:00</td><td><1 mph</td><td>Clear</td><td>No Contact</td><td>No Contact</td><td></td><td></td><td></td><td>0</td><td></td><td>Walk-in</td></tr>
<tr><td colspan="18">Parked at gate and walked along river/powerline to station 714. Searched around station 714. Walked back to gate and stopped truck in Elk Prairie and walked past station 700. Surveyed up toward stations 698 and 712. No contact. Map attached to survey form.</td></tr>
<tr><td>Men0179</td><td>Elk Prairie</td><td>812</td><td>0</td><td>05/17/16</td><td>Town, Pam</td><td>17:00</td><td>19:00</td><td>1-3 mph</td><td>Clear</td><td>No Contact</td><td>No Contact</td><td></td><td></td><td></td><td>0</td><td></td><td>Walk-in</td></tr>
<tr><td colspan="18">Start at station 714 and walk along LNF Gualala River to gate and back. Walked through open prairie and towards station 700. No detections.</td></tr>
<tr><td>Men0179</td><td>Elk Prairie</td><td>823</td><td>0</td><td>03/10/17</td><td>Town, Pam</td><td>11:00</td><td>12:15</td><td><1 mph</td><td>Clear</td><td>No Contact</td><td>No Contact</td><td></td><td></td><td></td><td>0</td><td></td><td>Walk-in</td></tr>
<tr><td colspan="18">Start near STA 714 where heard owls in 2016. Walked along road thru Elk Prairie past STA 700 and back. No detections.</td></tr>
<tr><td>Men0179</td><td>Elk Prairie</td><td>836</td><td>0</td><td>05/17/17</td><td>Town, Pam</td><td>9:45</td><td>10:45</td><td>4-7 mph</td><td>Clear</td><td>No Contact</td><td>No Contact</td><td></td><td></td><td></td><td>0</td><td></td><td>Walk-in</td></tr>
<tr><td colspan="18">Park at station 714 and broadcast while walking toward gate heading toward station 748. No response.</td></tr>
<tr><td>Men0179</td><td>Elk Prairie</td><td>849</td><td>0</td><td>03/07/18</td><td>Town, Pam</td><td>9:15</td><td>10:45</td><td><1 mph</td><td>Partly Clo</td><td>No Contact</td><td>No Contact</td><td></td><td></td><td></td><td>0</td><td></td><td>Walk-in</td></tr>
<tr><td colspan="18">Start broadcast calling from station 714 past station 700 to cover all historic detections. Walk back to 714 and walk on road NF Gualala River broadcasting. No response from NSO.</td></tr>
<tr><td>Men0179</td><td>Elk Prairie</td><td>851</td><td>0</td><td>03/10/18</td><td>Town, Pam</td><td>8:40</td><td>9:40</td><td><1 mph</td><td>Partly Clo</td><td>No Contact</td><td>No Contact</td><td></td><td></td><td></td><td>0</td><td></td><td>Walk-in</td></tr>
<tr><td colspan="18">On 3/9/18 an owl whistle was heard from station 730. Whistle was down near station 714 area. Broadcast called forested areas. When walking toward tation 698, silent owl flew in. Turns out was Barred owl. No NSO detected.</td></tr>
</table>

Spotted Owl Walk-In Visit Information

As of: 12/29/14

Cente	Visit	Sta.	Date	Surveyor	Start	End	Wind	Weather	Mouse Result	Occupancy	T	R	Sec	DBH	BA	Visit Type
Men0212 Doty Low	765	0	03/02/15	Town, Pam	2:55	3:55	4-7 mph	Partly Clo	No Contact	No Contact	11N	15W	10			Walk-in

Walked up Doty Creek to historic AC with no response.
Walked up and down LNF Gualala River with no response.

Dead salamander, pile of bird feathers, CORA, DEJU.

Men0212 Doty Low	778	0	04/15/15	Town, Pam	10:45	11:50	1-3 mph	Clear	Inconclusive	Male	11N	15W	10			Walk-in

Mouse #2 male took and lost him in canopy. He showed up again without mouse. Mouse #3, mouse escaped. Mouse #4 the male watched mouse and then fell asleep. I left at 1150. Moused near historic AC.

Men0212 Doty Low	806	0	03/31/16	Town, Pam	15:00	16:30	<1 mph	Clear	No Contact	No Contact			0			Walk-in

Walked up to historic AC up Doty Creek with no response. So walked along road on LNF Gualala River with no response. Went up road on NW side of Doty Creek with no response.

Men0212 Doty Low	818	0	05/24/16	Town, Pam	16:15	16:45	4-7 mph	Overcast	Inconclusive	Female			0			Walk-in

Stopped near Doty Creek and broadcast at 1615 hours. Female responds and flies in at 1617 hours. Put out mouse and she immediately takes and eats. Mouse #2 she takes and eats. Had no more live mice. No operations anywhere near this territory and storm moving in. Left.

Men0212 Doty Low	828	0	03/17/17	Town, Pam	12:30	12:50	1-3 mph	Partly Clo	Inconclusive	Pair			0			Walk-in

On main road near AC and after 1 "man-made" hoot, pair immediately responded just north of Doty Creek near main road. Pair very vocal and flew to surveyor. Left with both owls still vocalizing.

Within historic AC and too early for breeding mousing.

Men0212 Doty Low	863	0	04/14/18	Town, Pam	11:20	12:15	<1 mph	Clear	No Contact	No Contact			0			Walk-in

Broadcast calling from jct. Little NF and Doty Creek where owls often located. When no response walk up Doty Creek. No detections.

Men0212 Doty Low	857	0	05/16/18	Town, Pam	19:00	19:30	1-3 mph	Overcast	No Contact	No Contact			0			Walk-in

Broadcast calling around historic AC both up Doty Creek skid trail and along main road on LNF Gualala River. No response.

Spotted Owl Walk-In Visit Information

As of: 12/29/14

Cente	Visit	Sta.	Date	Surveyor	Start	End	Wind	Weather	Mouse Result	Occupancy	T	R	Sec	DBH	BA	Visit Type
Men0371 No Name	766	0	03/04/15	Town, Pam	16:35	17:10	<1 mph	Clear	Vocal	Pair	11N	15W	15			Walk-in
Walked up past station 658 on road above historic AC. At 0510 the pair became very vocal down by Lost Creek. Too early for reproductive survey and in historic AC...so left.																
Men0371 No Name	779	0	04/15/15	Town, Pam	18:15	19:15	<1 mph	Clear	Inconclusive	Pair	11N	15W	15			Walk-in
Pair of owls vocal and responded at 1815. saw male and offer mouse. He watched mouse for long time and mouse escaped. Mouse #2 he just watched. Would vocalize and could hear female but didn't see her.																
Men0371 No Name	787	0	05/13/15	Town, Pam	18:00	19:30	1-3 mph	Partly Clo	Nest Likely	Pair			0			Walk-in
Walked up to Station 658 and out on old skid trail. Male hooted down close to Lost Creek/Gualala River (close to existing green dot on map). Male kept disappearing in canopy to feed begging female. She remained stationary.																
Men0371 No Name	797	0	03/03/16	Town, Pam	16:00	17:00	<1 mph	Partly Clo	Inconclusive	Unknown			0			Walk-in
Started on main lower road. Walked up road to where moused owl in past. 16:30 saw silent owl fly in. No other vocal response & only one owl seen. Weather 2/3.																
Men0371 No Name	827	0	03/17/17	Town, Pam	10:00	11:45	1-3 mph	Partly Clo	No Contact	No Contact			0			Walk-in
Start at road jct north of station 698. Walk up past 658 and out skid trail toward historic AC. Broadcast calling. When no response broadcast back down to main road and walked up main road past known AC. Still no response.																
Men0371 No Name	835	0	05/16/17	Town, Pam	9:30	11:00	1-3 mph	Overcast	No Contact	No Contact			0			Walk-in
Walked up by station 658 and out skid trail to historic AC while broadcasting. Broadcast down to main road. Went to road just north of Lost Creek and broadcast up that road and walked down to stream. No responses.																
Men0371 No Name	846	0	05/30/17	Town, Pam	10:35	12:20	4-7 mph	Partly Clo	No Contact	No Contact			0			Walk-in
Start at station 714 and broadcast call toward station 656. At 10:55 saw large owl fly through trees. Identified as Barred owl and owl became vocal. Left site at 11:10 to see if same barred owls by MEN179, bird was very vocal. Got to MEN179 barred owl detected area at 11:30. Broadcast called in both directions but no response. Wind picking up so left at 12:20.																
Men0371 No Name	856	0	03/15/18	Town, Pam	14:50	15:50	1-3 mph	Overcast	No Contact	No Contact			0			Walk-in
Walk broadcast calling along LNF Gualala River and up Lost Creek. No detections.																
Men0371 No Name	864	0	04/14/18	Town, Pam	18:50	19:30	<1 mph	Clear	No Contact	No Contact			0			Walk-in
Start at Roxane Creek and walk along main road along Little NF. Silent owl flew in and was identified as Barred. Eventually it vocalized and yes, Barred. No NSO.																
Men0371 No Name	860	0	05/10/18	Town, Pam	9:15	10:15	8-12 mp	Clear	No Contact	No Contact			0			Walk-in
Barred owl heard night before in Lost Creek area. Broadcast called past station 658 down skid trails to historic AC. No NSOs located.																

Spotted Owl Visit Summary *18-01* *Little*

Active Stations

	Station	Date	Surveyor	Wind	Weather	Start	End	Behavior	Sex	Dist.	Azm
Year 2018											
	624	03/09/18	Town	<1 mph	Fog	19:37	19:47	No Contact	No Contact	0	0
	624	03/16/18	Town	<1 mph	Partly Cloud	23:30	23:40	No Contact	No Contact	0	0
	624	04/07/18	Town	<1 mph	Clear	22:39	22:49	No Contact	No Contact	0	0
	624	04/14/18	Town	<1 mph	Clear	21:45	21:55	No Contact	No Contact	0	0
	624	05/09/18	Town	1-3 mph	Clear	21:30	21:40	No Contact	No Contact	0	0
	624	05/16/18	Town	4-7 mph	Overcast	21:45	21:55	No Contact	No Contact	0	0
Year 2018											
	626	03/16/18	Town	<1 mph	Partly Cloud	22:50	23:00	No Contact	No Contact	0	0
	626	04/07/18	Town	<1 mph	Clear	21:49	22:00	No Contact	No Contact	0	0
	626	04/14/18	Town	<1 mph	Clear	22:06	22:16	No Contact	No Contact	0	0
	626	05/09/18	Town	1-3 mph	Clear	21:00	21:10	No Contact	No Contact	0	0
				Barred owl.							
	626	05/16/18	Town	4-7 mph	Overcast	22:05	22:15	No Contact	No Contact	0	0
	626	06/20/18	Stoneman	<1 mph	Clear	20:46	20:57	No Contact	No Contact	0	0
Year 2017											
	653	03/10/17	Town	1-3 mph	Clear	23:00	23:10	No Contact	No Contact	0	0
				dogs							
	653	03/17/17	Town	4-7 mph	Overcast	1:25	1:35	No Contact	No Contact	0	0
	653	04/10/17	Town	4-7 mph	Overcast	19:55	20:05	No Contact	No Contact	0	0
				WSOW							
	653	05/12/17	Town	4-7 mph	Clear	1:03	1:13	No Contact	No Contact	0	0
	653	05/17/17	Town	4-7 mph	Clear	20:29	20:39	No Contact	No Contact	0	0
				Dog							
	653	05/24/17	Town	1-3 mph	Fog	21:40	21:50	No Contact	No Contact	0	0
	653	05/31/17	Town	4-7 mph	Clear	23:30	23:40	No Contact	No Contact	0	0
Year 2018											
	653	03/11/18	Town	<1 mph	Partly Cloud	19:13	19:23	No Contact	No Contact	0	0
				People talking							
	653	03/18/18	Town	<1 mph	Partly Cloud	4:36	4:46	No Contact	No Contact	0	0
	653	04/08/18	Town	<1 mph	Clear	20:45	20:55	No Contact	No Contact	0	0
	653	04/18/18	Town	<1 mph	Partly Cloud	21:33	21:43	No Contact	No Contact	0	0
	653	05/08/18	Town	1-3 mph	Clear	23:04	23:14	No Contact	No Contact	0	0
	653	05/15/18	Town	1-3 mph	Overcast	20:30	20:40	No Contact	No Contact	0	0
Year 2017											
	656	03/17/17	Town	4-7 mph	Overcast	21:40	22:09	No Contact	No Contact	0	0
				Broadcast looking for MEN371.							
Year 2018											
	656	03/09/18	Town	<1 mph	Fog	19:21	19:31	No Contact	No Contact	0	0
	656	03/16/18	Town	<1 mph	Partly Cloud	22:20	22:30	No Contact	No Contact	0	0
	656	04/07/18	Town	<1 mph	Clear	21:15	21:25	No Contact	No Contact	0	0
	656	04/14/18	Town	<1 mph	Clear	21:20	21:30	No Contact	No Contact	0	0
				Barred owl							
	656	05/09/18	Town	1-3 mph	Clear	21:14	21:24	No Contact	No Contact	0	0
	656	05/16/18	Town	4-7 mph	Overcast	21:30	21:40	No Contact	No Contact	0	0
Year 2018											
	658	03/09/18	Town	<1 mph	Fog	18:45	18:55	No Contact	No Contact	0	0
	658	03/16/18	Town	<1 mph	Partly Cloud	21:50	22:00	No Contact	No Contact	0	0
	658	04/07/18	Town	<1 mph	Clear	20:30	20:40	No Contact	No Contact	0	0
	658	04/14/18	Town	<1 mph	Clear	20:45	20:55	No Contact	No Contact	0	0

Station	Date	Surveyor	Wind	Weather	Start	End	Behavior	Sex	Dist.	Azm
658	05/09/18	Town	1-3 mph	Clear	21:50	22:00	No Contact	No Contact	0	0
			Barred owl in Lost Creek.							
658	05/16/18	Town	4-7 mph	Overcast	20:50	21:00	No Contact	No Contact	0	0
			Barred owl.							
Year 2018										
660	03/09/18	Town	<1 mph	Fog	19:00	19:10	No Contact	No Contact	0	0
660	03/16/18	Town	<1 mph	Partly Cloud	22:04	22:14	No Contact	No Contact	0	0
660	04/07/18	Town	<1 mph	Clear	20:47	20:57	No Contact	No Contact	0	0
660	04/14/18	Town	<1 mph	Clear	21:00	21:10	No Contact	No Contact	0	0
660	05/09/18	Town	1-3 mph	Clear	22:08	22:18	No Contact	No Contact	0	0
			Barred owl.							
660	05/16/18	Town	4-7 mph	Overcast	21:07	21:17	No Contact	No Contact	0	0
Year 2017										
680	03/14/17	Town	1-3 mph	Partly Cloud	23:51	0:01	No Contact	No Contact	0	0
			Coyotes							
680	04/05/17	Town	<1 mph	Overcast	22:55	23:05	No Contact	No Contact	0	0
680	04/14/17	Town	4-7 mph	Clear	22:45	22:55	No Contact	No Contact	0	0
680	05/16/17	Town	1-3 mph	Overcast	20:59	21:09	No Contact	No Contact	0	0
680	05/23/17	Town	1-3 mph	Clear	22:40	22:50	No Contact	No Contact	0	0
680	05/30/17	Town	4-7 mph	Partly Cloud	22:40	22:50	No Contact	No Contact	0	0
Year 2018										
680	03/09/18	Town	<1 mph	Fog	18:15	18:25	No Contact	No Contact	0	0
680	03/16/18	Town	<1 mph	Partly Cloud	21:09	21:19	No Contact	No Contact	0	0
680	04/07/18	Town	<1 mph	Clear	19:57	20:07	No Contact	No Contact	0	0
680	04/14/18	Town	<1 mph	Clear	20:07	20:17	No Contact	No Contact	0	0
680	05/09/18	Town	1-3 mph	Clear	22:30	22:40	No Contact	No Contact	0	0
680	05/16/18	Town	4-7 mph	Overcast	20:29	20:39	No Contact	No Contact	0	0
Year 2017										
682	03/14/17	Town	1-3 mph	Partly Cloud	22:51	23:01	No Contact	No Contact	0	0
682	04/05/17	Town	<1 mph	Overcast	23:07	23:17	No Contact	No Contact	0	0
682	04/14/17	Town	4-7 mph	Clear	22:58	23:08	No Contact	No Contact	0	0
682	05/16/17	Town	1-3 mph	Overcast	20:43	20:53	No Contact	No Contact	0	0
682	05/23/17	Town	1-3 mph	Clear	22:53	23:03	No Contact	No Contact	0	0
682	05/30/17	Town	4-7 mph	Partly Cloud	22:57	23:07	No Contact	No Contact	0	0
Year 2018										
682	03/09/18	Town	<1 mph	Fog	18:28	18:38	No Contact	No Contact	0	0
682	03/16/18	Town	<1 mph	Partly Cloud	20:55	21:05	No Contact	No Contact	0	0
			Barred owl by NF Gualala River.							
682	04/07/18	Town	<1 mph	Clear	20:10	20:20	No Contact	No Contact	0	0
682	04/14/18	Town	<1 mph	Clear	19:50	20:00	No Contact	No Contact	0	0
682	05/09/18	Town	1-3 mph	Clear	22:44	22:54	No Contact	No Contact	0	0
682	05/16/18	Town	4-7 mph	Overcast	20:15	20:25	No Contact	No Contact	0	0
Year 2017										
696	03/10/17	Town	1-3 mph	Clear	22:45	22:55	No Contact	No Contact	0	0
			dogs							
696	03/17/17	Town	4-7 mph	Overcast	1:09	1:19	No Contact	No Contact	0	0
			Skunk							
696	04/10/17	Town	4-7 mph	Overcast	20:08	20:18	No Contact	No Contact	0	0
696	05/12/17	Town	4-7 mph	Clear	0:50	1:00	No Contact	No Contact	0	0
696	05/17/17	Town	4-7 mph	Clear	20:15	20:25	No Contact	No Contact	0	0
			Rabbits							
696	05/24/17	Town	1-3 mph	Fog	21:55	22:05	No Contact	No Contact	0	0
696	05/31/17	Town	4-7 mph	Clear	23:44	23:54	No Contact	No Contact	0	0
Year 2018										
696	03/11/18	Town	<1 mph	Partly Cloud	19:28	19:38	No Contact	No Contact	0	0
			dogs							

Station	Date	Surveyor	Wind	Weather	Start	End	Behavior	Sex	Dist.	Azm
696	03/18/18	Town	<1 mph	Partly Cloud	4:20	4:30	No Contact	No Contact	0	0
696	04/08/18	Town	<1 mph	Clear	20:30	20:40	No Contact	No Contact	0	0
696	04/18/18	Town	<1 mph	Partly Cloud	21:19	21:29	No Contact	No Contact	0	0
696	05/08/18	Town	1-3 mph	Clear	22:47	22:57	No Contact	No Contact	0	0
696	05/15/18	Town	1-3 mph	Overcast	20:15	20:25	No Contact	No Contact	0	0
Year 2017										
698	03/10/17	Town	1-3 mph	Clear	19:01	19:11	No Contact	No Contact	0	0
698	03/17/17	Town	4-7 mph	Overcast	21:26	21:36	No Contact	No Contact	0	0
698	04/10/17	Town	4-7 mph	Overcast	23:07	23:17	No Contact	No Contact	0	0
698	05/17/17	Town	4-7 mph	Clear	23:36	23:46	No Contact	No Contact	0	0
			SWOW							
698	05/24/17	Town	1-3 mph	Fog	20:20	20:30	No Contact	No Contact	0	0
698	05/31/17	Town	4-7 mph	Clear	20:26	20:36	No Contact	No Contact	0	0
Year 2018										
698	03/09/18	Town	<1 mph	Fog	20:55	21:05	No Contact	No Contact	0	0
698	03/16/18	Town	<1 mph	Partly Cloud	21:34	21:44	No Contact	No Contact	0	0
698	04/07/18	Town	<1 mph	Clear	19:40	19:50	No Contact	No Contact	0	0
698	04/14/18	Town	<1 mph	Clear	20:30	20:40	No Contact	No Contact	0	0
698	05/09/18	Town	1-3 mph	Clear	23:07	23:17	No Contact	No Contact	0	0
698	05/16/18	Town	4-7 mph	Overcast	23:45	23:55	No Contact	No Contact	0	0
			Pair Barred owls.							
Year 2017										
700	03/14/17	Town	1-3 mph	Partly Cloud	22:25	22:35	No Contact	No Contact	0	0
700	04/05/17	Town	<1 mph	Overcast	22:37	22:47	No Contact	No Contact	0	0
700	04/14/17	Town	4-7 mph	Clear	22:25	22:35	No Contact	No Contact	0	0
700	05/16/17	Town	1-3 mph	Overcast	21:20	21:30	No Contact	No Contact	0	0
700	05/23/17	Town	1-3 mph	Clear	22:20	22:30	No Contact	No Contact	0	0
			Pair of Barred owls. Flew in from upstream.							
700	05/30/17	Town	4-7 mph	Partly Cloud	22:25	22:35	No Contact	No Contact	0	0
Year 2018										
700	03/09/18	Town	<1 mph	Fog	21:23	21:33	No Contact	No Contact	0	0
700	03/16/18	Town	<1 mph	Partly Cloud	20:30	20:40	No Contact	No Contact	0	0
700	04/08/18	Town	<1 mph	Clear	19:39	19:49	No Contact	No Contact	0	0
700	04/18/18	Town	<1 mph	Partly Cloud	19:50	20:00	No Contact	No Contact	0	0
700	05/09/18	Town	1-3 mph	Clear	23:30	23:40	No Contact	No Contact	0	0
			Pair Barred owls.							
700	05/16/18	Town	4-7 mph	Overcast	0:10	0:20	No Contact	No Contact	0	0
Year 2017										
712	03/10/17	Town	1-3 mph	Clear	19:36	19:46	No Contact	No Contact	0	0
712	03/17/17	Town	4-7 mph	Overcast	22:15	22:25	No Contact	No Contact	0	0
712	04/10/17	Town	4-7 mph	Overcast	22:40	22:50	No Contact	No Contact	0	0
712	05/17/17	Town	4-7 mph	Clear	23:06	23:16	No Contact	No Contact	0	0
712	05/24/17	Town	1-3 mph	Fog	20:48	20:58	No Contact	No Contact	0	0
712	05/31/17	Town	4-7 mph	Clear	20:54	21:04	No Contact	No Contact	0	0
Year 2018										
712	03/09/18	Town	<1 mph	Fog	22:30	22:40	No Contact	No Contact	0	0
712	03/16/18	Town	<1 mph	Partly Cloud	20:13	20:23	No Contact	No Contact	0	0
712	04/08/18	Town	<1 mph	Clear	23:07	23:17	No Contact	No Contact	0	0
712	04/18/18	Town	<1 mph	Partly Cloud	20:20	20:30	No Contact	No Contact	0	0
712	05/09/18	Town	1-3 mph	Clear	0:10	0:20	No Contact	No Contact	0	0
712	05/16/18	Town	4-7 mph	Overcast	0:45	0:55	No Contact	No Contact	0	0
Year 2017										
714	03/10/17	Town	1-3 mph	Clear	19:20	19:30	No Contact	No Contact	0	0
714	03/17/17	Town	4-7 mph	Overcast	21:10	21:20	No Contact	No Contact	0	0
714	04/10/17	Town	4-7 mph	Overcast	22:53	23:03	No Contact	No Contact	0	0

Station	Date	Surveyor	Wind	Weather	Start	End	Behavior	Sex	Dist.	Azm
714	05/17/17	Town	4-7 mph	Clear	23:20	23:30	No Contact	No Contact	0	0
714	05/24/17	Town	1-3 mph	Fog	20:35	20:45	No Contact	No Contact	0	0
714	05/31/17	Town	4-7 mph	Clear	20:40	20:50	No Contact	No Contact	0	0
Year 2018										
714	03/09/18	Town	<1 mph	Fog	21:09	21:19	No Contact	No Contact	0	0
714	03/16/18	Town	<1 mph	Partly Cloud	19:59	20:09	No Contact	No Contact	0	0
714	04/08/18	Town	<1 mph	Clear	19:55	20:05	No Contact	No Contact	0	0
714	04/18/18	Town	<1 mph	Partly Cloud	20:06	20:16	No Contact	No Contact	0	0
714	05/09/18	Town	1-3 mph	Clear	23:55	0:05	No Contact	No Contact	0	0
714	05/16/18	Town	4-7 mph	Overcast	0:26	0:36	No Contact	No Contact	0	0
Year 2017										
730	03/10/17	Town	1-3 mph	Clear	19:53	20:03	No Contact	No Contact	0	0
			WSOW							
730	03/17/17	Town	4-7 mph	Overcast	22:36	22:46	No Contact	No Contact	0	0
730	04/10/17	Town	4-7 mph	Overcast	22:26	22:36	No Contact	No Contact	0	0
730	05/17/17	Town	4-7 mph	Clear	22:50	23:00	No Contact	No Contact	0	0
730	05/24/17	Town	1-3 mph	Fog	21:03	21:12	No Contact	No Contact	0	0
730	05/31/17	Town	4-7 mph	Clear	21:10	21:20	No Contact	No Contact	0	0
Year 2018										
730	03/09/18	Town	<1 mph	Fog	22:45	23:00	No Contact	No Contact	0	0
			Whistles coming from flat at 350 degrees. Get louder as moving closer to surveyor. Strix?? (Note: Barred owl was found here during walk-in on 3/10/18)							
730	03/16/18	Town	<1 mph	Partly Cloud	19:39	19:49	No Contact	No Contact	0	0
730	04/08/18	Town	<1 mph	Clear	22:48	23:00	No Contact	No Contact	0	0
730	04/18/18	Town	<1 mph	Partly Cloud	20:35	20:45	No Contact	No Contact	0	0
			Barred owl far away by Elk Prairie							
730	05/09/18	Town	1-3 mph	Clear	0:26	0:36	No Contact	No Contact	0	0
730	05/16/18	Town	4-7 mph	Overcast	1:00	1:10	No Contact	No Contact	0	0
Year 2018										
818	03/11/18	Town	<1 mph	Partly Cloud	23:45	23:55	No Contact	No Contact	0	0
818	03/18/18	Town	<1 mph	Partly Cloud	7:00	7:10	No Contact	No Contact	0	0
818	04/07/18	Town	<1 mph	Clear	23:54	0:04	No Contact	No Contact	0	0
818	04/18/18	Town	<1 mph	Partly Cloud	22:00	22:10	No Contact	No Contact	0	0
818	05/08/18	Town	1-3 mph	Clear	0:45	0:55	No Contact	No Contact	0	0
818	05/15/18	Town	1-3 mph	Overcast	0:15	0:25	No Contact	No Contact	0	0
Year 2018										
820	03/11/18	Town	<1 mph	Partly Cloud	23:59	0:09	No Contact	No Contact	0	0
820	03/18/18	Town	<1 mph	Partly Cloud	7:15	7:25	No Contact	No Contact	0	0
820	04/07/18	Town	<1 mph	Clear	23:20	23:30	No Contact	No Contact	0	0
820	04/18/18	Town	<1 mph	Partly Cloud	22:14	22:24	No Contact	No Contact	0	0
820	05/08/18	Town	1-3 mph	Clear	1:00	1:10	No Contact	No Contact	0	0
			Barred owl moving.							
820	05/15/18	Town	1-3 mph	Overcast	0:30	0:40	No Contact	No Contact	0	0
			Barred owl.							
Year 2018										
822	03/11/18	Town	<1 mph	Partly Cloud	0:15	0:25	No Contact	No Contact	0	0
			WSOW							
822	03/18/18	Town	<1 mph	Partly Cloud			Skipped Station	No Contact	0	0
			Detected MEN212 earlier in the season.							
822	04/07/18	Town	<1 mph	Clear	23:35	23:45	No Contact	No Contact	0	0
822	04/18/18	Town	<1 mph	Partly Cloud	22:30	22:40	No Contact	No Contact	0	0
822	05/08/18	Town	1-3 mph	Clear	1:15	1:25	No Contact	No Contact	0	0
			Barred owl moving.							
822	05/15/18	Town	1-3 mph	Overcast	0:50	1:00	No Contact	No Contact	0	0
Year 2018										
830	03/11/18	Town	<1 mph	Partly Cloud	23:06	23:16	No Contact	No Contact	0	0

Station	Date	Surveyor	Wind	Weather	Start	End	Behavior	Sex	Dist.	Azm
830	03/18/18	Town	<1 mph	Partly Cloud	6:36	6:46	No Contact	No Contact	0	0
830	04/07/18	Town	<1 mph	Clear	0:15	0:25	No Contact	No Contact	0	0
830	04/14/18	Town	<1 mph	Clear	0:17	0:27	No Contact	No Contact	0	0
830	05/08/18	Town	1-3 mph	Clear	0:00	0:10	No Contact	No Contact	0	0
830	05/15/18	Town	1-3 mph	Overcast	23:40	23:50	No Contact	No Contact	0	0
Year 2018										
832	03/09/18	Town	<1 mph	Fog	20:30	20:40	3-4 note Call	Pair	500	230
			MEN212 by Little NF Gualala.							
832	03/16/18	Town	<1 mph	Partly Cloud			Skipped Station	No Contact	0	0
			MEN212 detected earlier in season.							
832	04/07/18	Town	<1 mph	Clear			Skipped Station	No Contact	0	0
			Heard MEN212 in March.							
832	04/14/18	Town	<1 mph	Clear	23:00	23:10	No Contact	No Contact	0	0
832	05/09/18	Town	1-3 mph	Clear	20:00	20:18	No Contact	No Contact	0	0
832	05/16/18	Town	4-7 mph	Overcast	23:10	23:20	No Contact	No Contact	0	0
Year 2018										
838	03/11/18	Town	<1 mph	Partly Cloud	22:50	23:00	No Contact	No Contact	0	0
838	03/18/18	Town	<1 mph	Partly Cloud	6:15	6:25	No Contact	No Contact	0	0
838	04/07/18	Town	<1 mph	Clear	0:45	0:55	No Contact	No Contact	0	0
838	04/14/18	Town	<1 mph	Clear	0:00	0:10	No Contact	No Contact	0	0
838	05/08/18	Town	1-3 mph	Clear	23:30	23:40	No Contact	No Contact	0	0
838	05/15/18	Town	1-3 mph	Overcast	23:20	23:30	No Contact	No Contact	0	0
Year 2018										
840	03/09/18	Town	<1 mph	Fog	20:10	20:20	No Contact	No Contact	0	0
840	03/16/18	Town	<1 mph	Partly Cloud	23:05	23:15	No Contact	No Contact	0	0
840	04/07/18	Town	<1 mph	Clear	22:10	22:20	No Contact	No Contact	0	0
840	04/14/18	Town	<1 mph	Clear	22:45	22:55	No Contact	No Contact	0	0
840	05/09/18	Town	1-3 mph	Clear	20:30	20:40	No Contact	No Contact	0	0
840	05/16/18	Town	4-7 mph	Overcast	22:50	23:00	No Contact	No Contact	0	0
Year 2018										
846	03/09/18	Town	<1 mph	Fog	19:54	20:04	No Contact	No Contact	0	0
846	03/16/18	Town	<1 mph	Partly Cloud	22:34	22:44	No Contact	No Contact	0	0
846	04/07/18	Town	<1 mph	Clear	21:30	21:40	No Contact	No Contact	0	0
846	04/14/18	Town	<1 mph	Clear	22:20	22:30	No Contact	No Contact	0	0
846	05/09/18	Town	1-3 mph	Clear	20:45	20:55	No Contact	No Contact	0	0
846	05/16/18	Town	4-7 mph	Overcast	22:20	22:30	No Contact	No Contact	0	0

Data Version Date:
06/28/2018

Report Generation Date:
7/16/2018

Report #1 - Spotted Owl Sites Found

Known Spotted Owl sites having observations within the search area.

Meridian, Township, Range, Section (MTRS) searched:

M_11N_15W Sections(03,04,09,10,11,13,14,15,16,22,23,24);

Masterowl	*Subspecies*	*LatDD NAD83*	*LonDD NAD83*	*MTRS*	*AC Coordinate Source*
MEN0153	NORTHERN	38.816039	-123.477813	M 11N 14W 07	Contributor
MEN0179	NORTHERN	38.789914	-123.504183	M 11N 15W 23	Contributor
MEN0212	NORTHERN	38.824524	-123.531144	M 11N 15W 10	Contributor
MEN0213	NORTHERN	38.845401	-123.537464	M 11N 15W 04	Contributor
MEN0214	NORTHERN	38.835599	-123.518932	M 11N 15W 03	Contributor
MEN0371	NORTHERN	38.806553	-123.517364	M 11N 15W 15	Contributor
MEN0383	NORTHERN	38.862884	-123.552799	M 12N 15W 32	Contributor
MEN0510	NORTHERN	38.798709	-123.480809	M 11N 15W 13	Contributor
MEN0573	NORTHERN	38.838981	-123.526527	M 11N 15W 03	Contributor
SON0017	NORTHERN	38.768938	-123.476506	M 11N 14W 30	Contributor
SON0082	NORTHERN	38.771471	-123.505195	M 11N 15W 26	Contributor

Note: only MEN0179, MEN0212 and MEN0371 are within 0.7 miles of Plan area.

Data Version Date:
06/28/2018

Report Generation Date:
7/16/2018

Report #2 - Observations Reported

List of observations reported by site.

Meridian, Township, Range, Section (MTRS) searched:

M_11N_15W Sections(03,04,09,10,11,13,14,15,16,22,23,24);

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
Masterowl: MEN0153 Subspecies: NORTHERN											
POS	1990-06-01		1	UU				38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
NEG	1990-07-24		0					38.808449	-123.476202	M 11N 14W 07	Activity center
POS	1990-07-30		1	UM				38.809818	-123.471950	M 11N 14W 07	Contributor
POS	1990-07-31		1	UM				38.809818	-123.471950	M 11N 14W 07	Contributor
NEG	1990-08-07		0					38.808449	-123.476202	M 11N 14W 07	Activity center
NEG	1990-08-20		0					38.808449	-123.476202	M 11N 14W 07	Activity center
POS	1990-08-30		2	UMUF	Y			38.809818	-123.471950	M 11N 14W 07	Contributor
POS	1990-09-05		1	UM				38.809818	-123.471950	M 11N 14W 07	Contributor
POS	1990-09-12		1	UM				38.814840	-123.468861	M 11N 14W 07	Section centroid
POS	1991-06-01		1	UU				38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	1991-07-23	2125	1	UU				38.815001	-123.473735	M 11N 14W 07	Half-section centroid
POS	1991-08-30	1300	1	UM				38.814840	-123.468861	M 11N 14W 07	Section centroid
POS	1992-04-17		2	UUUU				38.811046	-123.469009	M 11N 14W 07	Half-section centroid
NEG	1992-04-18		0					38.814840	-123.468861	M 11N 14W 07	Section centroid
POS	1992-06-01		2	UMUF	Y			38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	1992-06-26		1	UM				38.811046	-123.469009	M 11N 14W 07	Half-section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	1993-02-19		0					38.814840	-123.468861	M 11N 14W 07	Section centroid
POS	1993-05-10		2	UMUF	Y			38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	1993-06-01		2	UMUF	Y			38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
NEG	1993-12-21		0					38.814840	-123.468861	M 11N 14W 07	Section centroid
POS	1994-01-20		1	UM				38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	1994-03-22		1	UM				38.803800	-123.473684	M 11N 14W 18	Quarter-section centroid
NEG	1994-04-04		0					38.814840	-123.468861	M 11N 14W 07	Section centroid
POS	1994-06-01		2	UMUF	Y		2	38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	1994-07-07		1	UU				38.818714	-123.473702	M 11N 14W 07	Quarter-section centroid
NEG	1994-07-08		0					38.814840	-123.468861	M 11N 14W 07	Section centroid
POS	1994-07-21		1	UU	Y		2	38.814493	-123.474515	M 11N 14W 07	Contributor
POS	1994-08-09		1	UU				38.825959	-123.473830	M 11N 14W 06	Quarter-section centroid
NEG	1995-03-30		0					38.799693	-123.468785	M 11N 14W 18	Section centroid
NEG	1995-04-10		0					38.799693	-123.468785	M 11N 14W 18	Section centroid
NEG	1995-04-10		0					38.799693	-123.468785	M 11N 14W 18	Section centroid
NEG	1995-04-14		0					38.799693	-123.468785	M 11N 14W 18	Section centroid
NEG	1995-04-19		0					38.799693	-123.468785	M 11N 14W 18	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	1995-04-23		1	UM				38.811476	-123.483098	M 11N 15W 12	Quarter-section centroid
POS	1995-04-24		1	UU				38.811476	-123.483098	M 11N 15W 12	Quarter-section centroid
POS	1995-05-03		1	UU				38.811476	-123.483098	M 11N 15W 12	Quarter-section centroid
POS	1995-05-11		1	UU				38.811476	-123.483098	M 11N 15W 12	Quarter-section centroid
NEG	1995-05-12		0					38.815034	-123.487614	M 11N 15W 12	Section centroid
POS	1995-05-23		1	UU				38.825772	-123.464198	M 11N 14W 06	Quarter-section centroid
POS	1995-06-01		1	UU				38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	1995-06-19		1	UU				38.818419	-123.463989	M 11N 14W 07	Quarter-section centroid
POS	1995-06-20		1	UU				38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
NEG	1995-06-28		0					38.814840	-123.468861	M 11N 14W 07	Section centroid
NEG	1995-07-17		0					38.814840	-123.468861	M 11N 14W 07	Section centroid
NEG	1995-08-24		0					38.814840	-123.468861	M 11N 14W 07	Section centroid
NEG	1996-03-07	2158	0					38.815001	-123.473735	M 11N 14W 07	Half-section centroid
NEG	1996-03-07	2050	0					38.814616	-123.464126	M 11N 14W 07	Half-section centroid
NEG	1996-03-08		0					38.815001	-123.473735	M 11N 14W 07	Half-section centroid
NEG	1996-03-13	2105	0					38.814616	-123.464126	M 11N 14W 07	Half-section centroid
NEG	1996-03-19		0					38.815034	-123.487614	M 11N 15W 12	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	1996-03-24		2	UMUF	Y			38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
NEG	1996-04-04		0					38.813535	-123.450148	M 11N 14W 08	Section centroid
NEG	1996-04-05		0					38.813535	-123.450148	M 11N 14W 08	Section centroid
POS	1996-04-18		2	UMUF	Y			38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
NEG	1996-05-01		0					38.799693	-123.468785	M 11N 14W 18	Section centroid
NEG	1996-05-09		0					38.799693	-123.468785	M 11N 14W 18	Section centroid
POS	1996-05-12		2	UMUF	Y			38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	1996-06-01		2	UMUF	Y			38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	1996-06-01		1	UU				38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	1996-06-11		1	UU				38.818714	-123.473702	M 11N 14W 07	Quarter-section centroid
NEG	1996-06-12	1200	0					38.814840	-123.468861	M 11N 14W 07	Section centroid
NEG	1996-06-25		0					38.814840	-123.468861	M 11N 14W 07	Section centroid
NEG	1997-02-24		0					38.814840	-123.468861	M 11N 14W 07	Section centroid
NEG	1997-03-12		0					38.800499	-123.487642	M 11N 15W 13	Section centroid
POS	1997-03-12		1	UU				38.818714	-123.473702	M 11N 14W 07	Quarter-section centroid
NEG	1997-03-17		0					38.814840	-123.468861	M 11N 14W 07	Section centroid
POS	1997-03-22		1	UU				38.818714	-123.473702	M 11N 14W 07	Quarter-section centroid

258

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	1997-03-24		1	UU				38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	1997-03-25		1	UU				38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	1997-03-27		1	UU				38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	1997-04-15		1	UU				38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	1997-05-27		1	UU				38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
NEG	1997-07-14		0					38.829383	-123.469233	M 11N 14W 06	Section centroid
NEG	1997-07-29		0					38.814840	-123.468861	M 11N 14W 07	Section centroid
POS	1998-03-18		2	UMUF	Y			38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
NEG	1998-04-20		0					38.815034	-123.487614	M 11N 15W 12	Section centroid
NEG	1998-04-24		0					38.814840	-123.468861	M 11N 14W 07	Section centroid
POS	1998-04-24	1525	2	UMUF	Y			38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	1998-04-24		2	UMUF	Y			38.811476	-123.483098	M 11N 15W 12	Quarter-section centroid
NEG	1998-05-05		0					38.815034	-123.487614	M 11N 15W 12	Section centroid
POS	1998-05-17		1	UU				38.811476	-123.483098	M 11N 15W 12	Quarter-section centroid
POS	1998-05-18		2	UMUF	Y			38.811476	-123.483098	M 11N 15W 12	Quarter-section centroid
POS	1998-06-01		2	UMUF	Y			38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
NEG	1998-06-05		0					38.815034	-123.487614	M 11N 15W 12	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	1998-06-10	1200	0					38.814840	-123.468861	M 11N 14W 07	Section centroid
NEG	1998-07-13		0					38.815034	-123.487614	M 11N 15W 12	Section centroid
NEG	1998-07-29		0					38.814840	-123.468861	M 11N 14W 07	Section centroid
NEG	1999		0					38.816039	-123.477813	M 11N 14W 07	Activity center
POS	1999-05-14	2052	1	UM				38.818566	-123.492165	M 11N 15W 12	Quarter-section centroid
NEG	1999-05-15	1830	0					38.814840	-123.468861	M 11N 14W 07	Section centroid
NEG	1999-05-15	1648	0					38.836678	-123.487923	M 11N 15W 01	Section centroid
NEG	1999-05-23	1500	0					38.814840	-123.468861	M 11N 14W 07	Section centroid
NEG	1999-06-17	1849	0					38.814840	-123.468861	M 11N 14W 07	Section centroid
NEG	2000		0					38.816039	-123.477813	M 11N 14W 07	Activity center
POS	2000-04-04	2106	1	UM				38.818748	-123.483101	M 11N 15W 12	Quarter-section centroid
POS	2000-04-14	2208	1	UU				38.818566	-123.492165	M 11N 15W 12	Quarter-section centroid
NEG	2000-06-06	1900	0					38.814840	-123.468861	M 11N 14W 07	Section centroid
POS	2001-03-11	2042	1	UF				38.818748	-123.483101	M 11N 15W 12	Quarter-section centroid
NEG	2001-03-14	1830	0					38.815034	-123.487614	M 11N 15W 12	Section centroid
NEG	2001-04-01	2017	0					38.815034	-123.487614	M 11N 15W 12	Section centroid
NEG	2001-05-15	2234	0					38.815034	-123.487614	M 11N 15W 12	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	2001-07-19	2253	1	UM				38.802051	-123.455810	M 11N 14W 17	Contributor
POS	2002-04-21	2209	1	UM				38.811908	-123.492765	M 11N 15W 12	Contributor
POS	2002-04-22	0041	1	UM				38.808020	-123.477521	M 11N 14W 07	Contributor
NEG	2003		0					38.816039	-123.477813	M 11N 14W 07	Activity center
POS	2003-05-15	2145	1	UM				38.820912	-123.466396	M 11N 14W 07	Contributor
POS	2003-06-26	2242	1	UU				38.811902	-123.478655	M 11N 15W 12	Contributor
NEG	2003-06-27	1200	0					38.811279	-123.473756	M 11N 14W 07	Contributor
NEG	2003-07-02	1805-2025	0					38.811279	-123.473756	M 11N 14W 07	Contributor
NEG	2003-07-11	1730-2100	0					38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
NEG	2004		0					38.816039	-123.477813	M 11N 14W 07	Activity center
POS	2004-06-17	1745	1	UM				38.816780	-123.477960	M 11N 14W 07	Contributor
NEG	2004-06-18	1155-1505	0					38.818711	-123.473702	M 11N 14W 07	Quarter-section centroid
NEG	2004-06-25	1435-1630	0					38.818711	-123.473702	M 11N 14W 07	Quarter-section centroid
NEG	2005		0					38.816039	-123.477813	M 11N 14W 07	Activity center
NEG	2005-07-09	0920-1145	0					38.818711	-123.473702	M 11N 14W 07	Quarter-section centroid
POS	2005-07-27	1305-1350	1	UM				38.820640	-123.478260	M 11N 14W 07	Contributor
POS	2005-07-28	1250-1510	2	UMUF	Y			38.820080	-123.477890	M 11N 14W 07	Contributor

288

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	2006		1	UU				38.816193	-123.477521	M 11N 14W 07	Contributor
POS	2006-05-26	1305-1350	1	UU				38.816300	-123.478560	M 11N 14W 07	Contributor
POS	2007		1	UU				38.816521	-123.485471	M 11N 15W 12	Contributor
POS	2007-04-06	2103	1	UM				38.818748	-123.483101	M 11N 15W 12	Quarter-section centroid
POS	2007-05-17	1900	2	UMUF	Y	N	0	38.816882	-123.485358	M 11N 15W 12	Contributor
POS	2008		2	UMUF	Y			38.816039	-123.477813	M 11N 14W 07	Activity center
POS	2008		1	UU				38.816521	-123.485471	M 11N 15W 12	Contributor
NEG	2008-03-22	0033	0					38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
NEG	2008-03-29	2333	0					38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	2008-03-29	1800	2	AMAF	Y			38.818748	-123.483101	M 11N 15W 12	Quarter-section centroid
POS	2008-05-17	1730	2	AMAF	Y	N		38.818748	-123.483101	M 11N 15W 12	Quarter-section centroid
NEG	2008-05-17	2222	0					38.811279	-123.473756	M 11N 14W 07	Quarter-section centroid
POS	2009		1	UU				38.816521	-123.485471	M 11N 15W 12	Contributor
POS	2009		2	UMUF	Y			38.816039	-123.477813	M 11N 14W 07	Activity center
POS	2009-04-06	2046	1	AM				38.818748	-123.483101	M 11N 15W 12	Quarter-section centroid
POS	2009-04-13	2039	1	AM				38.818748	-123.483101	M 11N 15W 12	Quarter-section centroid
POS	2009-05-19	2220	1	UU				38.808449	-123.476202	M 11N 14W 07	Contributor

287

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	2009-05-20	1830	2	AMAF	Y	Y		38.814452	-123.484535	M 11N 15W 12	Contributor
POS	2009-05-20	1900	1	AM				38.808449	-123.476202	M 11N 14W 07	Contributor
POS	2010		2	UMUF	Y	Y	1	38.816039	-123.477813	M 11N 14W 07	Activity center
NEG	2011	2400	0					38.808166	-123.467577	M 11N 14W 07	Contributor
NEG	2011-03-04	2158-2208	0					38.808020	-123.477521	M 11N 14W 07	Contributor
NEG	2011-03-04	2007-2017	0					38.812310	-123.483878	M 11N 15W 12	Contributor
NEG	2011-03-04	1830-1840	0					38.823126	-123.482633	M 11N 15W 01	Contributor
NEG	2011-03-04	2021-2131	0					38.811902	-123.478655	M 11N 15W 12	Contributor
POS	2011-03-04		2	UMUF	Y			38.816039	-123.477813	M 11N 14W 07	Activity center
POS	2011-03-04	1800-1806	2	UMUF	Y			38.817403	-123.481531	M 11N 15W 12	Contributor
POS	2011-04-02	0830-1000	2	UMUF	Y			38.814840	-123.468861	M 11N 14W 07	Section centroid
POS	2011-04-03	1845-1854	1	UM				38.808020	-123.477521	M 11N 14W 07	Contributor
POS	2011-05-12	1700-1800	1	UF		Y		38.814840	-123.468861	M 11N 14W 07	Section centroid
NEG	2011-05-12	2345-2355	0					38.808020	-123.477521	M 11N 14W 07	Contributor
POS	2012-03-07	1000-1100	1	UM				38.815034	-123.487614	M 11N 15W 12	Section centroid
NEG	2012-03-25	1700-1900	0					38.814840	-123.468861	M 11N 14W 07	Section centroid
POS	2012-04-01	1700-1900	2	UMUF	Y			38.814840	-123.468861	M 11N 14W 07	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
AC	2012-04-27	1700-1745	1	UF		Y		38.816039	-123.477813	M 11N 14W 07	Contributor
POS	2012-07-04	1600-1700	1	UF			1	38.816039	-123.477813	M 11N 14W 07	Activity center
POS	2014		1	UM				38.816039	-123.477813	M 11N 14W 07	Activity center
Masterowl: MEN0179 Subspecies: NORTHERN											
NEG	1990-04-16		0					38.786442	-123.506602	M 11N 15W 23	Section centroid
POS	1990-04-16		2	UMUF	Y			38.796858	-123.487652	M 11N 15W 13	Half-section centroid
POS	1990-06-01		2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
NEG	1990-06-17		0					38.786442	-123.506602	M 11N 15W 23	Section centroid
NEG	1990-07-07		0					38.786442	-123.506602	M 11N 15W 23	Section centroid
NEG	1990-07-19		0					38.786442	-123.506602	M 11N 15W 23	Section centroid
NEG	1991-01-25	0630	0					38.790188	-123.511441	M 11N 15W 23	Quarter-section centroid
NEG	1991-01-29	1800	0					38.790188	-123.511441	M 11N 15W 23	Quarter-section centroid
NEG	1991-01-31		0					38.796947	-123.492351	M 11N 15W 13	Quarter-section centroid
POS	1991-02-15	0700	1	UU				38.797150	-123.501841	M 11N 15W 14	Quarter-section centroid
NEG	1991-02-18	0800	0					38.786442	-123.506602	M 11N 15W 23	Section centroid
NEG	1991-02-22	0100	0					38.790188	-123.511441	M 11N 15W 23	Quarter-section centroid
NEG	1991-03-14	1830	0					38.786442	-123.506602	M 11N 15W 23	Section centroid

290

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
NEG	1991-04-10	1200	0					38.796947	-123.492351	M 11N 15W 13	Quarter-section centroid
POS	1991-04-22	0630	2	UUUU				38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
NEG	1991-05-15		0					38.784542	-123.504136	M 11N 15W 23	Activity center
POS	1991-05-22		2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1991-05-23		2	UMUF	Y	Y		38.789187	-123.492654	M 11N 15W 24	Contributor
POS	1991-05-29	1625	2	UMUF	Y	Y		38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1991-06-01		2	UMUF	Y		1	38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1991-07-08	1722	1	UM	Y	Y	2	38.789187	-123.492654	M 11N 15W 24	Contributor
POS	1991-11-04	2044	1	UF				38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1991-11-10	1755	2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1992-03-13		1	UU				38.800879	-123.506508	M 11N 15W 14	Section centroid
POS	1992-05-08		2	UMUF	Y	N		38.789922	-123.501894	M 11N 15W 23	Quarter-section centroid
POS	1992-06-01		2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1992-06-04		2	UMUF	Y			38.790055	-123.506662	M 11N 15W 23	Half-section centroid
POS	1992-09-16		2	UMUF	Y	N		38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1993-03-08		1	UU				38.782650	-123.501866	M 11N 15W 23	Quarter-section centroid
POS	1993-03-08	2115	1	UU				38.782393	-123.492389	M 11N 15W 24	Quarter-section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	1993-03-22	2000	0					38.785883	-123.487589	M 11N 15W 24	Section centroid
POS	1993-04-08		1	UU				38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1993-04-28		1	UU				38.797150	-123.501841	M 11N 15W 14	Quarter-section centroid
NEG	1993-04-28		0					38.785883	-123.487589	M 11N 15W 24	Section centroid
NEG	1993-05-04		0					38.785883	-123.487589	M 11N 15W 24	Section centroid
NEG	1993-05-10		0					38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	1993-05-13		0					38.785883	-123.487589	M 11N 15W 24	Section centroid
NEG	1993-05-18		0					38.786442	-123.506602	M 11N 15W 23	Section centroid
POS	1993-06-01		2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1993-06-02		2	UMUF	Y			38.796947	-123.492351	M 11N 15W 13	Quarter-section centroid
POS	1993-06-03	1200	2	UMUF				38.796947	-123.492351	M 11N 15W 13	Quarter-section centroid
NEG	1993-06-16		0					38.785883	-123.487589	M 11N 15W 24	Section centroid
POS	1993-07-22	1310	1	UM				38.789187	-123.492654	M 11N 15W 24	Contributor
POS	1993-11-13	1214	2	UMUF				38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
NEG	1994-03-22		0					38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	1994-03-24		0					38.785883	-123.487589	M 11N 15W 24	Section centroid
NEG	1994-03-30		0					38.785883	-123.487589	M 11N 15W 24	Section centroid

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
POS	1994-04-15		1	UU				38.796947	-123.492351	M 11N 15W 13	Quarter-section centroid
POS	1994-06-01	1158	2	UMUF	Y			38.786442	-123.506602	M 11N 15W 23	Section centroid
POS	1994-06-01		2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1994-11-22	1911	1	UM				38.786442	-123.506602	M 11N 15W 23	Section centroid
NEG	1995-04-02		0					38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	1995-04-23		0					38.786443	-123.506607	M 11N 15W 23	Section centroid
NEG	1995-04-24		0					38.786442	-123.506602	M 11N 15W 23	Section centroid
POS	1995-05-31	2142	1	UM				38.786442	-123.506602	M 11N 15W 23	Section centroid
POS	1995-06-01		2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1995-07-10		1	UU				38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1995-07-11		1	UU				38.789922	-123.501894	M 11N 15W 23	Quarter-section centroid
POS	1995-11-09	1849	2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
NEG	1996-03-07	2100	0					38.786442	-123.506602	M 11N 15W 23	Section centroid
POS	1996-03-17		1	UU				38.796947	-123.492351	M 11N 15W 13	Quarter-section centroid
POS	1996-03-18		1	UU				38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1996-04-05		2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
NEG	1996-04-07		0					38.785883	-123.487589	M 11N 15W 24	Section centroid

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
POS	1996-05-25		2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1996-06-01		2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1996-06-30		2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1996-07-10		2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1996-10-24	1426	1	UU				38.789922	-123.501894	M 11N 15W 23	Quarter-section centroid
POS	1996-10-24		1	UU				38.789922	-123.501894	M 11N 15W 23	Quarter-section centroid
POS	1997-02-24	0000	2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
NEG	1997-03-12		0					38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	1997-03-22		0					38.800499	-123.487642	M 11N 15W 13	Section centroid
POS	1997-04-15		2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1997-04-30	1325	2	UMUF	Y	Y		38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1997-05-27		2	UMUF	Y	Y	1	38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1997-06-01		2	UMUF	Y		1	38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1997-07-03		2	UMUF	Y		1	38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1997-07-15	1837	1	UF			1	38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1997-11-04	1904	1	UM				38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1998-03-03		1	UU				38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	1998-04-24		2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1998-05-18		1	UU				38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1998-06-01		2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
NEG	1998-06-10	1200	0					38.785883	-123.487589	M 11N 15W 24	Section centroid
POS	1998-07-29		1	UM				38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
NEG	1998-08-13		0					38.788932	-123.473342	M 11N 14W 19	Quarter-section centroid
NEG	1998-08-13		0					38.785883	-123.487589	M 11N 15W 24	Section centroid
NEG	1998-08-20		0					38.784897	-123.468539	M 11N 14W 19	Section centroid
POS	1998-08-20		1	UF				38.789435	-123.482869	M 11N 15W 24	Quarter-section centroid
NEG	1998-08-21		0					38.785883	-123.487589	M 11N 15W 24	Section centroid
NEG	1998-08-27		0					38.784897	-123.468539	M 11N 14W 19	Section centroid
NEG	1998-08-27		0					38.785883	-123.487589	M 11N 15W 24	Section centroid
POS	1998-10-12		2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1998-10-21		1	UU				38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
POS	1998-10-21	1148	1	UU				38.784542	-123.504136	M 11N 15W 23	Activity center
NEG	1999-03-17	2028-2038	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	1999-03-20	1719	0					38.785883	-123.487589	M 11N 15W 24	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	1999-03-29	2205-2215	0					38.791161	-123.486695	M 11N 15W 24	Contributor
NEG	1999-04-12	2318-2328	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	1999-04-23	0202-0212	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	1999-04-24	0014-0024	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	1999-05-01	0025-0035	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	1999-05-13	2141-2151	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	1999-05-15	1400	0					38.785883	-123.487589	M 11N 15W 24	Section centroid
NEG	1999-05-20	0050-0100	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	1999-05-20	2321-2331	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	1999-05-22	1715	0					38.785883	-123.487589	M 11N 15W 24	Section centroid
POS	1999-05-22	0138	2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
NEG	1999-06-01	0007-0017	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	1999-06-02	1730	0					38.785883	-123.487589	M 11N 15W 24	Section centroid
NEG	1999-06-02	2216-2226	0					38.791290	-123.517890	M 11N 15W 22	Contributor
POS	1999-06-02	0128	1	UM				38.796947	-123.492351	M 11N 15W 13	Quarter-section centroid
POS	1999-06-03	0642	1	UU				38.797150	-123.501841	M 11N 15W 14	Quarter-section centroid
POS	1999-06-03	0739-0842	1	UU				38.790582	-123.498195	M 11N 15W 23	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	1999-06-10	2240-2250	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	1999-06-17	2327-2337	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2000-03-02	2303	0					38.786442	-123.506602	M 11N 15W 23	Section centroid
NEG	2000-03-03	2000	0					38.786442	-123.506602	M 11N 15W 23	Section centroid
NEG	2000-03-03	2117-2137	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2000-04-06	2352-0002	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2000-04-09	2105	0					38.790462	-123.520828	M 11N 15W 22	Quarter-section centroid
NEG	2000-04-15	1050	0					38.786442	-123.506602	M 11N 15W 23	Section centroid
NEG	2000-04-19	2023	0					38.800879	-123.506508	M 11N 15W 14	Section centroid
POS	2000-04-26	2144	1	UM				38.791290	-123.517890	M 11N 15W 22	Contributor
POS	2000-04-28	2310	1	UM				38.797150	-123.501841	M 11N 15W 14	Quarter-section centroid
NEG	2000-05-09	2105-2115	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2000-06-04	2347-2357	0					38.783380	-123.516870	M 11N 15W 22	Contributor
POS	2000-06-04	2236	1	UM				38.797150	-123.501841	M 11N 15W 14	Quarter-section centroid
POS	2000-06-06	0845	1	UM				38.789922	-123.501894	M 11N 15W 23	Quarter-section centroid
NEG	2000-06-28	2138-2148	0					38.791290	-123.517890	M 11N 15W 22	Contributor
POS	2001-03-10	2223	1	UF				38.797150	-123.501841	M 11N 15W 14	Quarter-section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	2001-03-10	2240	1	UU				38.797150	-123.501841	M 11N 15W 14	Quarter-section centroid
POS	2001-03-10	2223	1	UF				38.793119	-123.499775	M 11N 15W 23	Contributor
NEG	2001-03-12	1941	0					38.785883	-123.487589	M 11N 15W 24	Section centroid
NEG	2001-03-14	1955-2005	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2001-03-18	1940-1950	0					38.783380	-123.516870	M 11N 15W 22	Contributor
POS	2001-05-05	1400	2	UMUF	Y			38.789665	-123.492370	M 11N 15W 24	Quarter-section centroid
NEG	2001-05-24	2313-2323	0					38.783380	-123.516870	M 11N 15W 22	Contributor
POS	2001-05-25	0050	1	UM				38.797150	-123.501841	M 11N 15W 14	Quarter-section centroid
NEG	2001-06-13	2121	0					38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	2001-06-14	2103-2113	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2001-06-14	2205-2215	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2001-06-29	2331-2341	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2002-03-04	2345-2355	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2002-03-06	2115	0					38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	2002-03-12	2326-2336	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2002-04-09	2325-2335	0					38.791290	-123.517890	M 11N 15W 22	Contributor
POS	2002-04-11	1430	2	UMUF	Y			38.795955	-123.488514	M 11N 15W 13	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2002-04-20	0129-0139	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2002-04-21	0058-0108	0					38.791290	-123.517890	M 11N 15W 22	Contributor
POS	2002-04-21	2357	2	UMUF	Y			38.790299	-123.509950	M 11N 15W 23	Contributor
POS	2002-04-22	1708	2	UMUF	Y			38.789914	-123.504183	M 11N 15W 23	Contributor
NEG	2002-04-30	0133-0143	0					38.783380	-123.516870	M 11N 15W 22	Contributor
AC	2002-05-02	1728-1732	2	UMUF	Y	Y		38.789914	-123.504183	M 11N 15W 23	Contributor
POS	2003		1	UU		Y		38.789859	-123.504173	M 11N 15W 23	Contributor
POS	2003-03-06	0044	1	UM				38.783990	-123.509120	M 11N 15W 23	Contributor
NEG	2003-03-07	2156-2206	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2003-03-07	2021-2031	0					38.791290	-123.517890	M 11N 15W 22	Contributor
POS	2003-03-30	1505-1520	2	UMUF	Y			38.789914	-123.504183	M 11N 15W 23	Contributor
NEG	2003-04-02	2033-2043	0					38.783990	-123.509120	M 11N 15W 23	Contributor
NEG	2003-04-02	1931-1941	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2003-04-14	0003-0013	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2003-04-30	0118-0128	0					38.783990	-123.509120	M 11N 15W 23	Contributor
NEG	2003-04-30	0040-0050	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2003-04-30	0159-0209	0					38.791290	-123.517890	M 11N 15W 22	Contributor

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
NEG	2004-03-11	2302-2312	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2004-03-11	2343-2353	0					38.783990	-123.509120	M 11N 15W 23	Contributor
POS	2004-03-19	1729-1745	2	UMUF	Y			38.789673	-123.507622	M 11N 15W 23	Contributor
NEG	2004-04-07	0015-0025	0					38.783990	-123.509120	M 11N 15W 23	Contributor
NEG	2004-04-15	0119-0129	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2004-06-14	0142-0152	0					38.783990	-123.509120	M 11N 15W 23	Contributor
NEG	2004-06-15	0134-0144	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2005-04-21	0121-0131	0					38.783990	-123.509120	M 11N 15W 23	Contributor
NEG	2005-04-21	2212-2222	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2005-05-10	2220-2230	0					38.783990	-123.509120	M 11N 15W 23	Contributor
NEG	2005-06-09	2242-2252	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2005-06-23	2148-2158	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2005-06-25	2157-2207	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2005-07-20	2107-2117	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2005-07-26	2128-2148	0					38.783990	-123.509120	M 11N 15W 23	Contributor
NEG	2005-07-27	2132-2142	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2006-04-13	0259-0309	0					38.791290	-123.517890	M 11N 15W 22	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2006-04-25	0301-0311	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2006-04-25	0035-0045	0					38.783990	-123.509120	M 11N 15W 23	Contributor
NEG	2006-04-25	0118-0128	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2006-05-25	2350-0000	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2006-05-25	2153-2203	0					38.783990	-123.509120	M 11N 15W 23	Contributor
NEG	2006-06-02	2232-2242	0					38.783990	-123.509120	M 11N 15W 23	Contributor
NEG	2006-06-02	2314-2324	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2006-06-03	2201-2211	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2007-03-28	2022-2032	0					38.791290	-123.517890	M 11N 15W 22	Contributor
NEG	2007-03-28	1928-1938	0					38.783990	-123.509120	M 11N 15W 23	Contributor
POS	2007-03-28	1904	1	UU				38.782650	-123.501866	M 11N 15W 23	Quarter-section centroid
NEG	2007-03-29	2054-2104	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2007-04-05	2338-2348	0					38.791290	-123.517890	M 11N 15W 22	Contributor
POS	2007-04-06	1804	2	UMUF	Y			38.784542	-123.504136	M 11N 15W 23	Contributor
NEG	2007-04-07	0127-0137	0					38.783990	-123.509120	M 11N 15W 23	Contributor
NEG	2007-04-25		0					38.783990	-123.509120	M 11N 15W 23	Contributor
NEG	2007-04-25	2146-2156	0					38.791290	-123.517890	M 11N 15W 22	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2008-05-17	2125	0					38.789922	-123.501894	M 11N 15W 23	Quarter-section centroid
NEG	2009-04-06	2038	0					38.789922	-123.501894	M 11N 15W 23	Quarter-section centroid
NEG	2009-04-13	2015	0					38.789922	-123.501894	M 11N 15W 23	Quarter-section centroid
NEG	2011	2400	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2011	2400	0					38.794570	-123.517684	M 11N 15W 15	Contributor
NEG	2011-03-04	2241-2251	0					38.793119	-123.499775	M 11N 15W 23	Contributor
POS	2011-03-06	2047-2100	1	UM				38.786171	-123.508792	M 11N 15W 23	Contributor
POS	2011-04-01	2203-2213	1	UM				38.786171	-123.508792	M 11N 15W 23	Contributor
NEG	2011-05-12	2059-2109	0					38.793119	-123.499775	M 11N 15W 23	Contributor
NEG	2012	2400	0					38.784782	-123.493778	M 11N 15W 24	Contributor
NEG	2012	2400	0					38.794570	-123.517684	M 11N 15W 15	Contributor
NEG	2012	2400	0					38.786171	-123.508792	M 11N 15W 23	Contributor
NEG	2012	2400	0					38.797460	-123.512839	M 11N 15W 14	Contributor
NEG	2012	2400	0					38.790299	-123.509950	M 11N 15W 23	Contributor
NEG	2012	2400	0					38.789150	-123.491524	M 11N 15W 24	Contributor
NEG	2012	2400	0					38.793119	-123.499775	M 11N 15W 23	Contributor
NEG	2012	2400	0					38.783380	-123.516870	M 11N 15W 22	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2013	2400	0					38.793119	-123.499775	M 11N 15W 23	Contributor
NEG	2013	2400	0					38.794570	-123.517684	M 11N 15W 15	Contributor
NEG	2013	2400	0					38.789150	-123.491524	M 11N 15W 24	Contributor
NEG	2013	2400	0					38.783380	-123.516870	M 11N 15W 22	Contributor
NEG	2013	2400	0					38.786171	-123.508792	M 11N 15W 23	Contributor
NEG	2013	2400	0					38.790299	-123.509950	M 11N 15W 23	Contributor
NEG	2013	2400	0					38.797460	-123.512839	M 11N 15W 14	Contributor
NEG	2013	2400	0					38.784782	-123.493778	M 11N 15W 24	Contributor
NEG	2014		0					38.789914	-123.504183	M 11N 15W 23	Activity center
Masterowl: MEN0212 Subspecies: NORTHERN											
POS	1991-04-30	2038	2	UMUF	Y	Y		38.822260	-123.533546	M 11N 15W 10	Contributor
POS	1991-05-08	1015	2	UMUF				38.822985	-123.532630	M 11N 15W 10	Contributor
POS	1991-05-08	1955	2	UUUU				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	1991-05-23		0					38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	1991-05-30	1015	1	UM				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	1991-06-13		0					38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	1991-07-12		0					38.816899	-123.525397	M 11N 15W 10	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	1991-07-17		0					38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	1991-11-12		2	UUUU				38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	1991-11-22		0					38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1992-03-10		1	UU				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1992-03-11		1	UU				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	1992-03-17		0					38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	1992-04-03		1	UM				38.822985	-123.532630	M 11N 15W 10	Contributor
NEG	1992-05-15		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
POS	1992-06-02		2	UMUF	Y		1	38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	1992-06-04		0					38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1992-06-11		2	UMUF	Y		1	38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1992-12-01		1	UM				38.831542	-123.549065	M 11N 15W 04	Quarter-section centroid
POS	1993-02-02	1910	1	UF				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1993-04-28	2049	1	UF				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1993-05-02	0552	2	UMUF				38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	1993-05-13		1	UF				38.815953	-123.532529	M 11N 15W 10	Contributor
POS	1993-05-13	2007	1	UU				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	1993-06-01		2	UMUF	Y		1	38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1993-06-01	1754	2	UMUF				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1993-07-14	1239	2	UMUF	Y	Y	1	38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	1993-11-13	1137	0					38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1994-03-09	1337	2	UMUF	Y			38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	1994-04-14	1645	2	UMUF	Y	Y		38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	1994-05-23		0					38.838332	-123.544209	M 11N 15W 04	Section centroid
POS	1994-06-01		2	UMUF	Y		1	38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	1994-06-08		0					38.838332	-123.544209	M 11N 15W 04	Section centroid
POS	1995-02-10		1	UU				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1995-03-29		1	UU				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1995-04-11	1452	1	UM				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1995-05-10		2	UMUF	Y			38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	1995-07-27		0					38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	1995-08-07		0					38.838332	-123.544209	M 11N 15W 04	Section centroid
NEG	1995-08-29		0					38.838332	-123.544209	M 11N 15W 04	Section centroid
POS	1995-12-07	1905	1	UU				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	1996-02-20		0					38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	1996-03-13	0754	3	UMUF	Y			38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	1996-03-16		0					38.817542	-123.544362	M 11N 15W 09	Section centroid
NEG	1996-03-19		0					38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	1996-03-23		0					38.817542	-123.544362	M 11N 15W 09	Section centroid
NEG	1996-04-02		0					38.838332	-123.544209	M 11N 15W 04	Section centroid
POS	1996-04-10	1423	2	UMUF	Y	Y		38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1996-05-25		2	UMUF	Y			38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	1996-07-10		0					38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	1996-08-26		1	UU				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1996-08-27	1942	1	UU				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1997-02-24		1	UF				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1997-02-25		1	UU				38.831550	-123.539722	M 11N 15W 04	Quarter-section centroid
POS	1997-02-25		1	UF				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	1997-03-03		0					38.838332	-123.544209	M 11N 15W 04	Section centroid
POS	1997-03-12		2	UMUF	Y			38.820370	-123.521080	M 11N 15W 10	Quarter-section centroid
POS	1997-04-11	1453	2	UMUF	Y	Y		38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	1997-05-16		1	UF				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1997-05-28	0931	1	UM				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	1997-07-29		0					38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	1997-11-04	1941	2	UMUF	Y			38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1998-03-03		1	UU				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1998-03-09		2	UMUF	Y			38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	1998-03-10		1	UU				38.831270	-123.525848	M 11N 15W 03	Half-section centroid
POS	1998-03-25		2	UMUF	Y			38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	1998-05-05		0					38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	1998-06-01		0					38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	1998-06-05		0					38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	1998-06-18		2	UMUF	Y			38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	1998-07-28		0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	1999-03-16	1541	0					38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	1999-03-20	1529	0					38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	1999-04-12	1935-2016	1	UM				38.822216	-123.531881	M 11N 15W 10	Contributor
POS	1999-07-21	1800	1	UM				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	2000-03-02	2255	1	UM				38.831403	-123.530458	M 11N 15W 03	Quarter-section centroid
NEG	2000-03-03	2149	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
POS	2000-03-11	1525	2	UMUF	Y			38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	2000-03-23	1920	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2000-03-24	2116	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2000-04-07	2220	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2000-04-14	1300	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2000-04-15	0017	0					38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	2000-04-26	2249	0					38.820370	-123.521080	M 11N 15W 10	Quarter-section centroid
NEG	2000-05-10	1134	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2000-06-07	0150	0					38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	2000-06-28	2244	0					38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	2000-06-28	0006	1	UM				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	2001		2	UMUF	Y	Y		38.822365	-123.530321	M 11N 15W 10	Contributor
NEG	2001-03-10	2231	0					38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	2001-04-01	1800	2	UMUF	Y	Y		38.822629	-123.531706	M 11N 15W 10	Contributor
POS	2001-05-03	0104	1	UM				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
NEG	2001-05-15	0413	0					38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	2001-05-15	2234	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
POS	2001-06-13	2135	1	UM				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	2002-03-04	2209	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
POS	2002-03-05	1545	2	UMUF	Y			38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	2002-03-07	2015	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2002-04-02	0828	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2002-04-08	2358	0					38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	2002-04-09	2355	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2002-04-20	2253	0					38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	2002-04-20	2137	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
POS	2002-04-21	1830	2	UMUF	Y	Y		38.822635	-123.530323	M 11N 15W 10	Contributor
NEG	2003-02-11	1925	0					38.802810	-123.544066	M 11N 15W 16	Section centroid
NEG	2003-03-21	2232	0					38.802810	-123.544066	M 11N 15W 16	Section centroid
POS	2003-03-31	1425-1620	2	UMUF	Y			38.822091	-123.531126	M 11N 15W 10	Contributor
NEG	2003-05-16	0029	0					38.802810	-123.544066	M 11N 15W 16	Section centroid
POS	2003-06-26	0015	2	UMUF	Y			38.830038	-123.529465	M 11N 15W 03	Contributor

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
POS	2004-04-29	1836	2	UMUF	Y	Y		38.824801	-123.529648	M 11N 15W 03	Contributor
POS	2005		1	UF	Y		2	38.822091	-123.531126	M 11N 15W 10	Contributor
POS	2007-05-16	1730	2	UMUF	Y	Y		38.822893	-123.532975	M 11N 15W 10	Contributor
POS	2008-03-23	2024	1	UM				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	2008-05-16	2202	1	UU				38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
AC	2008-05-18	1935	2	AMAF	Y	Y	1	38.824524	-123.531144	M 11N 15W 10	Contributor
POS	2008-05-29	2147	1	UM				38.822176	-123.526173	M 11N 15W 10	Contributor
NEG	2009-04-12	1000	0					38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	2009-04-13	2149	2	AMAF	Y			38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
POS	2010		2	UMUF	Y			38.824524	-123.531144	M 11N 15W 10	Activity center
POS	2011-03-04	1345-1515	2	UMUF	Y			38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	2011-04-04	0900-1030	2	UMUF	Y			38.831270	-123.525848	M 11N 15W 03	Half-section centroid
NEG	2012	2400	0					38.813749	-123.531468	M 11N 15W 10	Contributor
NEG	2012	2400	0					38.814692	-123.524189	M 11N 15W 10	Contributor
POS	2012-04-01	0730-0830	2	UMUF	Y			38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	2012-07-02	0310-0320	1	UM				38.823622	-123.528679	M 11N 15W 10	Contributor
NEG	2013	2400	0					38.813749	-123.531468	M 11N 15W 10	Contributor

310

311

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
NEG	2013	2400	0					38.814692	-123.524189	M 11N 15W 10	Contributor
POS	2013-05-26	1100-1300	1	UM				38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	2013-07-09	0800-0830	1	UM				38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	2014		2	UMUF	Y			38.824524	-123.531144	M 11N 15W 10	Activity center
POS	2015-03-26	2218	1	UF				38.830587	-123.541106	M 11N 15W 04	Contributor
Masterowl: MEN0213 Subspecies: NORTHERN											
POS	1991-05-30	0947	1	UM				38.842202	-123.527703	M 11N 15W 03	Contributor
POS	1991-06-01		1	UM				38.831137	-123.521250	M 11N 15W 03	Quarter-section centroid
POS	1992		1	UM				38.838872	-123.526699	M 11N 15W 03	Contributor
NEG	1992-03-17		0					38.838219	-123.525692	M 11N 15W 03	Section centroid
POS	1992-04-03		1	UM				38.838219	-123.525692	M 11N 15W 03	Section centroid
POS	1992-12-01		1	UM				38.845070	-123.520994	M 11N 15W 03	Quarter-section centroid
POS	1992-12-15		1	UM				38.838306	-123.530347	M 11N 15W 03	Half-section centroid
POS	1994-04-14	2043	1	UU				38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	1994-06-01		0					38.838332	-123.544209	M 11N 15W 04	Section centroid
POS	1997		1	UM			0	38.831550	-123.539722	M 11N 15W 04	Quarter-section centroid
POS	1997-07-02	0900	1	UU				38.845248	-123.539445	M 11N 15W 04	Quarter-section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	1997-07-18	0900	1	UM				38.836544	-123.543216	M 11N 15W 04	Contributor
POS	1997-10-01	1100	1	UU				38.845248	-123.539445	M 11N 15W 04	Quarter-section centroid
NEG	1997-11-04	2005	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
POS	1998		2	UMUF	Y			38.845773	-123.535104	M 11N 15W 04	Contributor
NEG	1998-03-09		0					38.838332	-123.544209	M 11N 15W 04	Section centroid
NEG	1998-04-01		0					38.838332	-123.544209	M 11N 15W 04	Section centroid
NEG	1998-07-28		0					38.838219	-123.525692	M 11N 15W 03	Section centroid
POS	1999		2	UMUF	Y	Y		38.844061	-123.536878	M 11N 15W 04	Contributor
POS	1999-04-28	1445	1	UM		Y		38.845248	-123.539445	M 11N 15W 04	Quarter-section centroid
NEG	2000		0					38.845401	-123.537464	M 11N 15W 04	Activity center
POS	2000-03-01	2326	1	UU				38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2000-03-03	2149	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2000-03-23	1920	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2000-03-24	2116	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2000-04-07	2220	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2000-06-28	2231	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2001-03-15	1200	0					38.845070	-123.520994	M 11N 15W 03	Quarter-section centroid

3-2

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
NEG	2001-04-12	1200	0					38.845070	-123.520994	M 11N 15W 03	Quarter-section centroid
NEG	2001-04-17	1200	0					38.845070	-123.520994	M 11N 15W 03	Quarter-section centroid
POS	2001-04-17	2035	1	UM				38.844654	-123.537297	M 11N 15W 04	Contributor
POS	2001-04-18	1200	2	UMUF	Y	Y		38.842714	-123.537916	M 11N 15W 04	Contributor
NEG	2001-05-23	1200	0					38.845070	-123.520994	M 11N 15W 03	Quarter-section centroid
POS	2001-06-04	2148	1	UM				38.844760	-123.537874	M 11N 15W 04	Contributor
POS	2001-06-04	1200	1	UM				38.845070	-123.520994	M 11N 15W 03	Quarter-section centroid
NEG	2002		0					38.845070	-123.520994	M 11N 15W 03	Quarter-section centroid
NEG	2002-05-08	1200	0					38.838332	-123.544209	M 11N 15W 04	Section centroid
POS	2002-05-28	1200	1	UU				38.846207	-123.534670	M 11N 15W 03	Contributor
POS	2002-05-28	2344	1	UF				38.852767	-123.526836	M 12N 15W 33	Contributor
POS	2002-06-04		1	UF				38.845149	-123.535434	M 11N 15W 04	Contributor
POS	2002-07-25	2053	1	UU				38.856064	-123.529027	M 12N 15W 33	Contributor
NEG	2003-05-23	1200	0					38.845401	-123.537464	M 11N 15W 04	Activity center
NEG	2003-07-10	1200	0					38.845401	-123.537464	M 11N 15W 04	Activity center
POS	2003-07-10	2132	1	UF				38.846954	-123.530826	M 11N 15W 03	Contributor
POS	2003-07-30	1200	1	UU				38.846380	-123.534337	M 11N 15W 03	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2004-03-04	2400	0					38.845401	-123.537464	M 11N 15W 04	Activity center
AC	2004-05-13	2400	2	UMUF	Y	Y		38.845401	-123.537464	M 11N 15W 04	Contributor
POS	2004-06-28	2211	1	UU				38.855122	-123.524041	M 12N 15W 33	Contributor
POS	2004-07-06	2400	1	UF		Y	2	38.845736	-123.537294	M 11N 15W 04	Contributor
POS	2005-03-29	2400	1	AU			0	38.845248	-123.539445	M 11N 15W 04	Quarter-section centroid
NEG	2005-04-20	2400	0					38.845209	-123.530237	M 11N 15W 03	Quarter-section centroid
NEG	2005-05-02	2400	0					38.845209	-123.530237	M 11N 15W 03	Quarter-section centroid
POS	2005-05-02	2400	2	UMUF	Y	N	0	38.845637	-123.537062	M 11N 15W 04	Contributor
NEG	2005-06-09	2400	0					38.845248	-123.539445	M 11N 15W 04	Quarter-section centroid
POS	2005-06-09	2210	1	UU				38.839887	-123.529506	M 11N 15W 03	Contributor
POS	2005-06-14	2400	1	UU		N	0	38.845783	-123.536798	M 11N 15W 04	Contributor
NEG	2005-07-21	2400	0					38.845209	-123.530237	M 11N 15W 03	Quarter-section centroid
NEG	2005-07-26	2400	0					38.845248	-123.539445	M 11N 15W 04	Quarter-section centroid
POS	2005-08-23	2212	1	UM				38.845052	-123.537012	M 11N 15W 04	Contributor
POS	2005-08-24	2400	1	AM				38.843047	-123.540039	M 11N 15W 04	Contributor
POS	2006		2	AMAF	Y			38.846079	-123.537089	M 11N 15W 04	Contributor
NEG	2006-05-04		0					38.845209	-123.530237	M 11N 15W 03	Quarter-section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	2006-05-04	2150	1	UF				38.843925	-123.541106	M 11N 15W 04	Contributor
POS	2006-05-04	2200	1	UF				38.843775	-123.538327	M 11N 15W 04	Contributor
POS	2006-06-14		1	AU		N		38.846079	-123.537089	M 11N 15W 04	Contributor
NEG	2006-07-19		0					38.845209	-123.530237	M 11N 15W 03	Quarter-section centroid
NEG	2006-07-27		0					38.845209	-123.530237	M 11N 15W 03	Quarter-section centroid
POS	2007-03-20	1950	2	UMUF	Y			38.844931	-123.535789	M 11N 15W 04	Contributor
POS	2007-03-29	2350	1	UM				38.831137	-123.521250	M 11N 15W 03	Quarter-section centroid
POS	2007-04-03	2124	1	UU				38.840791	-123.540621	M 11N 15W 04	Contributor
POS	2007-04-03	2023	1	UU				38.844954	-123.552314	M 11N 15W 04	Contributor
POS	2007-04-05	1900	1	UM				38.831137	-123.521250	M 11N 15W 03	Quarter-section centroid
POS	2007-04-10	1200	1	UM		N		38.845469	-123.536462	M 11N 15W 04	Contributor
POS	2007-04-10	2147	1	UM				38.838729	-123.540375	M 11N 15W 04	Contributor
POS	2007-04-10	2126	1	UM				38.839965	-123.541836	M 11N 15W 04	Contributor
POS	2007-04-18	2128	1	UU				38.840741	-123.539860	M 11N 15W 04	Contributor
NEG	2007-05-30	1200	0					38.844667	-123.501736	M 11N 15W 02	Quarter-section centroid
NEG	2007-06-06	1200	0					38.845248	-123.539445	M 11N 15W 04	Quarter-section centroid
NEG	2008		0					38.845401	-123.537464	M 11N 15W 04	Activity center

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
NEG	2008-03-19		0					38.845401	-123.537464	M 11N 15W 04	Activity center
POS	2008-03-19	2159	1	UU				38.849356	-123.533760	M 11N 15W 03	Contributor
NEG	2008-03-25		0					38.845401	-123.537464	M 11N 15W 04	Activity center
NEG	2008-03-31		0					38.845401	-123.537464	M 11N 15W 04	Activity center
NEG	2008-05-16		0					38.845401	-123.537464	M 11N 15W 04	Activity center
NEG	2008-06-18		0					38.845401	-123.537464	M 11N 15W 04	Activity center
POS	2010-05-31		2	UMUF	Y		0	38.845311	-123.537371	M 11N 15W 04	Contributor
POS	2011-05-09		2	UMUF	Y			38.845475	-123.537084	M 11N 15W 04	Contributor
POS	2011-07-25		1	UM				38.845205	-123.536920	M 11N 15W 04	Contributor
POS	2012-05-13	2114	1	UF				38.849265	-123.532452	M 11N 15W 03	Contributor
POS	2012-05-13		2	UMUF	Y		0	38.846820	-123.536425	M 11N 15W 04	Contributor
POS	2012-06-12		1	UM				38.845629	-123.534769	M 11N 15W 03	Contributor
POS	2012-06-17	2350	1	UM				38.840220	-123.524918	M 11N 15W 03	Contributor
POS	2012-06-17	2247	1	UF				38.850695	-123.539602	M 11N 15W 04	Contributor
POS	2012-06-17	0010	1	UM				38.847502	-123.535546	M 11N 15W 04	Contributor
POS	2012-07-15	2212	1	UM				38.843588	-123.548821	M 11N 15W 04	Contributor
POS	2012-07-15	2205	1	UM				38.844806	-123.550597	M 11N 15W 04	Contributor

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
POS	2012-07-15	0019	1	UM				38.844680	-123.535522	M 11N 15W 04	Contributor
POS	2012-07-15	2331	1	UF				38.847935	-123.526014	M 11N 15W 03	Contributor
POS	2012-07-15	2114	1	UM				38.844871	-123.557263	M 11N 15W 05	Contributor
POS	2013		2	UMUF	Y			38.846232	-123.537171	M 11N 15W 04	Contributor
POS	2013-04-22	2034	2	UMUF	Y			38.844760	-123.537874	M 11N 15W 04	Contributor
POS	2013-04-22	2331	1	UM				38.849364	-123.535961	M 11N 15W 04	Contributor
POS	2013-04-22	2333	1	UF				38.847895	-123.530177	M 11N 15W 03	Contributor
NEG	2013-05-01	1200	0					38.845401	-123.537464	M 11N 15W 04	Activity center
POS	2013-05-26	0041	1	UU				38.845352	-123.538385	M 11N 15W 04	Contributor
POS	2013-05-26	0106	1	UM				38.849487	-123.552153	M 11N 15W 04	Contributor
POS	2013-05-28	1200	1	UF		N		38.846232	-123.537171	M 11N 15W 04	Contributor
NEG	2013-05-28	1200	0					38.845268	-123.548592	M 11N 15W 04	Quarter-section centroid
NEG	2013-07-17	1200	0					38.845268	-123.548592	M 11N 15W 04	Quarter-section centroid
POS	2013-08-01	1200	1	UM		N		38.845242	-123.536829	M 11N 15W 04	Contributor
POS	2013-08-07	1200	1	UM				38.844884	-123.536400	M 11N 15W 04	Contributor
NEG	2014-03-07	1200	0					38.845248	-123.539445	M 11N 15W 04	Quarter-section centroid
POS	2014-04-08	2108	1	UM				38.846227	-123.526256	M 11N 15W 03	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	2014-04-08	2015	1	UU				38.839883	-123.541891	M 11N 15W 04	Contributor
POS	2014-05-02	1200	1	UM		N		38.844784	-123.536328	M 11N 15W 04	Contributor
POS	2014-05-02	2054	1	UM				38.844729	-123.532778	M 11N 15W 03	Contributor
POS	2014-05-13	2156	1	UM				38.846276	-123.543011	M 11N 15W 04	Contributor
POS	2014-05-14	2214	1	UF				38.843029	-123.543678	M 11N 15W 04	Contributor
NEG	2014-07-30	1200	0					38.845268	-123.548592	M 11N 15W 04	Quarter-section centroid
POS	2015-05-21	1200	2	UMUF	Y	N		38.845587	-123.536207	M 11N 15W 04	Contributor
POS	2015-07-30	1200	1	UU		N		38.845451	-123.536321	M 11N 15W 04	Contributor
NEG	2015-10-13	1200	0					38.838991	-123.545825	M 11N 15W 04	Contributor
NEG	2016-04-20	1200	0					38.845401	-123.537464	M 11N 15W 04	Activity center
NEG	2016-04-27	1200	0					38.845244	-123.539443	M 11N 15W 04	Quarter-section centroid
NEG	2016-06-09	1200	0					38.845401	-123.537464	M 11N 15W 04	Activity center
NEG	2016-07-08	1200	0					38.845401	-123.537464	M 11N 15W 04	Activity center
Masterowl: MEN0214 Subspecies: NORTHERN											
NEG	1991-05-23		0					38.837447	-123.506536	M 11N 15W 02	Section centroid
POS	1991-06-02	0015	1	UM				38.835165	-123.509101	M 11N 15W 02	Contributor
NEG	1991-06-13		0					38.837447	-123.506536	M 11N 15W 02	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	1991-06-18		0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	1991-07-12		0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	1991-07-12		0					38.837447	-123.506536	M 11N 15W 02	Section centroid
POS	1992-12-15		1	UM				38.837749	-123.511551	M 11N 15W 02	Half-section centroid
POS	1994-03-09	1521	2	UMUF	Y			38.844887	-123.511463	M 11N 15W 02	Quarter-section centroid
NEG	1994-08-01		0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	1995-05-17		0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	1995-05-30		0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	1996-03-13	2220	0					38.830228	-123.506646	M 11N 15W 02	Half-section centroid
NEG	1997-04-11	1355	0					38.837749	-123.511551	M 11N 15W 02	Half-section centroid
POS	1997-05-17	1943	1	UU				38.830603	-123.511626	M 11N 15W 02	Quarter-section centroid
NEG	1998-01-21		0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	1998-04-14		0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	1998-04-30		0					38.837447	-123.506536	M 11N 15W 02	Section centroid
POS	1998-04-30		1	UU				38.831137	-123.521250	M 11N 15W 03	Quarter-section centroid
NEG	1998-05-05		0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	1998-07-28		0					38.838219	-123.525692	M 11N 15W 03	Section centroid

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
POS	1999-06-02	1904-1945	2	UMUF	Y			38.835396	-123.518090	M 11N 15W 03	Contributor
POS	1999-06-02	1748	2	UMUF	Y			38.832960	-123.518763	M 11N 15W 03	Contributor
NEG	2000-03-01	2222	0					38.837447	-123.506536	M 11N 15W 02	Section centroid
POS	2000-03-02	2255	1	UM				38.831137	-123.521250	M 11N 15W 03	Quarter-section centroid
NEG	2000-03-04		0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2000-03-11	0938	0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	2000-03-14	1740	0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	2000-03-23	1920	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2000-03-24	2116	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2000-04-04	2155	0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	2000-04-07	2220	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2000-04-14	2323	0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	2000-04-14	1300	0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	2000-06-28	2219	0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	2000-06-29	0025	0					38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	2001-03-13	2003	0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	2001-04-03	1745	0					38.838219	-123.525692	M 11N 15W 03	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	2001-04-17	2105	1	UU				38.839803	-123.515829	M 11N 15W 02	Contributor
NEG	2001-05-09	2202	0					38.837447	-123.506536	M 11N 15W 02	Section centroid
NEG	2001-05-15	2306	0					38.837447	-123.506536	M 11N 15W 02	Section centroid
POS	2001-05-22	2155	1	UU				38.838001	-123.515816	M 11N 15W 02	Contributor
NEG	2002		0					38.835396	-123.518090	M 11N 15W 03	Activity center
NEG	2002-03-05	1230	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
POS	2002-04-09	2130	1	UM				38.829862	-123.501667	M 11N 15W 02	Quarter-section centroid
POS	2002-04-21	2219	1	UF				38.829862	-123.501667	M 11N 15W 02	Quarter-section centroid
POS	2002-04-21	2338	1	UM				38.831137	-123.521250	M 11N 15W 03	Quarter-section centroid
NEG	2002-07-02	1200	0					38.835396	-123.518090	M 11N 15W 03	Activity center
NEG	2004-05-13	2400	0					38.835396	-123.518090	M 11N 15W 03	Activity center
NEG	2005-04-20	2400	0					38.831137	-123.521250	M 11N 15W 03	Quarter-section centroid
POS	2005-08-17	2041	1	UF				38.840283	-123.515302	M 11N 15W 02	Contributor
POS	2007-03-29	2350	2	UMUF				38.835396	-123.518090	M 11N 15W 03	Contributor
POS	2007-03-30	1940	1	UM				38.831137	-123.521250	M 11N 15W 03	Quarter-section centroid
POS	2007-04-05	1900	1	UM				38.831137	-123.521250	M 11N 15W 03	Quarter-section centroid
POS	2008-05-16	2137	1	UU				38.831137	-123.521250	M 11N 15W 03	Quarter-section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
AC	2012		2	UMUF	Y			38.835599	-123.518932	M 11N 15W 03	Contributor
POS	2012-05-06	2221	1	UM				38.834236	-123.519503	M 11N 15W 03	Contributor
POS	2012-06-17	2328	1	UM				38.836896	-123.519163	M 11N 15W 03	Contributor
POS	2012-06-17	2306	1	UF				38.843322	-123.514889	M 11N 15W 02	Contributor
NEG	2012-06-18		0					38.844890	-123.511468	M 11N 15W 02	Quarter-section centroid
NEG	2013-07-04	1200	0					38.831137	-123.521250	M 11N 15W 03	Quarter-section centroid
POS	2013-07-09	0915-1000	1	UM				38.831137	-123.521250	M 11N 15W 03	Quarter-section centroid
POS	2014		1	UU				38.835599	-123.518932	M 11N 15W 03	Activity center
Masterowl: MEN0371 Subspecies: NORTHERN											
POS	1990-08-07		2	UMUF	Y		1	38.792521	-123.513749	M 11N 15W 23	Contributor
NEG	1991-02-22		0					38.797442	-123.511389	M 11N 15W 14	Quarter-section centroid
NEG	1991-04-30		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
NEG	1991-05-15		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
NEG	1991-05-23		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
NEG	1991-06-11		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
NEG	1991-06-13		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
NEG	1991-06-18		0					38.800879	-123.506508	M 11N 15W 14	Section centroid

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
NEG	1991-07-01		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
NEG	1991-07-09		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
NEG	1991-07-12		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
POS	1991-07-17		1	UU				38.800879	-123.506508	M 11N 15W 14	Section centroid
POS	1991-07-23		1	UU				38.800879	-123.506508	M 11N 15W 14	Section centroid
POS	1991-11-10		2	UMUF				38.800879	-123.506508	M 11N 15W 14	Section centroid
POS	1992-03-12		1	UU				38.804698	-123.511084	M 11N 15W 14	Quarter-section centroid
POS	1992-03-26		1	UU				38.810326	-123.501553	M 11N 15W 11	Contributor
POS	1992-03-26		1	UU				38.804698	-123.511084	M 11N 15W 14	Quarter-section centroid
POS	1992-04-22		1	UU				38.800879	-123.506508	M 11N 15W 14	Section centroid
NEG	1992-04-27		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
POS	1992-06-04		1	UU				38.800879	-123.506508	M 11N 15W 14	Section centroid
POS	1993-03-22		1	UU				38.797442	-123.511389	M 11N 15W 14	Quarter-section centroid
POS	1993-03-22	2120	1	UU				38.797442	-123.511389	M 11N 15W 14	Quarter-section centroid
POS	1993-05-13	2228	1	UM				38.801074	-123.511231	M 11N 15W 14	Half-section centroid
POS	1993-05-13		1	UM				38.799460	-123.513569	M 11N 15W 14	Contributor
NEG	1993-05-18		0					38.800879	-123.506508	M 11N 15W 14	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	1993-06-02	1200	2	UMUF	Y			38.804698	-123.511084	M 11N 15W 14	Quarter-section centroid
POS	1993-06-03		2	UMUF	Y			38.804698	-123.511084	M 11N 15W 14	Quarter-section centroid
POS	1993-06-04	1719	2	UMUF				38.804698	-123.511084	M 11N 15W 14	Quarter-section centroid
POS	1993-06-09		2	UMUF	Y			38.804698	-123.511084	M 11N 15W 14	Quarter-section centroid
NEG	1994-03-22		0					38.786442	-123.506602	M 11N 15W 23	Section centroid
NEG	1994-04-28		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
NEG	1994-08-01		0					38.815693	-123.506613	M 11N 15W 11	Section centroid
POS	1994-08-12		1	UU				38.819315	-123.506800	M 11N 15W 11	Contributor
NEG	1995-04-02		0					38.786442	-123.506602	M 11N 15W 23	Section centroid
NEG	1995-04-11		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
NEG	1995-04-11		0					38.815693	-123.506613	M 11N 15W 11	Section centroid
NEG	1995-05-09		0					38.786442	-123.506602	M 11N 15W 23	Section centroid
NEG	1995-05-17		0					38.815693	-123.506613	M 11N 15W 11	Section centroid
NEG	1995-05-30		0					38.815693	-123.506613	M 11N 15W 11	Section centroid
NEG	1995-08-02		0					38.786442	-123.506602	M 11N 15W 23	Section centroid
NEG	1996-03-13	2205	0					38.815693	-123.506613	M 11N 15W 11	Section centroid
POS	1996-03-19		2	UMUF	Y			38.812150	-123.511160	M 11N 15W 11	Quarter-section centroid

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
POS	1996-03-19		1	UU				38.812150	-123.511160	M 11N 15W 11	Quarter-section centroid
POS	1996-03-20		3	UMUF	Y			38.812150	-123.511160	M 11N 15W 11	Quarter-section centroid
NEG	1996-05-12		0					38.815693	-123.506613	M 11N 15W 11	Section centroid
NEG	1996-05-25		0					38.815693	-123.506613	M 11N 15W 11	Section centroid
POS	1996-07-05		1	UU				38.797815	-123.520904	M 11N 15W 15	Quarter-section centroid
POS	1996-07-05		1	UU				38.805323	-123.520509	M 11N 15W 15	Quarter-section centroid
POS	1996-07-06	1200	1	UU				38.805323	-123.520509	M 11N 15W 15	Quarter-section centroid
NEG	1996-07-06		0					38.812150	-123.511160	M 11N 15W 11	Quarter-section centroid
NEG	1996-07-12		0					38.786442	-123.506602	M 11N 15W 23	Section centroid
POS	1996-07-18		1	UU	Y			38.804698	-123.511084	M 11N 15W 14	Quarter-section centroid
POS	1996-07-18		1	UU	Y			38.797442	-123.511389	M 11N 15W 14	Quarter-section centroid
NEG	1996-08-07		0					38.815693	-123.506613	M 11N 15W 11	Section centroid
NEG	1996-08-23		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
POS	1996-08-27		2	UMUF	Y			38.805323	-123.520509	M 11N 15W 15	Quarter-section centroid
POS	1996-08-27	2025	2	UMUF	Y			38.797442	-123.511389	M 11N 15W 14	Quarter-section centroid
NEG	1997-02-24		0					38.809983	-123.518251	M 11N 15W 10	Activity center
NEG	1997-03-31		0					38.800879	-123.506508	M 11N 15W 14	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	1997-04-29		1	UU				38.805323	-123.520509	M 11N 15W 15	Quarter-section centroid
NEG	1997-04-30		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
NEG	1997-07-29		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
NEG	1998-03-03		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
NEG	1998-04-07		0					38.815693	-123.506613	M 11N 15W 11	Section centroid
POS	1998-04-07		1	UU				38.805323	-123.520509	M 11N 15W 15	Quarter-section centroid
POS	1998-04-14		2	UMUF	Y			38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
NEG	1998-04-14		0					38.815693	-123.506613	M 11N 15W 11	Section centroid
NEG	1998-04-20		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
POS	1998-04-20		2	UMUF	Y			38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
NEG	1998-05-05		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
POS	1998-05-08		1	UU				38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
NEG	1998-05-17		0					38.801922	-123.525471	M 11N 15W 15	Section centroid
NEG	1998-06-02		0					38.786442	-123.506602	M 11N 15W 23	Section centroid
NEG	1998-06-05		0					38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	1998-06-18		0					38.800879	-123.506508	M 11N 15W 14	Section centroid
NEG	1998-07-28		0					38.800879	-123.506508	M 11N 15W 14	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	1999-03-20	1609	2	UMUF	Y	Y		38.810610	-123.519062	M 11N 15W 10	Contributor
NEG	2000-03-02	2219	0					38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
POS	2000-03-05	1038	2	UMUF	Y			38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
NEG	2000-04-26	2303	0					38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	2000-04-26	2114	0					38.802810	-123.544066	M 11N 15W 16	Section centroid
NEG	2000-06-07	0150	0					38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	2000-06-28	2219	0					38.820896	-123.530391	M 11N 15W 10	Quarter-section centroid
NEG	2001-03-10	2231	0					38.800879	-123.506508	M 11N 15W 14	Section centroid
POS	2001-03-10	1645	1	UU				38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
NEG	2001-03-14	1907	0					38.802810	-123.544066	M 11N 15W 16	Section centroid
POS	2001-05-03	0137	1	UM				38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
POS	2001-05-08	1630	1	UU				38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
NEG	2001-05-15	2234	0					38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	2001-05-25	0050	1	UM				38.797150	-123.501841	M 11N 15W 14	Quarter-section centroid
POS	2001-06-26	1830	2	UMUF	Y			38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
POS	2002-03-06	1500	2	UMUF	Y			38.805323	-123.520509	M 11N 15W 15	Quarter-section centroid
POS	2002-04-09	1755	2	UMUF	Y			38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
POS	2002-04-21	0029	1	UM				38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
POS	2002-04-21	1350	1	UM				38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
POS	2002-04-21	0014	1	UM				38.801822	-123.522796	M 11N 15W 15	Contributor
POS	2002-05-02	1515	2	UMUF	Y			38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
NEG	2003-03-07	1924	0					38.802810	-123.544066	M 11N 15W 16	Section centroid
POS	2003-03-09	1651	1	UF				38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
NEG	2003-04-02	2014	0					38.802810	-123.544066	M 11N 15W 16	Section centroid
AC	2003-04-13	1230	2	UMUF	Y	Y		38.806553	-123.517364	M 11N 15W 15	Contributor
POS	2004-04-29	1704	2	UMUF	Y			38.807014	-123.517078	M 11N 15W 15	Contributor
NEG	2005		0					38.806553	-123.517364	M 11N 15W 15	Activity center
POS	2006		1	UM				38.806553	-123.517364	M 11N 15W 15	Activity center
POS	2007-04-05	1715	1	UM				38.805323	-123.520509	M 11N 15W 15	Quarter-section centroid
POS	2007-04-07	1539	2	UMUF	Y	N		38.807014	-123.517078	M 11N 15W 15	Contributor
POS	2007-05-17	1930	2	UMUF	Y	N		38.805323	-123.520509	M 11N 15W 15	Quarter-section centroid
POS	2008-03-23	1926	1	AM				38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
POS	2008-03-30	1825	2	AMAF	Y			38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
POS	2008-05-18	1930	2	AMAF	Y			38.809983	-123.518251	M 11N 15W 10	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2009-04-12	1100	0					38.812793	-123.520552	M 11N 15W 10	Quarter-section centroid
POS	2010		1	UM				38.806553	-123.517364	M 11N 15W 15	Activity center
NEG	2011	2400	0					38.802262	-123.504678	M 11N 15W 14	Contributor
NEG	2011	2400	0					38.794570	-123.517684	M 11N 15W 15	Contributor
NEG	2011	2400	0					38.801984	-123.525606	M 11N 15W 15	Section centroid
NEG	2011	2400	0					38.800558	-123.500457	M 11N 15W 14	Contributor
POS	2011-03-04	1700-1730	2	UMUF	Y			38.815693	-123.506613	M 11N 15W 11	Section centroid
POS	2011-03-06	2319-2329	1	UM				38.801984	-123.525606	M 11N 15W 15	Section centroid
NEG	2011-04-01	2030-2040	0					38.801984	-123.525606	M 11N 15W 15	Section centroid
POS	2011-04-03	0945-1050	1	UM				38.801922	-123.525471	M 11N 15W 15	Section centroid
POS	2011-05-16	2000-2014	1	UM				38.801984	-123.525606	M 11N 15W 15	Section centroid
NEG	2012	2400	0					38.813749	-123.531468	M 11N 15W 10	Contributor
NEG	2012	2400	0					38.797460	-123.512839	M 11N 15W 14	Contributor
NEG	2012	2400	0					38.802262	-123.504678	M 11N 15W 14	Contributor
NEG	2012	2400	0					38.801984	-123.525606	M 11N 15W 15	Section centroid
NEG	2012	2400	0					38.794570	-123.517684	M 11N 15W 15	Contributor
NEG	2012	2400	0					38.814692	-123.524189	M 11N 15W 10	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2012	2400	0					38.801984	-123.525606	M 11N 15W 15	Section centroid
POS	2012-03-08	1000-1130	1	UF				38.816899	-123.525397	M 11N 15W 10	Section centroid
NEG	2012-04-28	1800-1900	0					38.801922	-123.525471	M 11N 15W 15	Section centroid
NEG	2013	2400	0					38.813749	-123.531468	M 11N 15W 10	Contributor
NEG	2013	2400	0					38.807437	-123.497538	M 11N 15W 14	Contributor
NEG	2013	2400	0					38.802262	-123.504678	M 11N 15W 14	Contributor
NEG	2013	2400	0					38.814692	-123.524189	M 11N 15W 10	Contributor
NEG	2013	2400	0					38.801984	-123.525606	M 11N 15W 15	Section centroid
NEG	2013	2400	0					38.797460	-123.512839	M 11N 15W 14	Contributor
NEG	2013	2400	0					38.794570	-123.517684	M 11N 15W 15	Contributor
NEG	2013	2400	0					38.801984	-123.525606	M 11N 15W 15	Section centroid
NEG	2013-03-07	2254-2304	0					38.808257	-123.522569	M 11N 15W 15	Contributor
POS	2013-03-07	2237-2250	2	UMUF	Y			38.805303	-123.515347	M 11N 15W 14	Contributor
NEG	2013-03-08	1545-1700	0					38.816899	-123.525397	M 11N 15W 10	Section centroid
POS	2014		1	UF				38.806553	-123.517364	M 11N 15W 15	Activity center
Masterowl: MEN0383 Subspecies: NORTHERN											
POS	1993		1	UM				38.861206	-123.549397	M 12N 15W 32	Contributor

133

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
POS	1993-02-15	1715	1	UM				38.859662	-123.553822	M 12N 15W 32	Half-section centroid
POS	1993-04-28	1805	1	UM				38.861625	-123.556085	M 12N 15W 32	Contributor
POS	1994-03-15	0845	2	UMUF	Y			38.863393	-123.553897	M 12N 15W 32	Quarter-section centroid
POS	1994-06-01	2021	2	UMUF	Y			38.859648	-123.549189	M 12N 15W 32	Section centroid
POS	1994-06-02	1620	2	UMUF	Y			38.859648	-123.549189	M 12N 15W 32	Section centroid
NEG	1995		0					38.862884	-123.552799	M 12N 15W 32	Activity center
POS	1997		1	AU			0	38.863393	-123.553897	M 12N 15W 32	Quarter-section centroid
POS	1997-06-23	2400	1	UU				38.855903	-123.544481	M 12N 15W 32	Quarter-section centroid
POS	1997-07-15	1101	2	UMUF	Y			38.860188	-123.555037	M 12N 15W 32	Contributor
POS	2000		2	UMUF	Y	Y	1	38.863040	-123.554264	M 12N 15W 32	Contributor
POS	2001		2	UMUF	Y	N		38.858261	-123.547184	M 12N 15W 32	Contributor
POS	2001-05-23	1200	2	UMUF	Y	N		38.858261	-123.547184	M 12N 15W 32	Contributor
POS	2002		2	UMUF	Y	N		38.863052	-123.553618	M 12N 15W 32	Contributor
NEG	2002-05-06	1200	0					38.862884	-123.552799	M 12N 15W 32	Activity center
NEG	2002-05-08	1200	0					38.862884	-123.552799	M 12N 15W 32	Activity center
POS	2002-06-27	1200	1	UU				38.863052	-123.553618	M 12N 15W 32	Contributor
POS	2002-07-02	2048	1	UU				38.861204	-123.553719	M 12N 15W 32	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	2002-07-08	1200	2	UMUF	Y	N		38.863052	-123.553618	M 12N 15W 32	Contributor
POS	2002-07-29	1200	2	UMUF	Y	N		38.863052	-123.553618	M 12N 15W 32	Contributor
POS	2003-05-21	2049	1	UU				38.863033	-123.553814	M 12N 15W 32	Contributor
POS	2003-05-22	1200	2	UMUF	Y	N		38.863050	-123.554045	M 12N 15W 32	Contributor
POS	2003-05-22	2152	1	UM				38.859370	-123.527357	M 12N 15W 33	Contributor
POS	2003-07-09	1200	1	UM		N		38.863249	-123.553758	M 12N 15W 32	Contributor
POS	2003-07-22	2209	1	UU				38.855217	-123.537042	M 12N 15W 33	Contributor
NEG	2004-04-05	2400	0					38.862884	-123.552799	M 12N 15W 32	Activity center
NEG	2004-04-20	2400	0					38.862884	-123.552799	M 12N 15W 32	Activity center
NEG	2004-04-26	2400	0					38.862884	-123.552799	M 12N 15W 32	Activity center
NEG	2004-05-17	2400	0					38.862884	-123.552799	M 12N 15W 32	Activity center
NEG	2004-05-19	2400	0					38.862884	-123.552799	M 12N 15W 32	Activity center
POS	2004-06-01	2116	1	UU				38.862214	-123.551514	M 12N 15W 32	Contributor
POS	2004-06-01	2104	1	UU				38.860719	-123.551456	M 12N 15W 32	Contributor
POS	2004-06-01	2150	1	UU				38.861696	-123.548801	M 12N 15W 32	Contributor
POS	2004-06-02	2400	2	UMUF	Y	N	0	38.862911	-123.552822	M 12N 15W 32	Contributor
POS	2004-06-28	2400	1	UU				38.863257	-123.554023	M 12N 15W 32	Contributor

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
POS	2004-07-21	2400	1	UU		N	0	38.863257	-123.554023	M 12N 15W 32	Contributor
POS	2005-04-20	2400	1	UM				38.862878	-123.554147	M 12N 15W 32	Contributor
POS	2005-06-02	2400	2	UMUF	Y		2	38.862464	-123.553948	M 12N 15W 32	Contributor
POS	2005-07-21	2400	2	UMUF	Y		1	38.863117	-123.553112	M 12N 15W 32	Contributor
POS	2005-08-23	2400	2	UMUF	Y		1	38.862540	-123.553096	M 12N 15W 32	Contributor
POS	2006		1	UU				38.862464	-123.553948	M 12N 15W 32	Contributor
NEG	2006-05-04		0					38.863393	-123.553897	M 12N 15W 32	Quarter-section centroid
POS	2006-06-14		1	SU		N		38.862464	-123.553948	M 12N 15W 32	Contributor
POS	2007-04-10	2101	1	UU				38.861154	-123.550883	M 12N 15W 32	Contributor
POS	2007-04-18	2200	1	UU				38.856171	-123.558532	M 12N 15W 31	Contributor
POS	2007-06-07	1200	2	UMUF	Y	N		38.862797	-123.554100	M 12N 15W 32	Contributor
AC	2008		2	UMUF	Y	Y	1	38.862884	-123.552799	M 12N 15W 32	Contributor
POS	2008-03-11	2058	1	UM				38.860559	-123.550856	M 12N 15W 32	Contributor
POS	2008-04-16		1	UM				38.862740	-123.552901	M 12N 15W 32	Contributor
POS	2008-05-28		2	UMUF	Y			38.863014	-123.553987	M 12N 15W 32	Contributor
POS	2008-07-10		2	UMUF	Y		1	38.862884	-123.552799	M 12N 15W 32	Contributor
POS	2008-08-12		1	UF		Y	1	38.862881	-123.555369	M 12N 15W 32	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2010-06-24		0					38.855901	-123.544482	M 12N 15W 32	Quarter-section centroid
NEG	2011-06-08		0					38.862884	-123.552799	M 12N 15W 32	Activity center
NEG	2011-07-25		0					38.862884	-123.552799	M 12N 15W 32	Activity center
POS	2012-05-13	2231	1	UU				38.865040	-123.543631	M 12N 15W 32	Contributor
NEG	2012-06-09		0					38.862884	-123.552799	M 12N 15W 32	Activity center
NEG	2012-07-09		0					38.863396	-123.553895	M 12N 15W 32	Quarter-section centroid
POS	2013-04-21	2259	1	UF				38.858384	-123.549709	M 12N 15W 32	Contributor
POS	2013-04-29	2257	2	UMUF	Y			38.862085	-123.554026	M 12N 15W 32	Contributor
POS	2013-04-29	2014	1	UM				38.856859	-123.544281	M 12N 15W 32	Contributor
POS	2013-05-01	1200	1	UF		N		38.858630	-123.550991	M 12N 15W 32	Contributor
POS	2013-06-18	0110	1	UM				38.861388	-123.552902	M 12N 15W 32	Contributor
NEG	2013-07-09	1200	0					38.859646	-123.549186	M 12N 15W 32	Section centroid
NEG	2014-04-03	1200	0					38.862884	-123.552799	M 12N 15W 32	Activity center
POS	2014-04-08	2001	1	UM				38.859056	-123.556063	M 12N 15W 32	Contributor
NEG	2014-05-02	1200	0					38.862884	-123.552799	M 12N 15W 32	Activity center
NEG	2014-05-05	1200	0					38.862884	-123.552799	M 12N 15W 32	Activity center
POS	2014-05-13	2117	1	UF				38.850781	-123.550870	M 11N 15W 04	Contributor

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
NEG	2014-05-14	1200	0					38.862884	-123.552799	M 12N 15W 32	Activity center
NEG	2014-05-19	1200	0					38.862884	-123.552799	M 12N 15W 32	Activity center
POS	2014-05-19	2055	1	UM				38.857150	-123.559079	M 12N 15W 31	Contributor
NEG	2014-07-01	1200	0					38.855934	-123.553748	M 12N 15W 32	Quarter-section centroid
NEG	2016-04-26	1200	0					38.863396	-123.553895	M 12N 15W 32	Quarter-section centroid
Masterowl: MEN0510 Subspecies: NORTHERN											
POS	1990-05-03	2152	1	UF				38.804149	-123.483060	M 11N 15W 13	Quarter-section centroid
POS	1990-06-01		1	UU				38.796779	-123.482953	M 11N 15W 13	Quarter-section centroid
NEG	1995-04-24		0					38.800499	-123.487642	M 11N 15W 13	Section centroid
POS	1996-03-17		1	UU				38.804149	-123.483060	M 11N 15W 13	Quarter-section centroid
POS	1996-03-24		1	UU				38.799146	-123.481322	M 11N 15W 13	Contributor
POS	1996-03-25		2	UMUF	Y			38.799146	-123.481322	M 11N 15W 13	Contributor
POS	1996-04-05		2	UMUF	Y			38.799146	-123.481322	M 11N 15W 13	Contributor
POS	1996-06-06		2	UMUF	Y			38.796779	-123.482953	M 11N 15W 13	Quarter-section centroid
NEG	1997-05-19		0					38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	1997-05-27		0					38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	1997-07-29		0					38.800499	-123.487642	M 11N 15W 13	Section centroid

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
NEG	1998-04-24		0					38.799693	-123.468785	M 11N 14W 18	Section centroid
POS	1998-04-24		1	UU				38.796779	-123.482953	M 11N 15W 13	Quarter-section centroid
NEG	1998-04-25		0					38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	1998-05-05		0					38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	1998-05-18		0					38.800499	-123.487642	M 11N 15W 13	Section centroid
POS	1998-06-01		1	UU				38.796779	-123.482953	M 11N 15W 13	Quarter-section centroid
NEG	1998-07-29		0					38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	1998-08-13		0					38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	1998-08-13		0					38.799693	-123.468785	M 11N 14W 18	Section centroid
NEG	1998-08-20		0					38.800699	-123.487242	M 11N 15W 13	Section centroid
NEG	1998-08-20		0					38.799693	-123.468785	M 11N 14W 18	Section centroid
NEG	1998-08-27		0					38.799693	-123.468785	M 11N 14W 18	Section centroid
NEG	1998-08-27		0					38.800699	-123.487242	M 11N 15W 13	Section centroid
NEG	1999-03-29	2009-2019	0					38.803014	-123.474921	M 11N 14W 18	Contributor
NEG	1999-05-22	1600	0					38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	1999-06-17	1600	0					38.800499	-123.487642	M 11N 15W 13	Section centroid
POS	2000-06-27	2334	1	UU				38.796779	-123.482953	M 11N 15W 13	Quarter-section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2002-03-06	2137	0					38.800499	-123.487642	M 11N 15W 13	Section centroid
POS	2002-04-10	2142	1	UF				38.791161	-123.486695	M 11N 15W 24	Contributor
POS	2002-04-10	2201	1	UM				38.800318	-123.483186	M 11N 15W 13	Contributor
NEG	2002-04-11	1430	0					38.796779	-123.482953	M 11N 15W 13	Quarter-section centroid
AC	2002-05-14	1500	2	UMUF	Y			38.798709	-123.480809	M 11N 15W 13	Contributor
POS	2002-05-15	1300	1	UM				38.800465	-123.483006	M 11N 15W 13	Half-section centroid
POS	2002-05-15	1300	1	UM				38.804149	-123.483060	M 11N 15W 13	Quarter-section centroid
NEG	2003-04-10	1725-1925	0					38.796779	-123.482953	M 11N 15W 13	Quarter-section centroid
NEG	2003-05-15	1705	0					38.796779	-123.482953	M 11N 15W 13	Quarter-section centroid
NEG	2003-06-10	1800-2020	0					38.796779	-123.482953	M 11N 15W 13	Quarter-section centroid
NEG	2006		0					38.798709	-123.480809	M 11N 15W 13	Activity center
NEG	2011-03-04	2227-2237	0					38.803014	-123.474921	M 11N 14W 18	Contributor
NEG	2011-03-04	2213-2223	0					38.803358	-123.486652	M 11N 15W 13	Contributor
NEG	2011-04-01	2230-2240	0					38.803358	-123.486652	M 11N 15W 13	Contributor
NEG	2011-04-03	1859-1909	0					38.803014	-123.474921	M 11N 14W 18	Contributor
POS	2011-05-12	1615-1630	2	UMUF	Y			38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	2012	2400	0					38.798537	-123.470552	M 11N 14W 18	Contributor

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
NEG	2012	2400	0					38.790009	-123.478609	M 11N 15W 24	Contributor
NEG	2012	2400	0					38.800699	-123.487242	M 11N 15W 13	Contributor
NEG	2012	2400	0					38.791490	-123.470585	M 11N 14W 19	Contributor
NEG	2012	2400	0					38.791161	-123.486695	M 11N 15W 24	Contributor
POS	2012-03-10	1700-1830	2	UMUF	Y			38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	2012-03-25	1915-1940	0					38.800318	-123.483186	M 11N 15W 13	Contributor
POS	2012-04-27	1815-1915	2	UMUF	Y			38.800499	-123.487642	M 11N 15W 13	Section centroid
NEG	2013	2400	0					38.798537	-123.470552	M 11N 14W 18	Contributor
NEG	2013	2400	0					38.791161	-123.486695	M 11N 15W 24	Contributor
NEG	2013-03-08	1936-1946	0					38.790009	-123.478609	M 11N 15W 24	Contributor
POS	2013-03-08	1715-1718	2	UMUF	Y			38.800318	-123.483186	M 11N 15W 13	Contributor
POS	2013-03-08	1915-1925	1	UU				38.791490	-123.470585	M 11N 14W 19	Contributor
NEG	2013-04-19	2327-2337	0					38.790009	-123.478609	M 11N 15W 24	Contributor
NEG	2013-04-19	2249-2259	0					38.791490	-123.470585	M 11N 14W 19	Contributor
NEG	2013-04-27	0206-0216	0					38.791490	-123.470585	M 11N 14W 19	Contributor
POS	2013-04-27	0245-0255	1	UU				38.790009	-123.478609	M 11N 15W 24	Contributor
NEG	2013-05-26	0204-0214	0					38.790009	-123.478609	M 11N 15W 24	Contributor

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
NEG	2013-06-03	0226-0236	0					38.790009	-123.478609	M 11N 15W 24	Contributor
NEG	2013-07-06	0309-0319	0					38.790009	-123.478609	M 11N 15W 24	Contributor
POS	2013-07-10	0830-0945	2	UMUF	Y			38.799693	-123.468785	M 11N 14W 18	Section centroid
POS	2014		2	UMUF	Y			38.798709	-123.480809	M 11N 15W 13	Activity center
Masterowl: MEN0573 Subspecies: NORTHERN											
POS	2001-05-22	2202	1	UU				38.842207	-123.518392	M 11N 15W 03	Contributor
POS	2001-05-22	2220	1	UU				38.843805	-123.521861	M 11N 15W 03	Contributor
POS	2001-06-05	1200	1	UM				38.838219	-123.525692	M 11N 15W 03	Section centroid
NEG	2001-06-12	1200	0					38.838219	-123.525692	M 11N 15W 03	Section centroid
POS	2001-06-15	1200	2	UMUF	Y	Y	2	38.838743	-123.529233	M 11N 15W 03	Contributor
POS	2002-04-08	2248	1	UU				38.831403	-123.530458	M 11N 15W 03	Quarter-section centroid
NEG	2002-05-08	1200	0					38.845070	-123.520994	M 11N 15W 03	Quarter-section centroid
NEG	2002-05-28	1200	0					38.845070	-123.520994	M 11N 15W 03	Quarter-section centroid
NEG	2002-06-04	1200	0					38.845070	-123.520994	M 11N 15W 03	Quarter-section centroid
NEG	2002-06-13	1200	0					38.845070	-123.520994	M 11N 15W 03	Quarter-section centroid
NEG	2002-07-18	1200	0					38.845070	-123.520994	M 11N 15W 03	Quarter-section centroid
NEG	2002-07-25	1200	0					38.845070	-123.520994	M 11N 15W 03	Quarter-section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	2003-05-21		1	UF				38.839282	-123.533696	M 11N 15W 03	Contributor
POS	2003-05-21		1	UU				38.842206	-123.528763	M 11N 15W 03	Contributor
NEG	2003-05-23	1200	0					38.838981	-123.526527	M 11N 15W 03	Activity center
NEG	2003-07-09	1200	0					38.838981	-123.526527	M 11N 15W 03	Activity center
NEG	2003-07-30	1200	0					38.838981	-123.526527	M 11N 15W 03	Activity center
NEG	2004-03-04	2400	0					38.838981	-123.526527	M 11N 15W 03	Activity center
NEG	2004-03-09	2400	0					38.838981	-123.526527	M 11N 15W 03	Activity center
POS	2004-03-09		1	UU				38.842492	-123.529261	M 11N 15W 03	Contributor
NEG	2004-03-10	2400	0					38.838981	-123.526527	M 11N 15W 03	Activity center
POS	2004-05-17	2400	2	UMUF	Y	Y		38.838418	-123.527445	M 11N 15W 03	Contributor
POS	2004-06-28	2400	2	UMUF	Y	Y	1	38.831403	-123.530458	M 11N 15W 03	Quarter-section centroid
NEG	2004-06-28	2400	0					38.838981	-123.526527	M 11N 15W 03	Activity center
POS	2004-07-12	2400	1	UF		Y	1	38.837323	-123.528462	M 11N 15W 03	Contributor
NEG	2005-03-29	2400	0					38.838306	-123.530347	M 11N 15W 03	Half-section centroid
NEG	2005-05-19	2400	0					38.838306	-123.530347	M 11N 15W 03	Half-section centroid
POS	2005-05-19	2119	1	UM				38.838650	-123.534026	M 11N 15W 03	Contributor
POS	2005-06-09	2210	1	UU				38.842211	-123.529673	M 11N 15W 03	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2005-06-09	2400	0					38.838306	-123.530347	M 11N 15W 03	Half-section centroid
NEG	2005-06-14	2400	0					38.845209	-123.530237	M 11N 15W 03	Quarter-section centroid
NEG	2005-06-22	2400	0					38.831137	-123.521250	M 11N 15W 03	Quarter-section centroid
NEG	2005-07-21	2400	0					38.831403	-123.530458	M 11N 15W 03	Quarter-section centroid
NEG	2006		0					38.838981	-123.526527	M 11N 15W 03	Activity center
NEG	2006-05-04		0					38.831403	-123.530458	M 11N 15W 03	Quarter-section centroid
NEG	2006-06-14		0					38.831403	-123.530458	M 11N 15W 03	Quarter-section centroid
POS	2006-07-19	2208	1	UM				38.845229	-123.529892	M 11N 15W 03	Contributor
POS	2006-07-19	2201	1	UF				38.845024	-123.529256	M 11N 15W 03	Contributor
POS	2007-04-03	2105	1	UU				38.838476	-123.526466	M 11N 15W 03	Contributor
POS	2007-04-03	2022	1	UU				38.838009	-123.522084	M 11N 15W 03	Contributor
POS	2007-04-10	2150	1	UM				38.835367	-123.538518	M 11N 15W 04	Contributor
POS	2007-04-10	2210	1	UM				38.834275	-123.542784	M 11N 15W 04	Contributor
POS	2007-04-18	2221	1	UU				38.835612	-123.545928	M 11N 15W 04	Contributor
POS	2007-04-18	2205	1	UU				38.831950	-123.540739	M 11N 15W 04	Contributor
POS	2007-04-18	2105	1	UM				38.842089	-123.526700	M 11N 15W 03	Contributor
NEG	2007-04-18	1200	0					38.845209	-123.530237	M 11N 15W 03	Quarter-section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	2007-05-07	1903	2	UMUF	Y			38.841246	-123.527788	M 11N 15W 03	Contributor
POS	2007-05-08	1200	2	UMUF	Y	N		38.838780	-123.527159	M 11N 15W 03	Contributor
POS	2008		2	UMUF	Y	Y	0	38.838981	-123.526527	M 11N 15W 03	Contributor
POS	2008-03-04	1847	1	UU				38.839723	-123.527869	M 11N 15W 03	Contributor
POS	2008-03-04	1900	1	UM				38.841131	-123.529216	M 11N 15W 03	Contributor
NEG	2008-03-04		0					38.838981	-123.526527	M 11N 15W 03	Activity center
POS	2008-03-11	1931	1	UU				38.837924	-123.528973	M 11N 15W 03	Contributor
POS	2008-03-11	1920	1	UU				38.838615	-123.525626	M 11N 15W 03	Contributor
POS	2008-03-11		1	AM				38.837915	-123.527176	M 11N 15W 03	Contributor
POS	2008-03-19		2	UMUF	Y	N		38.838981	-123.526527	M 11N 15W 03	Activity center
AC	2008-05-16		2	UMUF	Y	Y		38.838981	-123.526527	M 11N 15W 03	Contributor
POS	2008-06-18		1	UM				38.839473	-123.527360	M 11N 15W 03	Contributor
NEG	2010-05-31		0					38.838981	-123.526527	M 11N 15W 03	Activity center
NEG	2010-07-18		0					38.845074	-123.520997	M 11N 15W 03	Quarter-section centroid
NEG	2011-05-09		0					38.845205	-123.530242	M 11N 15W 03	Quarter-section centroid
NEG	2011-07-25		0					38.845205	-123.530242	M 11N 15W 03	Quarter-section centroid
NEG	2012-05-13		0					38.838981	-123.526527	M 11N 15W 03	Activity center

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2012-06-09		0					38.838981	-123.526527	M 11N 15W 03	Activity center
NEG	2012-06-12		0					38.831398	-123.530456	M 11N 15W 03	Quarter-section centroid
POS	2012-07-15	2314	1	UM				38.843738	-123.519279	M 11N 15W 03	Contributor
POS	2012-07-15	2340	1	UM				38.840609	-123.524697	M 11N 15W 03	Contributor
NEG	2013-06-17	1200	0					38.831398	-123.530456	M 11N 15W 03	Quarter-section centroid
NEG	2016-06-28	1200	0					38.845070	-123.520994	M 11N 15W 03	Quarter-section centroid
Masterowl: SON0017 Subspecies: NORTHERN											
POS	1990-02-02		1	UU				38.773615	-123.463826	M 11N 14W 30	Quarter-section centroid
POS	1990-02-07		1	UM				38.766342	-123.464101	M 11N 14W 30	Quarter-section centroid
POS	1990-03-21		2	UMUF	Y	Y		38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	1990-04-04	1700	1	UM				38.768549	-123.470988	M 11N 14W 30	Contributor
POS	1990-06-17	2045					2	38.773390	-123.454662	M 11N 14W 29	Quarter-section centroid
NEG	1991-04-23		0					38.771320	-123.487547	M 11N 15W 25	Section centroid
POS	1991-04-24	2010	2	UMUF	Y			38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	1991-05-21		1	UU				38.773390	-123.454662	M 11N 14W 29	Quarter-section centroid
POS	1991-07-17	9999	1	UU				38.770325	-123.468628	M 11N 14W 30	Section centroid
POS	1991-07-17		1	UU				38.785883	-123.487589	M 11N 15W 24	Section centroid

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
POS	1991-07-17	9999	1	UU				38.771320	-123.487547	M 11N 15W 25	Section centroid
POS	1991-08-07		1	UU				38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	1991-08-07		1	UU				38.767528	-123.482860	M 11N 15W 25	Quarter-section centroid
POS	1991-08-15	2040	1	UU				38.767528	-123.482860	M 11N 15W 25	Quarter-section centroid
POS	1991-10-02		1	UU				38.767528	-123.482860	M 11N 15W 25	Quarter-section centroid
NEG	1992-03-10		0					38.770325	-123.468628	M 11N 14W 30	Section centroid
POS	1992-03-24		2	UUUU				38.773390	-123.454662	M 11N 14W 29	Quarter-section centroid
NEG	1992-03-31		0					38.785883	-123.487589	M 11N 15W 24	Section centroid
POS	1992-04-25		2	UMUF	Y			38.773390	-123.454662	M 11N 14W 29	Quarter-section centroid
POS	1992-05-01		2	UMUF				38.769964	-123.450450	M 11N 14W 29	Section centroid
POS	1992-05-01	9999	2	UMUF				38.770325	-123.468628	M 11N 14W 30	Section centroid
NEG	1992-05-12		0					38.770325	-123.468628	M 11N 14W 30	Section centroid
NEG	1992-05-15		0					38.770325	-123.468628	M 11N 14W 30	Section centroid
NEG	1992-07-09		0					38.769964	-123.450450	M 11N 14W 29	Section centroid
POS	1993-01-02		1	UU				38.774809	-123.482748	M 11N 15W 25	Quarter-section centroid
NEG	1993-03-22		0					38.784897	-123.468539	M 11N 14W 19	Section centroid
NEG	1993-04-28		0					38.770325	-123.468628	M 11N 14W 30	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	1993-05-05		1	UU				38.773615	-123.463826	M 11N 14W 30	Quarter-section centroid
NEG	1993-06-16		0					38.770325	-123.468628	M 11N 14W 30	Section centroid
NEG	1993-06-23		0					38.770325	-123.468628	M 11N 14W 30	Section centroid
POS	1994-01-19	1723	2	UMUF	Y			38.768981	-123.475595	M 11N 14W 30	Contributor
POS	1994-03-03		1	UU				38.768981	-123.475595	M 11N 14W 30	Contributor
NEG	1994-03-24		0					38.770325	-123.468628	M 11N 14W 30	Section centroid
POS	1994-04-01		1	UM				38.768981	-123.475595	M 11N 14W 30	Contributor
NEG	1994-04-06		0					38.770325	-123.468628	M 11N 14W 30	Section centroid
POS	1994-04-27		2	UMUF	Y			38.768981	-123.475595	M 11N 14W 30	Contributor
POS	1995-03-30		2	UMUF	Y			38.768549	-123.470988	M 11N 14W 30	Contributor
NEG	1995-04-10		0					38.769964	-123.450450	M 11N 14W 29	Section centroid
POS	1995-04-20		1	UU				38.768549	-123.470988	M 11N 14W 30	Contributor
NEG	1995-05-04		0					38.784113	-123.450136	M 11N 14W 20	Section centroid
POS	1995-05-10	9999	1	UU				38.773615	-123.463826	M 11N 14W 30	Quarter-section centroid
POS	1995-05-10		1	UU				38.780545	-123.454511	M 11N 14W 20	Quarter-section centroid
POS	1995-05-11		2	UMUF	Y	Y		38.768981	-123.475595	M 11N 14W 30	Contributor
NEG	1995-05-18		0					38.770325	-123.468628	M 11N 14W 30	Section centroid

345

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	1995-05-25		0					38.770325	-123.468628	M 11N 14W 30	Section centroid
POS	1995-05-29		2	UMUF	Y			38.770325	-123.468628	M 11N 14W 30	Section centroid
POS	1995-06-01	0925	2	UMUF	Y	Y		38.768981	-123.475595	M 11N 14W 30	Contributor
POS	1995-07-06		2	UMUF	Y	Y	1	38.768981	-123.475595	M 11N 14W 30	Contributor
POS	1995-09-18		1	UU				38.773604	-123.445765	M 11N 14W 29	Quarter-section centroid
NEG	1996-02-26		0					38.770325	-123.468628	M 11N 14W 30	Section centroid
POS	1996-03-03		1	UU				38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	1996-03-04		1	UU				38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
NEG	1996-03-13	0937	0					38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	1996-03-17		2	UMUF	Y			38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	1996-03-18		2	UMUF	Y			38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	1996-05-09		1	UU				38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
NEG	1996-06-30		0					38.770325	-123.468628	M 11N 14W 30	Section centroid
NEG	1996-06-30		0					38.769964	-123.450450	M 11N 14W 29	Section centroid
NEG	1996-08-05		0					38.770325	-123.468628	M 11N 14W 30	Section centroid
POS	1997-03-03		2	UMUF				38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	1997-04-14		2	UMUF	Y	Y		38.768549	-123.470988	M 11N 14W 30	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	1997-04-29		0					38.771320	-123.487547	M 11N 15W 25	Section centroid
POS	1997-05-27		2	UMUF	Y			38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
NEG	1997-06-10		0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1997-06-17		0					38.771320	-123.487547	M 11N 15W 25	Section centroid
POS	1997-07-01	9999	1	UU				38.759878	-123.473693	M 11N 14W 31	Quarter-section centroid
POS	1997-07-01		1	UU				38.767528	-123.482860	M 11N 15W 25	Quarter-section centroid
POS	1997-07-22		1	UU				38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	1998-03-03		2	UMUF	Y			38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	1998-04-28		2	UMUF	Y			38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	1998-06-09		1	UU				38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
NEG	1998-07-13		0					38.769964	-123.450450	M 11N 14W 29	Section centroid
NEG	1998-07-20		0					38.769964	-123.450450	M 11N 14W 29	Section centroid
POS	1998-07-24		1	UM				38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	1998-07-29		2	UMUF	Y			38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
NEG	1998-08-13		0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1998-08-20		0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1998-08-27		0					38.771320	-123.487547	M 11N 15W 25	Section centroid

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
NEG	1999	2400	0					38.775071	-123.448740	M 11N 14W 29	Contributor
NEG	1999	2400	0					38.771384	-123.457321	M 11N 14W 29	Contributor
POS	1999-03-15	1753	2	UMUF	Y			38.774344	-123.473236	M 11N 14W 30	Quarter-section centroid
NEG	1999-03-17	0015	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-03-19	1926	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-03-28	2250	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-04-07	2025	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-04-08	2233	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-04-14	2255	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-04-21	2058	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
POS	1999-04-21	1601-1646	2	UMUF	Y			38.769832	-123.474835	M 11N 14W 30	Contributor
POS	1999-04-23	2153	1	UM				38.760569	-123.475284	M 11N 14W 31	Contributor
NEG	1999-05-01	2334	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-05-14	2212	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
POS	1999-05-20	2356	2	UMUF	Y			38.767528	-123.482860	M 11N 15W 25	Quarter-section centroid
NEG	1999-05-21	2327	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-06-02	2216	0					38.771320	-123.487547	M 11N 15W 25	Section centroid

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
NEG	1999-06-03	2304	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	2000	2400	0					38.775071	-123.448740	M 11N 14W 29	Contributor
NEG	2000	2400	0					38.771384	-123.457321	M 11N 14W 29	Contributor
NEG	2000-03-04	1505	0					38.766541	-123.477305	M 11N 14W 30	Activity center
POS	2000-03-11	0920	1	UU				38.774344	-123.473236	M 11N 14W 30	Quarter-section centroid
POS	2000-03-13	2200	1	UM				38.773615	-123.463826	M 11N 14W 30	Quarter-section centroid
POS	2000-03-14	1101	2	UMUF	Y			38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
NEG	2000-03-30	1943	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
POS	2000-03-31	1333-1442	2	UMUF	Y			38.774862	-123.461222	M 11N 14W 30	Contributor
POS	2000-03-31	1045	2	UMUF	Y			38.773615	-123.463826	M 11N 14W 30	Quarter-section centroid
POS	2000-04-03	2307	1	UU				38.767678	-123.492242	M 11N 15W 25	Quarter-section centroid
POS	2000-04-18	1957	1	UF				38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	2000-04-18	1854	1	UM				38.759343	-123.474495	M 11N 14W 31	Contributor
POS	2000-04-18	1928	1	UF				38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
NEG	2000-04-28	1500	0					38.769964	-123.450450	M 11N 14W 29	Section centroid
POS	2000-06-06	2406	1	UU				38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	2001-03-11	1216	2	UMUF	Y			38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2001-03-14	2150	0					38.770325	-123.468628	M 11N 14W 30	Section centroid
NEG	2001-03-15	2258	0					38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
NEG	2001-04-18	1330	0					38.769964	-123.450450	M 11N 14W 29	Section centroid
AC	2001-05-05	1615	2	UMUF	Y	Y		38.768938	-123.476506	M 11N 14W 30	Contributor
POS	2001-05-08	2222	1	UM				38.751048	-123.475289	M 11N 14W 31	Contributor
NEG	2001-05-16	2240	0					38.770325	-123.468628	M 11N 14W 30	Section centroid
NEG	2002-03-05	1425-1640	0					38.773615	-123.463826	M 11N 14W 30	Quarter-section centroid
POS	2002-03-05	1340	1	UU				38.769832	-123.474835	M 11N 14W 30	Contributor
POS	2002-03-13	2346	1	UM				38.771384	-123.457321	M 11N 14W 29	Contributor
NEG	2002-03-14	1400-1700	0					38.773615	-123.463826	M 11N 14W 30	Quarter-section centroid
NEG	2002-03-14	1325-1650	0					38.773497	-123.450212	M 11N 14W 29	Half-section centroid
NEG	2002-03-15	2002	0					38.770325	-123.468628	M 11N 14W 30	Section centroid
POS	2002-04-06	1211-1238	2	UMUF	Y	N		38.769832	-123.474835	M 11N 14W 30	Contributor
POS	2002-04-11	2113	1	UM				38.766429	-123.487526	M 11N 15W 25	Contributor
NEG	2002-04-23	1530-1800	0					38.773615	-123.463826	M 11N 14W 30	Quarter-section centroid
POS	2003-03-04	2024	1	UM				38.756052	-123.479172	M 11N 15W 36	Contributor
POS	2003-03-09	1435-1557	2	UMUF	Y			38.768569	-123.476942	M 11N 14W 30	Contributor

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
POS	2003-05-13	1635-1714	1	UU				38.768672	-123.477129	M 11N 14W 30	Contributor
POS	2003-05-14	1838-1907	2	UMUF	Y			38.776563	-123.460283	M 11N 14W 30	Contributor
NEG	2003-07-21	2238	0					38.770325	-123.468628	M 11N 14W 30	Section centroid
NEG	2004-04-06	1530	0					38.766541	-123.477305	M 11N 14W 30	Activity center
POS	2004-04-13	1710-1730	1	UU				38.769832	-123.474835	M 11N 14W 30	Contributor
NEG	2004-05-20	2010	0					38.766541	-123.477305	M 11N 14W 30	Activity center
NEG	2005-03-13	1235	0					38.766541	-123.477305	M 11N 14W 30	Activity center
NEG	2005-07-08	1840	0					38.766541	-123.477305	M 11N 14W 30	Activity center
POS	2005-07-25	2000	2	UMUF				38.766541	-123.477305	M 11N 14W 30	Activity center
NEG	2005-07-26	1400	0					38.766541	-123.477305	M 11N 14W 30	Activity center
NEG	2005-07-27	1830	0					38.766541	-123.477305	M 11N 14W 30	Activity center
POS	2006		2	UMUF	Y			38.756266	-123.477812	M 11N 14W 31	Contributor
NEG	2006-03-30	1400	0					38.766541	-123.477305	M 11N 14W 30	Activity center
NEG	2006-04-05	1300	0					38.766541	-123.477305	M 11N 14W 30	Activity center
POS	2006-06-02	1300	1	UF				38.766541	-123.477305	M 11N 14W 30	Activity center
POS	2006-06-03	1230	2	UMUF	Y			38.756266	-123.477812	M 11N 14W 31	Contributor
NEG	2007		0					38.768938	-123.476506	M 11N 14W 30	Activity center

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	2008-03-27	0021	2	AMAF	Y			38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	2008-04-01	2325	2	AMAF	Y			38.766541	-123.477305	M 11N 14W 30	Contributor
POS	2008-05-20	1933	2	AMAF	Y	N		38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	2009-04-11	2257	1	AM				38.767034	-123.473487	M 11N 14W 30	Quarter-section centroid
POS	2010		2	UMUF	Y			38.768938	-123.476506	M 11N 14W 30	Activity center
NEG	2011	2400	0					38.751819	-123.488838	M 11N 15W 36	Contributor
NEG	2011-03-06	1957-2007	0					38.760569	-123.475284	M 11N 14W 31	Contributor
POS	2011-03-06	1934-1949	2	UMUF	Y			38.770640	-123.477159	M 11N 14W 30	Contributor
NEG	2011-03-06	1857-1907	0					38.775640	-123.474278	M 11N 14W 30	Contributor
NEG	2011-04-02	2059-2109	0					38.761461	-123.484415	M 11N 15W 36	Contributor
NEG	2011-04-02	2114-2124	0					38.766429	-123.487526	M 11N 15W 25	Contributor
POS	2011-04-03	1930-1934	1	UF				38.775640	-123.474278	M 11N 14W 30	Contributor
POS	2011-04-04	1630-1800	2	UMUF	Y			38.756103	-123.469053	M 11N 14W 31	Section centroid
NEG	2011-05-12	2257-2307	0					38.775640	-123.474278	M 11N 14W 30	Contributor
NEG	2011-05-13	2257-2307	0					38.766429	-123.487526	M 11N 15W 25	Contributor
NEG	2011-05-13	2244-2254	0					38.761461	-123.484415	M 11N 15W 36	Contributor
POS	2011-06-05	2343-2355	2	UMUF	Y			38.761461	-123.484415	M 11N 15W 36	Contributor

353

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2011-06-05	0002-0012	0					38.766429	-123.487526	M 11N 15W 25	Contributor
NEG	2011-06-12	0059-0109	0					38.766429	-123.487526	M 11N 15W 25	Contributor
POS	2011-06-12	0113-0125	1	UU				38.761461	-123.484415	M 11N 15W 36	Contributor
POS	2011-06-21	2117-2120	1	UU				38.766429	-123.487526	M 11N 15W 25	Contributor
POS	2011-06-29	2144-2148	1	UU				38.761461	-123.484415	M 11N 15W 36	Contributor
NEG	2011-06-29	2127-2137	0					38.766429	-123.487526	M 11N 15W 25	Contributor
NEG	2012	2400	0					38.751819	-123.488838	M 11N 15W 36	Contributor
NEG	2012	2400	0					38.761477	-123.494327	M 11N 15W 36	Contributor
NEG	2012	2400	0					38.766429	-123.487526	M 11N 15W 25	Contributor
NEG	2012-03-07	2019-2029	0					38.775640	-123.474278	M 11N 14W 30	Contributor
POS	2012-03-07	2118-2128	1	UM				38.761461	-123.484415	M 11N 15W 36	Contributor
POS	2012-03-26	1300-1430	2	UMUF	Y			38.770325	-123.468628	M 11N 14W 30	Section centroid
POS	2012-03-29	2356-0006	1	UU				38.761461	-123.484415	M 11N 15W 36	Contributor
NEG	2012-04-27	2225-2235	0					38.761461	-123.484415	M 11N 15W 36	Contributor
POS	2012-06-29	0001-0011	1	UM				38.761461	-123.484415	M 11N 15W 36	Contributor
NEG	2012-07-06	0213-0223	0					38.761461	-123.484415	M 11N 15W 36	Contributor
NEG	2013	2400	0					38.757367	-123.487494	M 11N 15W 36	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2013	2400	0					38.761461	-123.484415	M 11N 15W 36	Contributor
NEG	2013	2400	0					38.751819	-123.488838	M 11N 15W 36	Contributor
NEG	2013	2400	0					38.761477	-123.494327	M 11N 15W 36	Contributor
NEG	2013	2400	0					38.756052	-123.479172	M 11N 15W 36	Contributor
NEG	2013	2400	0					38.766429	-123.487526	M 11N 15W 25	Contributor
NEG	2013	2400	0					38.760569	-123.475284	M 11N 14W 31	Contributor
POS	2013-03-05	0930-0935	1	UF				38.770325	-123.468628	M 11N 14W 30	Section centroid
POS	2013-03-08	2157-2207	1	UU				38.770640	-123.477159	M 11N 14W 30	Contributor
NEG	2013-03-08	2127-2137	0					38.775640	-123.474278	M 11N 14W 30	Contributor
POS	2013-04-19	2148-2158	2	UMUF	Y			38.770640	-123.477159	M 11N 14W 30	Contributor
POS	2013-04-24	0805-0930	1	UU				38.770325	-123.468628	M 11N 14W 30	Section centroid
POS	2013-07-06	0159-0209	1	UM				38.775640	-123.474278	M 11N 14W 30	Contributor
NEG	2013-07-06	0130-0140	0					38.770640	-123.477159	M 11N 14W 30	Contributor
POS	2014		1	UM				38.768938	-123.476506	M 11N 14W 30	Activity center
Masterowl: SON0082 Subspecies: NORTHERN											
POS	1990-02-12	2001	1	UM				38.768549	-123.470988	M 11N 14W 30	Contributor
POS	1993-01-11		1	UU				38.775076	-123.492350	M 11N 15W 25	Quarter-section centroid

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
POS	1995-04-02		1	UU				38.767819	-123.501532	M 11N 15W 26	Quarter-section centroid
POS	1995-04-17		1	UU				38.767968	-123.510776	M 11N 15W 26	Quarter-section centroid
NEG	1995-04-23		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1995-05-02		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
POS	1995-05-04		2	UMUF	Y			38.767819	-123.501532	M 11N 15W 26	Quarter-section centroid
NEG	1995-05-10		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
POS	1995-05-26		1	UU				38.775076	-123.492350	M 11N 15W 25	Quarter-section centroid
POS	1995-05-26		2	UMUF	Y			38.767819	-123.501532	M 11N 15W 26	Quarter-section centroid
NEG	1995-05-29		0					38.775076	-123.492350	M 11N 15W 25	Quarter-section centroid
NEG	1995-06-29		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1995-07-11		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
POS	1995-07-18		1	UU				38.775270	-123.501745	M 11N 15W 26	Quarter-section centroid
NEG	1995-07-19	1200	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1995-11-10	1809	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
POS	1996-03-03		1	UU				38.767968	-123.510776	M 11N 15W 26	Quarter-section centroid
NEG	1996-03-06	2110	0					38.772158	-123.525161	M 11N 15W 27	Section centroid
NEG	1996-03-14	0515	0					38.772158	-123.525161	M 11N 15W 27	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
POS	1996-03-14	0616	2	UMUF	Y			38.765244	-123.507338	M 11N 15W 26	Contributor
NEG	1996-03-22		0					38.772158	-123.525161	M 11N 15W 27	Section centroid
POS	1996-04-29		1	UU				38.767819	-123.501532	M 11N 15W 26	Quarter-section centroid
NEG	1996-05-02		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
POS	1996-05-09		1	UU				38.767968	-123.510776	M 11N 15W 26	Quarter-section centroid
NEG	1996-05-13		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1996-05-20		0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1996-05-30		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
POS	1996-06-06		1	UF				38.775847	-123.520376	M 11N 15W 27	Quarter-section centroid
NEG	1996-06-07	1200	0					38.772158	-123.525161	M 11N 15W 27	Section centroid
NEG	1996-06-16		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1996-06-17		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1996-07-10		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1996-08-30		0					38.772158	-123.525161	M 11N 15W 27	Section centroid
NEG	1997-03-03		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1997-03-10		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1997-04-08		0					38.757230	-123.505889	M 11N 15W 35	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	1997-04-09		0					38.772158	-123.525161	M 11N 15W 27	Section centroid
NEG	1997-04-09		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1997-04-29		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1997-05-02		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1997-05-08		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1997-06-10		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1997-06-17		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1997-06-26		0					38.757230	-123.505889	M 11N 15W 35	Section centroid
NEG	1997-07-01		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1998-04-09		0					38.757230	-123.505889	M 11N 15W 35	Section centroid
NEG	1998-04-15		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1998-04-16		0					38.757230	-123.505889	M 11N 15W 35	Section centroid
NEG	1998-04-24		0					38.757230	-123.505889	M 11N 15W 35	Section centroid
POS	1998-05-13		1	UM				38.767819	-123.501532	M 11N 15W 26	Quarter-section centroid
NEG	1998-05-18		0					38.772158	-123.525161	M 11N 15W 27	Section centroid
NEG	1998-06-02		0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1998-06-03		0					38.772158	-123.525161	M 11N 15W 27	Section centroid

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
NEG	1998-07-28		0					38.772158	-123.525161	M 11N 15W 27	Section centroid
NEG	1999-03-15	0015	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-03-17	0015	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-03-19	1926	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-03-28	2250	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-04-08	2233	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-04-21	2058	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-04-24	2028	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1999-04-28	1700	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1999-05-01	2334	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-05-13	2046	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1999-05-14	2212	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
POS	1999-05-14	2052	1	UM				38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1999-05-20	2343	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-05-21	2327	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-06-01	2055	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1999-06-02	2216	0					38.771320	-123.487547	M 11N 15W 25	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	1999-06-03	2304	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	1999-06-09	2055	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	1999-08-29	2000	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
POS	2000		2	UMUF	Y			38.767819	-123.501532	M 11N 15W 26	Quarter-section centroid
NEG	2000-03-03	2000	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2000-03-12	0732	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2000-03-14	1902	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2000-03-14	0026	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2000-03-30	1943	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
POS	2000-04-03	2025	1	UM				38.771628	-123.506267	M 11N 15W 26	Section centroid
POS	2000-04-03	1947	1	UM				38.775270	-123.501745	M 11N 15W 26	Quarter-section centroid
POS	2000-04-03	2247	1	UU				38.771628	-123.506267	M 11N 15W 26	Section centroid
POS	2000-04-04	1431	2	UMUF	Y			38.767819	-123.501532	M 11N 15W 26	Quarter-section centroid
NEG	2000-04-05	2052	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2000-04-06	2015	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2000-04-07	1945	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
POS	2000-04-13	2100	1	UM				38.771628	-123.506267	M 11N 15W 26	Section centroid

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
POS	2000-04-14	2059	2	UMUF	Y			38.775270	-123.501745	M 11N 15W 26	Quarter-section centroid
NEG	2000-04-15	1050	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2000-04-18	2105	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2000-04-24	0030	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2000-06-04	2122	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
POS	2000-06-06	2352	1	UM				38.767678	-123.492242	M 11N 15W 25	Quarter-section centroid
POS	2000-06-29	1100	2	UMUF	Y			38.772547	-123.500126	M 11N 15W 26	Contributor
NEG	2001-03-13	1933	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2001-03-15	1611	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2001-04-04	1730	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2001-04-19	1630	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2001-05-05	1145	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2001-05-08	0313	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	2001-05-16	0030	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
NEG	2002-03-06	2002-03-06	0					38.767819	-123.501532	M 11N 15W 26	Quarter-section centroid
POS	2002-03-15	2033	1	UM				38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2002-03-15	2002	0					38.771628	-123.506267	M 11N 15W 26	Section centroid

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2002-04-11	2101	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
POS	2002-04-11	0041	1	UM				38.765786	-123.514210	M 11N 15W 26	Contributor
POS	2002-04-12	1125	1	UF				38.765987	-123.514497	M 11N 15W 26	Contributor
POS	2002-04-12	0041	1	UF				38.767968	-123.510776	M 11N 15W 26	Quarter-section centroid
NEG	2002-04-21	1050-1305	0					38.767968	-123.510776	M 11N 15W 26	Quarter-section centroid
NEG	2002-04-22	0123	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2002-04-22	0123	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2002-04-30	2149	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
POS	2002-04-30	0016	1	UU				38.770009	-123.502228	M 11N 15W 26	Contributor
POS	2002-05-01	0016	1	UU				38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2002-05-01	1230-1400	0					38.767968	-123.510776	M 11N 15W 26	Quarter-section centroid
POS	2002-05-05	1230	1	UM				38.767819	-123.501532	M 11N 15W 26	Quarter-section centroid
NEG	2002-05-13	2349	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2002-05-14	1300-1633	0					38.767819	-123.501532	M 11N 15W 26	Quarter-section centroid
NEG	2002-05-15	1312-1523	0					38.767819	-123.501532	M 11N 15W 26	Quarter-section centroid
NEG	2002-08-30	1111	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
POS	2003-03-04	1420-1452	1	UF				38.771698	-123.503227	M 11N 15W 26	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2003-03-06	2023	0					38.785883	-123.487589	M 11N 15W 24	Section centroid
POS	2003-03-08	1913	1	UM				38.766296	-123.487434	M 11N 15W 25	Contributor
NEG	2003-04-03	1540-1630	0					38.767968	-123.510776	M 11N 15W 26	Quarter-section centroid
POS	2003-04-07	2214	1	UM				38.784782	-123.493778	M 11N 15W 24	Contributor
POS	2003-04-08	1536-1550	1	UU				38.769112	-123.503789	M 11N 15W 26	Contributor
POS	2003-04-09	1745-1830	1	UF				38.769260	-123.503613	M 11N 15W 26	Contributor
NEG	2003-04-10	2330	0					38.771320	-123.487547	M 11N 15W 25	Section centroid
POS	2003-04-29	1901-1942	1	UU				38.769390	-123.503854	M 11N 15W 26	Contributor
POS	2003-04-30	2350	1	UF				38.771008	-123.492923	M 11N 15W 25	Contributor
POS	2004-03-10	1440-1535	2	UMUF	Y			38.772132	-123.502149	M 11N 15W 26	Contributor
POS	2004-05-20	1840	2	AMAF	Y	Y	1	38.771471	-123.505195	M 11N 15W 26	Contributor
POS	2005		1	UU		Y		38.771471	-123.505195	M 11N 15W 26	Contributor
POS	2005-06-09	1916	2	UMUF	Y	Y	2	38.771471	-123.505195	M 11N 15W 26	Contributor
AC	2006		1	UU		Y		38.771471	-123.505195	M 11N 15W 26	Contributor
POS	2006-04-07	1445-1454	2	UMUF	Y			38.771471	-123.505195	M 11N 15W 26	Contributor
POS	2007-04-10	2154	1	UM				38.767819	-123.501532	M 11N 15W 26	Quarter-section centroid
POS	2007-05-15	0111	2	UMUF	Y			38.767819	-123.501532	M 11N 15W 26	Quarter-section centroid

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
POS	2008-05-21	0056	1	UU				38.767819	-123.501532	M 11N 15W 26	Quarter-section centroid
NEG	2009		0					38.771471	-123.505195	M 11N 15W 26	Activity center
NEG	2010		0					38.771471	-123.505195	M 11N 15W 26	Activity center
NEG	2011	2400	0					38.776040	-123.500132	M 11N 15W 26	Contributor
NEG	2011	2400	0					38.777482	-123.508707	M 11N 15W 26	Contributor
NEG	2011	2400	0					38.777923	-123.485538	M 11N 15W 25	Contributor
NEG	2011	2400	0					38.770021	-123.512985	M 11N 15W 26	Contributor
NEG	2011	2400	0					38.771008	-123.492923	M 11N 15W 25	Contributor
NEG	2011	2400	0					38.759479	-123.502901	M 11N 15W 35	Contributor
NEG	2011	2400	0					38.765786	-123.514210	M 11N 15W 26	Contributor
NEG	2011	2400	0					38.765077	-123.502655	M 11N 15W 26	Contributor
NEG	2011	2400	0					38.772302	-123.496673	M 11N 15W 25	Contributor
NEG	2011	2400	0					38.770009	-123.502228	M 11N 15W 26	Contributor
NEG	2011	2400	0					38.774406	-123.516242	M 11N 15W 27	Contributor
NEG	2012	2400	0					38.777482	-123.508707	M 11N 15W 26	Contributor
NEG	2012	2400	0					38.774406	-123.516242	M 11N 15W 27	Contributor
NEG	2012	2400	0					38.765786	-123.514210	M 11N 15W 26	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2012	2400	0					38.765077	-123.502655	M 11N 15W 26	Contributor
NEG	2012	2400	0					38.770009	-123.502228	M 11N 15W 26	Contributor
NEG	2012	2400	0					38.772302	-123.496673	M 11N 15W 25	Contributor
NEG	2012	2400	0					38.777923	-123.485538	M 11N 15W 25	Contributor
NEG	2012	2400	0					38.771008	-123.492923	M 11N 15W 25	Contributor
NEG	2012	2400	0					38.770021	-123.512985	M 11N 15W 26	Contributor
NEG	2012	2400	0					38.759479	-123.502901	M 11N 15W 35	Contributor
NEG	2012	2400	0					38.776040	-123.500132	M 11N 15W 26	Contributor
NEG	2012-03-28	1015-1200	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2012-04-30	1830-1930	0					38.771420	-123.505189	M 11N 15W 26	Activity center
NEG	2013	2400	0					38.777923	-123.485538	M 11N 15W 25	Contributor
NEG	2013	2400	0					38.771008	-123.492923	M 11N 15W 25	Contributor
NEG	2013	2400	0					38.774406	-123.516242	M 11N 15W 27	Contributor
NEG	2013	2400	0					38.770009	-123.502228	M 11N 15W 26	Contributor
NEG	2013	2400	0					38.765077	-123.502655	M 11N 15W 26	Contributor
NEG	2013	2400	0					38.776040	-123.500132	M 11N 15W 26	Contributor
NEG	2013	2400	0					38.777482	-123.508707	M 11N 15W 26	Contributor

Type	*Date*	*Time*	*#Adults*	*Age/Sex*	*Pair*	*Nest*	*#Young*	*Latitude DD NAD83*	*Longitude DD NAD83*	*MTRS*	*Coordinate Source*
NEG	2013	2400	0					38.772302	-123.496673	M 11N 15W 25	Contributor
NEG	2013	2400	0					38.765786	-123.514210	M 11N 15W 26	Contributor
NEG	2013	2400	0					38.770021	-123.512985	M 11N 15W 26	Contributor
NEG	2013	2400	0					38.759479	-123.502901	M 11N 15W 35	Contributor
NEG	2013-03-04	1150-1315	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2013-05-31	1400-1530	0					38.771628	-123.506267	M 11N 15W 26	Section centroid
NEG	2014		0					38.771471	-123.505195	M 11N 15W 26	Activity center
Additional surveys within the search area with no Spotted Owls detected											
NEG	2007-04-25	0031-0041	0					38.783960	-123.526040	M 11N 15W 22	Contributor
NEG	2007-04-25	2317-2327	0					38.791520	-123.532910	M 11N 15W 22	Contributor
NEG	2007-05-12	0019-0029	0					38.783960	-123.526040	M 11N 15W 22	Contributor
NEG	2007-05-12	2331-2341	0					38.791520	-123.532910	M 11N 15W 22	Contributor
NEG	2007-05-18	0112-0122	0					38.791520	-123.532910	M 11N 15W 22	Contributor
NEG	2007-05-18	0143-0153	0					38.783960	-123.526040	M 11N 15W 22	Contributor
NEG	2011	2400	0					38.791520	-123.532910	M 11N 15W 22	Contributor
NEG	2011	2400	0					38.783960	-123.526040	M 11N 15W 22	Contributor
NEG	2012	2400	0					38.791520	-123.532910	M 11N 15W 22	Contributor

395

Type	Date	Time	#Adults	Age/Sex	Pair	Nest	#Young	Latitude DD NAD83	Longitude DD NAD83	MTRS	Coordinate Source
NEG	2012	2400	0					38.796394	-123.532623	M 11N 15W 15	Contributor
NEG	2012	2400	0					38.783960	-123.526040	M 11N 15W 22	Contributor
NEG	2012	2400	0					38.797689	-123.539838	M 11N 15W 16	Contributor
NEG	2012	2400	0					38.801273	-123.535225	M 11N 15W 16	Contributor
NEG	2013	2400	0					38.791520	-123.532910	M 11N 15W 22	Contributor
NEG	2013	2400	0					38.801273	-123.535225	M 11N 15W 16	Contributor
NEG	2013	2400	0					38.783960	-123.526040	M 11N 15W 22	Contributor
NEG	2013	2400	0					38.797689	-123.539838	M 11N 15W 16	Contributor
NEG	2013	2400	0					38.796394	-123.532623	M 11N 15W 15	Contributor

366

Attachment:

Marbled Murrelet (MAMU) Consultation **16-R1-CTP-041-MAMU** for "Green Bridge" Habitat Area in Association with Timber Harvesting Plan (THP) 1-16-094 MEN "Plum" in Mendocino County

The marbled murrelet is a small seabird that nests within multistoried canopies on platforms with surface areas at least 4 inches by 4 inches. MAMU are found in trees with large lateral limbs, epicormic branching, epiphytic growth and/or intertwined branching and are often associated with late seral (post-mature) forests and/or trees with late seral-like structural characteristics.

The marbled murrelet is listed as State endangered pursuant to Fish and Game Code Section (§)2050 *et seq.*, Federally threatened pursuant to Section 1531, Title 16, United States Code (16 U.S.C) *et seq.*, and is a sensitive species as defined by Title 14, California Code of Regulations (14 CCR), §895.1. This consultation is being conducted pursuant to 14 CCR §919.11, which requires consultation with CDFW.

This consultation is in response to potential MAMU nesting habitat observed during the October 17, 2016, pre-harvest inspection of the THP adjacent to the "Green Bridge Habitat Area". The Green Bridge Habitat Area is comprised of several late seral trees and/or tress with late seral characteristics displaying a multistory canopy with large re-iterating limbs and epicormic branching providing suitable platforms for MAMU nesting. This small stand of trees is on the Stillman property north of the Green Bridge and along the left (eastern) bank of the North Fork Gualala River (sees Figure A-1). United States Fish and Wildlife Service (USFWS) identified the Green Bridge Habitat Area as potential habitat requiring technical assistance for an earlier THP in the area (USFWS letter 1-14-2000-837 dated October 3, 2000).

While the nearest MAMU inland detection occurred along Skaggs Creek Road less than 12 air miles south, southeast of the Green Bridge Habitat Area, numerous observations groups of murrelets numbering as many as 12 have been observed toward the end of the breeding season at the mouth of the Gualala River, approximately 2 air miles west of the Green Bridge Habitat Area. Offshore surveys in 2001 detected up to 26 individual murrelets including at least 1 potential juvenile off the southern Gualala coastline (between the mouth of the Gualala and Sea Ranch less than 4 miles to the south, southeast of Gualala).

Proposed activities

The THP proposes timber operations (specifically associated with Unit 1) within 300 feet of the Green Bridge Habitat Area. Operations within Unit 1 include use and maintenance of existing permanent and seasonal appurtenant roads, timber harvesting, and tractor yarding on the existing skid trails. Proposed timber operations within 825 feet of the Green Bridge Habitat Area include use and maintenance of existing permanent and

~~Added 11/19/18~~
Added 1/10/21
per RPF on 3/26/21

366.1

seasonal appurtenant roads, as well as a paved, public road; temporary Class I watercourse crossing installation and removal; timber falling; and tractor yarding on the existing skid trail network, as well as other THP related activities.

The RPF indicated the Green Bridge is not to be used because its structure is insufficient to pass large vehicles, such as logging trucks. Instead, the THP proposes to use a temporary crossing below the Green Bridge for heavy equipment ingress/egress for Unit 1.

For the purposes of consultation 16-R1-CTP-041-MAMU, the existing ambient sound level associated with the Green Bridge Habitat Area shall be *Moderate*[7] (71-80dB) based on the presence of residential traffic crossing the Green Bridge.

Until completed MAMU surveys[8] result in "no detection" CDFW concurrence is amended to the THP, CDFW recommends the THP include the following MAMU protection measures in Section II, Item 32 of the THP:

1. No vegetation modification shall occur within 300 feet of the Green Bridge Habitat Area (see Figure A-1).

2. Based on the ambient noise level *Moderate*[7], during the MAMU breeding season (March 23 through September 15) take avoidance shall include the following measures:

    a. Anticipated project generated sounds exceeding 90 dBs or a "Very High"[9] sound level shall not occur within 330 feet of the Green Bridge Habitat Area during the MAMU breeding season (March 24 through September 15);

    b. Anticipated project generated sounds exceeding 90 dBs or a "Very High"[9] sound level shall not occur within 825 feet of the Green Bridge Habitat Area during the Dawn Period (between 2 hours before sun rise and 2 hours after sunrise) and Dusk Period (between 2 hours before sunset and 2 hours after sunset) within the MAMU breeding season (March 24 through September 15);

    c. Anticipated project generated sounds exceeding 100 dBs or a "Extreme"[9] sound level shall not occur within 825 feet of the Green Bridge Habitat Area during the MAMU breeding season (March 24 through September 15);

---

[7] USFWS Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northern California – 8-14-2006-2887 dated July 31, 2006.

[8] Protocol survey consistent with Mack, D. E., W. P. Ritchie, S. K. Nelson, E. Kuo-Harrison, P. Harrison and T. E. Hamer. 2003. Method for surveying marbled murrelets in forests: a revised protocol for land management and research, Pacific Seabird Group Technical Publication Number 2.

[9] Anticipated sound levels may be assessed using USFWS Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northern California – 8-14-2006-2887 dated July 31, 2006, Table 2. Some Common Sound Levels for Equipment Activity.

per RPF on 3/26/21

1/10/21

ADDED ~~11/19/18~~

   d. Anticipated project generated sounds exceeding 100 dBs or a "Extreme"[9] sound level shall not occur within1,320 feet of the Green Bridge Habitat Area during the Dawn Period (between 2 hours before sun rise and 2 hours after sunrise) and Dusk Period (between 2 hours before sunset and 2 hours after sunset) within the MAMU breeding season (March 24 through September 15).

3. Along the public road and all appurtenant roads within 825 feet of the Green Bridge Habitat Area (see Figure A-2), THP related vehicles shall adhere to the following during the MAMU nesting season (March 24 to September 15):

   a. Do not exceed 15 miles per hour within 2 hours prior to dawn and 2 hours after dusk;

   b. Restrict stopping to the minimum required in order to safely use public and connecting appurtenant roads;

   and

   c. Prohibit log load band tightening.

Year-round protection measures:

4. Workers shall not leave food waste or personal trash within 1,320 feet of the Green Bridge Habitat Area.

5. In the event that a marbled murrelet is found grounded during any activity associated with the THP, CDFW shall be contacted immediately.

Please direct questions or correspondence regarding consultation 16-R1-CTP-041-MAMU to Environmental Scientist Adam Hutchins at (707) 964-1980, or E-mail adam.hutchins@wildlife.ca.gov.

per RPF on 3/26/21

1/10/21

ADDED ~~11/19/18~~

366.3

PART OF PLAN

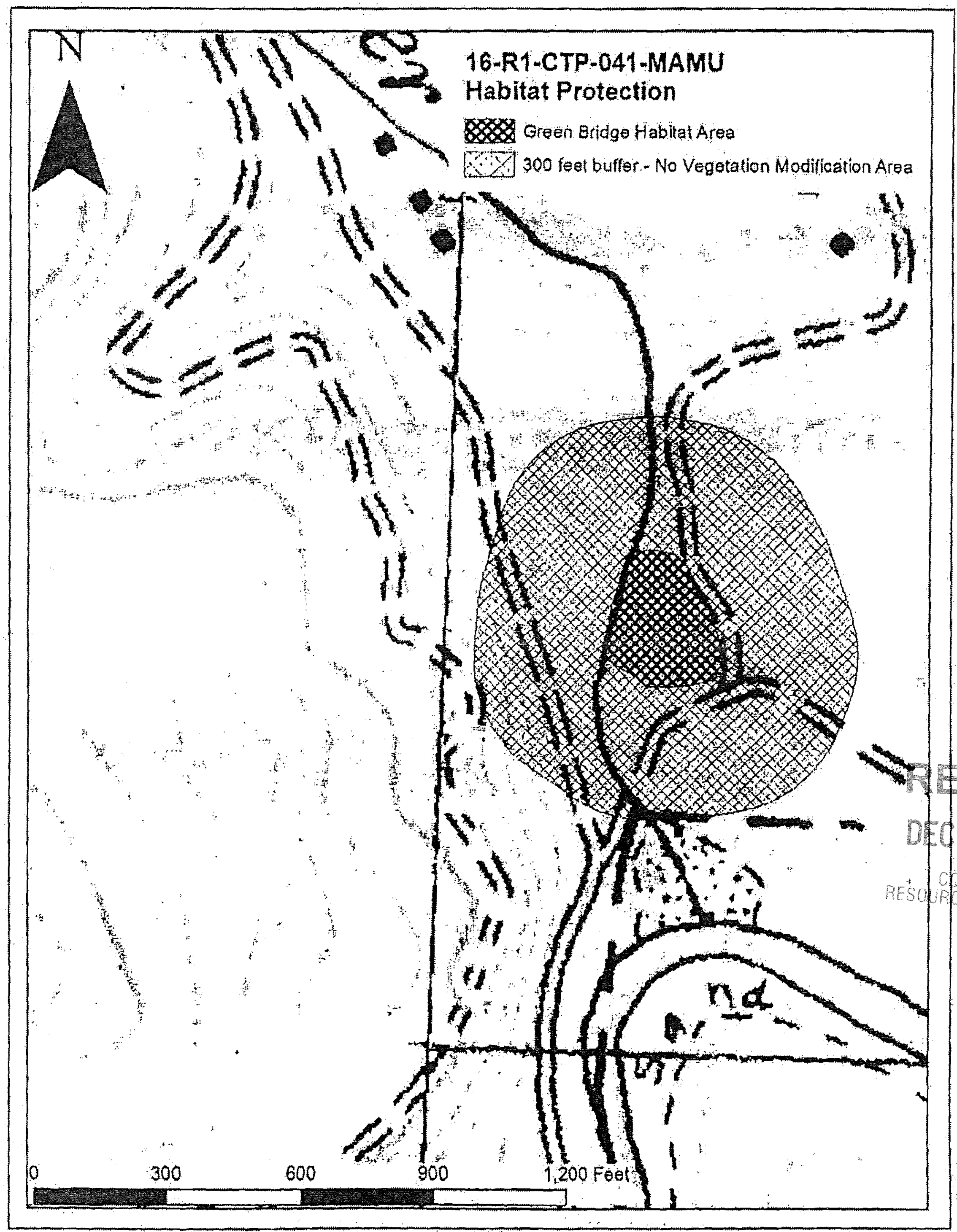


Figure A-1. Green Bridge Habitat Area protection buffer.

366.4

1/10/21

Apped ~~4/19/18~~
per RPF on 3/26/21

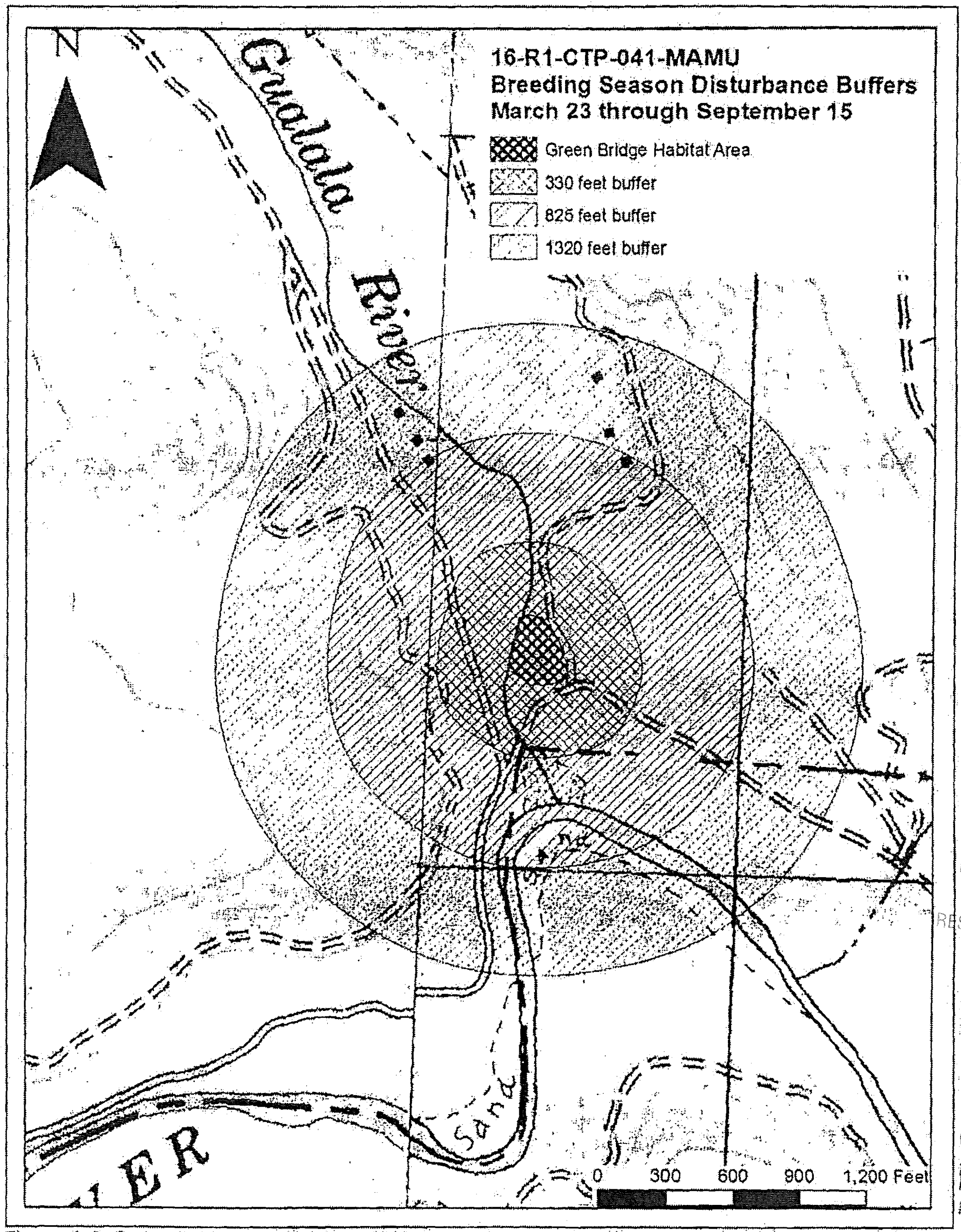


Figure A-2. Green Bridge Habitat Area MAMU breeding season disturbance buffers.

per RPF on 3/26/21
1/10/21
ADDED ~~11/19/18~~

366.5

DRAFT

Drew Coe

Pete Cafferata

Will Olsen

DRAFT LITTLE THP MONITORING QUESTIONS AND PROTOCOLS

The following are suggested conceptual approaches for monitoring the implementation and/or effectiveness of proposed THP BMPs and design elements on riparian/floodprone area soil disturbance and channel migration processes. These conceptual approaches contained herein are subject to change based upon discussion and feedback.

Water Quality Impacts from Soil Disturbance within WLPZs/FPAs

Questions are linked in a manner that will establish cause-and-effect from the proposed management activities and the desired outcomes for the resource of concern (i.e., protecting water quality). The questions are:

1. Are erosion control BMPs being implemented as per the THP mitigation measures and the CA FPRs?
2. What is the degree of soil disturbance from ground-based operations within the WLPZ/FPA following operations?
3. Does soil disturbance result in sediment delivery to the watercourse?

Methods:

For **Question 1**, I suggest utilizing an approach that assesses the success of BMP implementation as per the specifications of the THP. For instance:

- Was skidding confined to pre-mapped (designated) skid trails?
    - How wide were the pre-mapped skid trails?
- Is ground disturbance consistent with the plan requirement to crawler tractors drive with their blade elevated, except as needed to move debris, resulting in no new excavation except at watercourse crossings or to improve conditions at existing site-specific problem areas?
- Were waterbreaks implemented as per the plan requirements? and
- Was slash and/or cover applied to the cover and depth specified in the plan.
- Are all overflow channel open and free to flow water, as specified in the plan.

This establishes whether plan specific BMPs/FPRs were implemented.

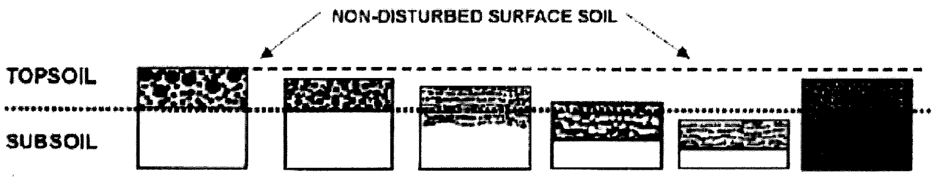
For **Question 2**, I suggest using the Heninger et al. (2002) approach, which is a qualitative method that uses six classes (0 through 5) to characterize the degree of mechanical soil disturbance by heavy equipment. **Question 2** is necessary to answer because we may find that the degree of soil disturbance, irrespective of BMP implementation, is resulting in sediment production and delivery to watercourses.

1/10/21

366.6

DRAFT

SOIL DISTURBANCE CLASSIFICATION



CONDITION:

TOPSOIL	NON-DISTURBED	COMPACTED	PUDDLED	PARTLY REMOVED / PUDDLED	REMOVED	SATURATED
SUBSOIL	NON DISTURBED	SLIGHTLY OR NOT COMPACTED	COMPACTED	MIXED WITH TOPSOIL / PUDDLED	PUDDLED	WATER RESTICTING LAYER OR HIGH WATER TABLE
CLASS:	0	1	2	3	4	5'
	NON-DISTURBED	LIGHT	MODERATE	MODERATE - SEVERE	SEVERE	SEVERE

Figure 1. The Heninger et al. (2002) for classifying mechanical soil disturbance. Figure taken from Chase et al., (2019).

Question 3 will require the survey of WLPZ/FPA skid trails to determine if they deliver sediment from overland flow generation within the skid trail, or whether the skid trails capture overbank flood flows from the LNFG.

Survey Approach:

This approach can be implemented in a variety of ways, but should focus on answering questions at the skid trail segment scale. We suggest monitoring 100% of the skid trails. Monitoring will require staff to identify discrete skid trail segments (i.e., defined by length between two waterbreaks), then characterize the degree of BMP implementation and soil disturbance for 100% of skid trail segments. Variables measured include:

1. Skid trail length;
2. Skid trail width;
3. Disturbance condition.
4. Slash depth
5. Slash coverage as percentage of segment area.

The skid trail network will need to be surveyed after every winter season for 3 years to determine if:

1. Sediment delivered from overland flow generation within the segment; or
2. The skid trail segment/network captured overbank flood flow and subsequently delivered sediment.
3. Whether sediment discharge appears to be chronic or episodic.

1/10/21

366.7

DRAFT

CMZ Effectiveness Monitoring

The primary questions regarding CMZ effectiveness is the following:

4. Did the channel migrate outside of areas delineated as CMZ during the life of the THP?
5. Did the channel migrate outside of the areas delineated as CMZ over a longer time span (e.g., 10-50 years)? Data are to be collected after a major flood event or following large-scale channel modifications.
6. Did the channel migrate into harvested areas?

We suggest focusing on **Questions 1** and **3** during the duration that the THP is active. **Question 3** can be answered at a much later date by digitizing the delineated CMZ and evaluating channel migration relative to the CMZ delineation over time as new information (i.e., LiDAR data; Google Earth imagery) becomes available.

Methods:

We suggest evaluating the presence or absence of channel migration at the six reaches identified in the O'Connor (2019) CMZ evaluation (Figure 1). LiDAR imagery already established the location of the current channel as of 2017. Reaches will be inspected annually after the annual maximum flood to determine the presence of avulsion pathways and/or lateral bank erosion by comparing existing channel banks to those mapped by 2017 LiDAR. Surveys can be as simple as walking the existing channel bank boundary and comparing it to the 2017 LiDAR mapped channel boundaries. Due to measurement error, we will not be able to detect small shifts in the channel. If the presence of channel migration is established, the following questions should be answered:

- Did channel migrate through avulsion or lateral migration?
- What is the spatial extent of migration?
- How did channel erosion interact with harvested areas (i.e., did it preferentially follow areas of ground disturbance and/or tree removal)?

We suggest using WAFB CMZ Board Manual (2004) and Rapp and Abbe (2003) as a basis for mapping the extent of avulsions and/or lateral erosion. Mapping the spatial extent of channel erosion can allow a spatial comparison to the FPA/WLPZs activities (i.e., skidding; degree of basal area removal) to determine how channel migration processes interacted with the harvested areas.

Establish photo points at the six reaches (downstream end) described and mapped in the OECa,b,c (2019) reports.

1/10/21 366.8

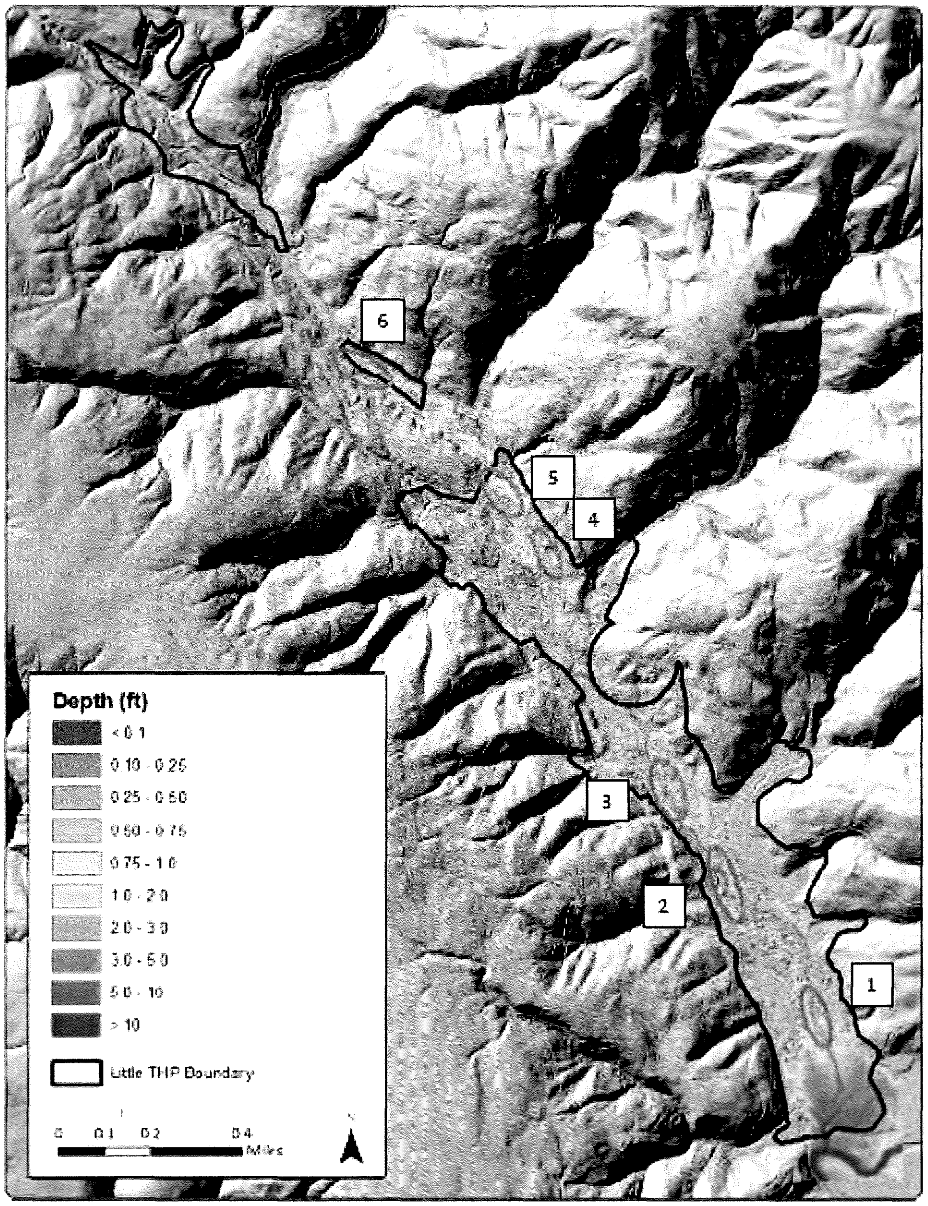


Figure 2. Areas where the presence of channel migration processes should be evaluated during the life of the THP. Figure taken from O'Connor (2019).

References

Chase, C.W., Reiter, M., Homyack, J.A., Jones, J.E. and Sucre, E.B., 2019. Soil disturbance and stream-adjacent disturbance from tethered logging in Oregon and Washington. Forest Ecology and Management, 454, p.117672.

1/10/21

366.9

DRAFT

Heninger, R., Scott, W., Dobkowski, A., Miller, R., Anderson, H. and Duke, S., 2002. Soil disturbance and 10-year growth response of coast Douglas-fir on nontilled and tilled skid trails in the Oregon Cascades. Canadian Journal of Forest Research, 32(2), pp.233-246.

Rapp, C.F. and T.B. Abbe. 2003. A framework for delineating channel migration zones. Washington State Departments of Ecology and Transportation Publication #03-06-027. Olympia, WA. 135 p. https://fortress.wa.gov/ecy/publications/documents/0306027.pdf

WFPB (Washington Forest Practices Board). 2004. Section 2. Standard methods for identifying bankfull channel features and channel migration zones. Forest Practices Board Manual. Washington Department of Natural Resources. Olympia, WA. 69 p.
http://www.dnr.wa.gov/Publications/fp_board_manual_section02.pdf

1/10/21

366.10

UNIT, RPF, PLANSUB, Ca IT, ARV

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404-4731

November 21, 2019

In response refer to:
151416WCR2019SR00221

Nick Kent
Gualala Redwood Timberlands
P.O. Box 197
39951 Old Stage Road
Gualala, California 95445

Dominik Schwab
California Department of Forestry and Fire Protection
135 Ridgeway Avenue
Santa Rosa, California 95401

PART OF PLAN

Dear Messrs. Kent and Schwab:

The purpose of this letter is to provide Technical Assistance to Gualala Redwoods Timberlands (GRT) and California Department of Forestry and Fire Protection (CalFire) from NOAA's National Marine Fisheries Service (NMFS) for the proposed "Little" timber harvest plan 1-18-095-MEN (Little THP). GRT proposes to harvest redwood trees along the Little North Fork Gualala River (LNFGR) in a manner that is consistent with the California Forest Practice Rules (CFPRs) and that will not adversely affect Endangered Species Act (ESA) listed anadromous salmonids. CalFire and GRT has requested technical assistance from NMFS before approving the Little THP.

NMFS' technical assistance is based on: (1) our review of information supplied by Gualala Redwoods Incorporated (GRI)[1] during a meeting on July 1, 2011; (2) two Pre-harvest Site Inspection (PHIs) visits by NMFS staff to the proposed Little THP on July 11, 2019 and August 29, 2019; (3) a project description supplied by GRT via emails from July to September 2019; (4) a meeting with Matt O'Connor of O'Connor Environment Inc., (OEI) on August 15, 2019; (5) NMFS' administrative record regarding the CFPRs (ARN 151416SWR2010SR00347); (6) NMFS final Central California Coast (CCC) coho salmon Recovery Plan (NMFS 2012) and final Multi-Species Recovery Plan (NMFS 2015); and (7) NMFS comments on the Cassidy THP (1-00-101 MEN).[2]

The available information indicates the following ESA-listed species (Distinct Population Segment [DPS]) and (Evolutionarily Significant Unit [ESU]) may be affected by the proposed Little THP:

RECEIVED
MAR 16 2021
COAST AREA
RESOURCE MANAGEMENT

---

[1] In April 2015, GRI was sold to GRT. NMFS understands that GRT will continue harvesting under the same management regime utilized by GRI. Therefore, for purposes of this letter, GRI is synonymous with GRT.

[2] This administrative record includes the Lily THP in 2004 (1-04-032-MEN), which was found to be materially the same as plan as the Cassidy THP.

RECEIVED
NOV 20 2019
COAST AREA OFFICE
RESOURCE MANAGEMENT

1/10/2021

366.11

Northern California (NC) steelhead (*Oncorhynchus mykiss)*
Threatened (71 FR 834; January 5, 2006);
Critical Habitat (70 FR 52488; September 2, 2005);

Central California Coast (CCC) coho salmon (*O. kisutch)*
Endangered (70 FR 37160; June 28, 2005);
Critical Habitat (64 FR 24049; May 5, 1999).

Harvest prescriptions under the Proposed Little THP

Implementation of the Little THP is part of GRT's larger floodplain management plan (FMP). In 2011, GRT shared its forest production modeling of harvesting trees under their FMP relative to a no harvest option. GRT's FMP is intended to achieve the conditions of a "fully functioning forest" as defined by Ligon et al. (1999) and a "properly functioning" forest as described in NMFS and U.S. Fish and Wildlife Service's (USFWS) Aquatic Properly Functioning Conditions Matrix (NMFS and USFW 1997). NMFS and USFWS (1997) describe a "properly functioning" forest as having about 18 trees per acre larger than 40" in diameter at breast height. In general, GRT's FMP will harvest half of the growth that occurs in a stand of trees between harvest intervals (*i.e.*, about 15 years). Using the results of the model, GRT estimates that they will achieve these forest conditions under the FMP and the no harvest option in about 100 years.

The Little THP encompasses approximately 251 acres of floodplain along approximately 3 miles of the LNFGR. There are approximately 21 Class III watercourses that are tributary to the LNFGR. Many of these watercourses never reach the river and instead disappear into the soils of the flood prone area adjacent to the river. As a result, these Class III streams do not directly deliver sediment to the LNFGR. The plan also includes 15 Class II standard watercourses, three Class II large watercourses and one Class I watercourse. Much of the THP Area is within the Watercourse and Lake Protection Zones (WLPZ) of the Class I LNFGR.

In compliance with CFPRs, we understand GRT will implement the following measures as part of the proposed THP for purposes of protecting ESA-listed salmonid species:

1.) A 30-foot (ft.) no harvest buffer (Core Zone) as measured from the Watercourse Transition Line (WTL), as defined in the CFPRs. This comprises about 46 acres of the plan area.
2.) A 120-ft buffer (Inner Zone A) measured from the landward edge of the Core Zone. Inner Zone A is approximately 120 acres of the plan area and will:
    a. retain post-harvest 80% overstory conifer canopy cover;
    b. retain post-harvest the 13 largest trees per acre; and
    c. increase Quadratic Mean Diameter (QMD) of the post-harvest forest stand.
3.) Where Inner Zone A does not encompass the entire 20 year floodplain, Inner Zone B rules will be implemented within that portion of the floodplain[3]. An exception applies to the area in valley constriction point near a spotted owl circle, where Inner Zone B rules will be implemented outside of the 20 year floodplain and extend to the toe of slope.

---

[3] The area occupied by Core Zone, Inner Zone A, and Inner Zone B are part of what the CFPRs refer to as the "Flood Prone Area."

1/10/2021

366.12

Inner Zone B comprises about 25 acres of the plan area and will have the following post-harvest levels:

   a. 50% overstory conifer canopy cover;
   b. retain the 13 largest trees per acre; and
   c. increase QMD.

4.) About 54 acres falls outside any of these protection zones; regular selection harvest will occur in these areas.
5.) GRT estimates that 17% of the conifer basal area will be harvested, leaving about 175-225 sq. ft. of basal area per acre. This remaining basal area is comprised of mostly conifer and some hardwood species.
6.) Tractor use and yarding will be limited to existing skid trails, which minimize adverse effects (e.g., compaction of floodplain soils, diversion of high flows onto roads, etc.). Existing skid roads were selected for reuse where possible to minimize impacts and to protect the hydrologic functions of the flood plain. GRT estimates that only 38% of the existing skid roads are selected for reuse.
7.) There are no new logging roads proposed for construction.
8.) Water drafting may occur at either Horse Shoe Bend on the North Fork Gualala River or at Groshong floodplain hole near the green bridge. At either location, water drafting will be conducted in compliance with NMFS water draft guidelines (NMFS 2001) and by excavating a hole in the gravel bar to divert groundwater (rather than drafting water directly from the active channel).
9.) Timber operations associated with the Little THP will not occur in the winter period, nor any time when saturated soil conditions exist.

Two dimensional modeling for the delineation and mapping of the Flood Prone Area[4] along the LNFGR

Since the adoption of the anadromous salmonid protection rules (ASP rules), the Flood Prone Area (FPA) has been delineated using the field indicators described in the CFPR's definition of a FPA. However, GRT has proposed an alternative way of delineating the FPA along the LNFGR for this THP. Specifically, GRT has utilized a publically available digital terrain Light Detection and Ranging (LIDAR) data set and hydrology data to develop a two dimensional (2-d) hydraulic model that maps out a 20 year recurrence interval flood flow event in the LNFGR. This map is the basis for setting the FPA boundaries in the Little THP. We believe that this is the first time a 2-d hydraulic model has been used for this purpose, at least in this region.

---

[4] The CFPRs define the Flood Prone Area as "an area contiguous to a Watercourse Channel Zone that is periodically flooded by overbank flow. Indicators of flood prone areas may include diverse fluvial landforms, such as overflow side channels or oxbow lakes, hydric vegetation, and deposits of fine-grained sediment between duff layers or on the bark of hardwoods and conifers. The outer boundary of the flood prone area may be determined by field indicators such as the location where valley slope begins (i.e., where there is a substantial% change in slope, including terraces, the toes of the alluvial fan, etc.), a distinct change in soil/plant characteristics, and the absence of silt lines on trees and residual evidence of floatable debris caught in brush or trees. Along laterally stable Watercourses lacking a Channel Migration Zone where the outer boundary of the flood prone area cannot be clearly determined using the field indicators above, it shall be determined based on the area inundated by a 20-year recurrence interval flood flow event, or the elevation equivalent to twice the distance between a thalweg riffle crest and the depth of the channel at Bankfull stage. When both a Channel Migration Zone and flood prone area are present, the boundaries established by the Channel Migration Zone supersede the establishment of a flood prone area."

1/10/2021

366,12a

Ultimately it is CalFire's responsibility to determine whether to accept 2-d modeling results or field indicators as a way to delineate the FPA, consistent with the CFPRs. Based on discussions that occurred during the focused PHI, the 2-d hydraulic model could produce a different FPA boundary than what is mapped with traditional field indicators. For example, the Little THP's FPA boundary informed by the 2-d model is narrower than the FPA boundary informed by the field indicators. Consequently, CalFire's determination of the Little THP's FPA boundary could influence how FPA boundaries are drawn by THP applicants in the future. Given the current state of technology used for 2-d hydraulic modeling, data used to inform modeling, and the prospect of CalFire seeing more 2-d hydraulic models in the future, we recommend the following general principles to consider when using any 2-d hydraulic model to delineate the FPA:

- Although LIDAR are available now and LIDAR Digital Terrain Models (DTM) facilitate 2-d hydraulic modeling, there is often limited hydrology data to input into those models. The lack of hydrology data is a significant limitation for using hydraulic models in forestlands. While it is possible to scale hydrology data from a nearby watershed when no data exists, there is unquantified uncertainty and error inherent in that approach.

- Any hydraulic model used to specify a water surface elevation requires model verification with field data, specifically regarding discharge and water surface elevations. This can be expensive and difficult to obtain.

- The difference in water surface elevation between the 20-year reoccurrence interval flow and a 100-year reoccurrence interval flow is usually within the range of model accuracy in a forested floodplain.

- The standard accuracy for modeled water surface elevations is 0.5ft (+/-), and can be up to 1ft. However, we often see model output with water surface elevations reported to an unrealistic accuracy (*e.g.*, 0.01 ft). CalFire should consider how the FPA boundaries may change within the range of the model's standard accuracy. In a wide low gradient valley, the difference of 0.5ft (+/-) in water surface elevation can result in a significant horizontal distance in inundated area.

- Because it is unlikely that resource agencies will have the capacity to adequately review complex hydraulic models, CalFire should consider the precedent that could be established by accepting a 2-d hydraulic model to delineate the FPA.

- A 2-d hydraulic model can be manipulated to reach a desired outcome, whereas field indicators may provide a more objective assessment of physical variables.

- 2-d hydraulic modeling can be a highly effective tool for identifying, planning, and implementing salmonid habitat restoration and recovery, a key tenant of the ASP Rules.

366, 13

1/10/2021

Review of the 2-d Model and Enhancement measures in the proposed Little THP for ESA-listed salmonids

In reviewing the 2-d hydraulic model for the LNFGR, we have found the modeled floodplain may not substantially support salmonid rearing because large areas of the floodplain are only inundated for a brief period of time (less than 24 hours) and inundation only occurs at infrequent reoccurrence intervals. The model results indicate that the *current*[5] use of this floodplain by anadromous fish is limited to flood refugia, rather than off-channel rearing habitat, and that refuge may be risky due to the very short duration. This is a physical/geometric condition of the channel and floodplain and is likely independent of storm distribution and/or frequency. Specifically, the channel has incised into its floodplain (*i.e.*, the floodplain is not functionally connected to its stream channel). The incised condition in the LNFGR is likely a product of 100 or more years of poor watershed management including, historic logging, historic wood removal from streams, grazing, historic road construction and maintenance, and other historic land use practices described in Church (2012). The LNFGR will likely remain in this condition unless active channel restoration is undertaken.

One of the actions necessary to recover the NC steelhead DPS and CCC coho salmon ESU is more frequent and increased periods of inundation on the LNFGR's floodplain throughout the wet season. The Gualala River represents an independent population for both species. Delisting NC steelhead and CCC coho salmon requires viable independent populations throughout their range and that each independent population meet all the recovery criteria set forth in their respective recovery plans (NMFS 2012, 2015). The LNFGR is located low in the Gualala River watershed just upstream of the confluence of North Fork Gualala River and South Fork Gualala River, which together comprise 98% of Gualala River's basin. In flood events, a backwater forms at the confluence and inundates the LNFGR's floodplain. The inundated floodplain within the backwater has very low velocity relative to the main channel and tributaries. During these flood events, juvenile salmonids from both forks emigrate from the tributaries and can use the floodplain habitat in the lower portion of the watershed as refuge from the high flow velocities during the winter. Therefore, we expect this habitat to be critical for Gualala River's salmonid population when the LNFGR's floodplain is inundated. The LNFGR's floodplain can create ideal conditions for juvenile salmonid growth because the slow water velocity reduces their energy expenditures and the newly inundated terrain increases the abundance and diversity of prey items. Maximizing these conditions can significantly improve opportunities for juvenile salmonid growth. Increases in juvenile salmonid growth increases the probability of ocean survival and adult returns (Quinn 2005). Therefore increasing the frequency and inundation period of the LNFGR's floodplain is expected to produce population benefits in the Gualala River that aide the recovery of the NC steelhead DPS and CCC coho salmon ESU.

For that reason, GRT is currently working with NMFS to implement up to eight Large Woody Debris (LWD) projects to improve these conditions. GRT and NMFS identified the location of the eight LWD projects based on the results of the 2-d model described above. These LWD projects are expected to be relatively large and occupy a high portion of the cross-section area of the active

---

[5] We note that OEI 2019b states that model result "indicates that **potential** use of floodplain habitat by anadromous fish (e.g., coho salmon that could hypothetically be present in the watershed) would be limited primarily to flood refugia rather than off-channel rearing habitat." We believe the potential use of floodplain habitat by anadromous fish should not be measured by the channel's current condition. The LNFGR floodplain offers great potential for off channel rearing habitat in the future.

1/10/2021

366,14

channel so that side channels on the floodplain will be activated during moderate flow evens. Each of the projects will incorporate a mix of key pieces, medium pieces, and slash. These projects will enhance the hydraulic connection among the LNFGR's main channel, floodplain, and associated side channels. A key objective of these projects is to increase the inundation area and duration of the 20-year return interval as modeled by OEI (2019a, b). The purpose of these projects is to enhance salmonid habitat in the LNFGR by creating habitat complexity in the active channel, increase the frequency and duration of inundation on the floodplain, increase the network of anastomosing channels, and improve winter/spring rearing habitat.

We expect these projects will also recruit additional riparian trees through bank scour and by capturing fallen trees from upstream reaches that have transported downstream. The recruited LWD will provide essential cover for migrating adults and for juvenile fish rearing throughout the year. More importantly these habitat features are expected to help retain spawning gravels, reduce redd scour during winter storms, and improve winter rearing habitat. These efforts are consistent with specific recovery actions for the Gualala River identified in the NMFS CCC coho salmon Recovery Plan (*i.e.,* Recovery Actions 6.1.1.1, 6.1.1.2, 6.1.1.3, and 6.1.2.1).

Potential Effects of the Little THP to Listed Salmonids

NMFS' administrative record regarding the CFPRs indicates many of the specific rules may not adequately protect listed salmonids in all circumstances. A review of this administrative record as well as other reports noting the effects of timber harvest (*i.e.,* Ligon *et al.* 1999, Liquori *et al.* 2008, Hicks *et al.* 1991) demonstrates that the potential adverse effects of timber harvest on listed anadromous salmonids results from alterations in watershed hydrology, LWD recruitment to streams, increases in stream temperature, elevated sediment load, and increased nutrient loading. In the following sections we describe the potential effects of the Little THP on key environmental factors, which are relevant to sustaining good quality habitat conditions for steelhead and salmon.

Hydrology

The hydrology of a watershed is controlled by many complex interacting factors. Increases in runoff and peak flows can result from soil compaction along skid trails, harvesting activity, and road construction and drainage that intercepts hillslope hydrology (either from individual harvesting activities or from the combined effects of multiple harvesting operations in drainages that are temporally or spatially related). Such increases in runoff and peak flows could in turn result in incidental take of listed salmonid species or adverse effects to critical habitat.

The effects of temporary changes in watershed hydrology on these species and their habitats are difficult to assess. However, a harvesting-related increase in peak flow could increase the frequency of storm events that mobilize channel substrates and damage developing eggs and alevins in redds. Increased peak flows could also affect the survival of over-wintering juvenile salmonids by displacing them out of preferred habitats. Displacement of juveniles could result in take if the displacement results in killing or injuring individuals.

The extent to which watershed hydrology is altered by the Little THP is a function of the amount and timing of those activities in conjunction with timber harvest activities elsewhere in a sub-basin or watershed. Given the cumulative relationship among those timber harvest activities and

1/10/2021

366,15

increased peak flows, the potential for the Little THP to alter hydrology itself must be viewed as its ability to contribute to cumulative effects.

The potential impacts of altered hydrology due to timber harvest are highly complex; their severity depends on watershed size, type of precipitation, season, flood magnitude (Zeimer and Lisle 1998), density of hydrologically connected roads (Coe 2004) and silvicultural practice (Zeimer 1998). Literature describing the effects of forest management on hydrology has focused on clear-cut harvesting (Zeimer 1998, Lisle *et al.* 2008, Lisle *et al.* 2009). Zeimer (1998) reported a 9% increase in 2-year peak flows following clear-cutting approximately 50% of the North Fork Caspar Creek watershed (5 square kilometers), located in western Mendocino County near Fort Bragg, California. Lisle et al. (2008) reported that clearcutting in Caspar Creek watershed has increased the drainage network by as much as 28%. Munn and Cafferata (1992) suggest timber harvest exceeding 20% of a watershed within a 10-year period could result in consideration of a watershed as "sensitive." Tuttle (1992) recommends that harvesting 15% of a watershed's area with even-aged management (clearcut) within a decade (equating to an annual harvest rate of 1.5%) be used as a threshold for triggering examination of impacts on beneficial uses of water, including for fisheries. In 2006, the North Coast Regional Water Quality Control Board ordered that harvest rates in Elk River and Freshwater Creek (two Humboldt County streams) be limited to approximately 2% per year to minimize harvest-related landslide sediment discharges and reduce nuisance flooding of downstream landowners caused by channel aggradation (North Coast Regional Water Quality Control Board 2006).

In comparison, about 12.8% of the Doty Creek planning watershed area has been subject to timber harvest, including the Little THP, in the past ten years. This is 1.28% per year, a rate of harvest well below any of the thresholds described previously. In addition, the historic rate of harvest in this same area is far greater than the current rate (1.28% per year). The previous THPs that proposed harvesting in this footprint were the Cassidy THP in 2001 (1-00-101 MEN) and the Lily THP in 2004 (1-04-032), which was identical in nature to Cassidy THP. NMFS commented on both plans, stating: "The rate, extent and type of harvesting were found to be extensive and significant. Over a 15-year period [1986-2001], the Little North Fork had 83% of its watershed under timber harvest plans," or 5.53% per year. The historic harvest rate of 5.53% per year not only exceeds all of the thresholds mentioned earlier, but is also nearly five times more than the current rate of harvest.

The Little THP does not propose clearcutting and proposes measures to minimize the potential for this project to alter hydrology (*e.g.,* including overstory conifer canopy requirements, avoiding winter operations, minimizing use of existing skid trails, avoiding skidding or yarding logs across watercourses, treating skid trails). Considering this information, the techniques proposed, and the minimization measures, the Little THP reduces the probability of significant impacts to watershed hydrology, which could adversely affect listed salmonids or their designated critical habitat.

LWD Recruitment

Timber harvesting can reduce short- and long-term recruitment of LWD. Long-term reductions in LWD can result in less stream complexity and reduce the amount of high quality rearing habitat for salmonids. LWD in a watercourse provides for sediment storage and sorting that benefits salmonid habitat. A decline in pool density, pool depth, in-stream cover, and gravel retention is likely to

1/10/2021

366,16

result from reduced levels of LWD. Harvesting practices that result in low levels of instream LWD may, accordingly, impact the growth, survival, and total production of listed salmonids.

Over the long term, much of the LWD that creates and maintains aquatic habitat elements is likely derived from significant geologic events such as major floods, avulsion, and landslides. However, LWD is also recruited frequently when individual trees fall into the stream channel from adjacent riparian forest stands. Therefore, harvesting trees from a floodplain or along a stream may result in a failure to allow short-term and long-term natural recruitment of wood for future habitat. Such habitat alterations may constitute significant modification or degradation of habitat elements that would result in adverse effects to listed salmonids.

The Little THP proposes measures to minimize the potential for short term or long term reduction in LWD recruitment (*e.g.*, placing up to eight LWD structures, retaining the 13 largest trees per acre, placing a no-cut buffer, increased basal area retention in the WLPZ). The implementation of these minimization measures reduce the probability of adverse effects to listed salmonids and their designated critical habitat.

Nutrient Inputs and Shading

Timber harvest in riparian areas can affect productivity of streams in several ways. Removal of canopy cover increases the amount of sunlight reaching the stream and can increase periphyton (algal) production (unless it is limited by nitrogen). This activity may increase the abundance of invertebrates because algae is a higher quality food than leaf or needle litter. However, a beneficial effect to production would only be realized if reduced shading of the riparian vegetation did not also lead to unsuitable water temperatures.

Because site-specific data on nutrient levels in streams within the Little THP is not available, it is unknown whether nutrient levels in area streams are a limiting factor. However, the riparian management for this project will provide effective shading to the LNFGR in the THP area. Based on review of numerous investigations, Johnson and Ryba (1992) concluded that forested buffer widths greater than 100 ft. generally provide the same level of shading as that of an old-growth forest stand. Other authors (*e.g.*, Beschta *et al.* 1987; Murphy 1995) have also concluded that buffers greater than 100 ft. provide adequate shade to stream systems. In addition, the generalized curves from FEMAT (1993) suggests that 100% effective shading is achieved with a riparian buffer of 0.75 site potential tree height. Assuming a site potential tree height of a redwood tree in a site Class I for a 100-year site index is between 180 ft. and 240 ft. (Lindquist and Palley 1963), 100% effective shading is achieved with a riparian buffer of approximately 150 ft. Beschta *et al.* (1987) found that 80% to 90% shade canopy is representative of unmanaged forests in the Pacific Northwest (Beschta *et al.* 1987).

The Little THP has a 30 ft. no cut core zone and a 120 ft. Inner Zone A, which must have 80% overstory conifer canopy for a total buffer of 150 ft. Therefore, measurable increases in the amount of sunlight reaching the streams are unlikely to increase nutrient production that would result in adverse effects to listed salmonids.

1/10/2021

366.17

Altered Stream Temperatures

Timber harvest in riparian areas is known to result in increased solar radiation, which may cause increased daytime summer stream temperatures as well as potentially reduce nighttime and winter stream temperatures. Increases in water temperatures during summer can have negative impacts on salmonids (Beschta *et al.* 1987). Potential impacts of elevated temperatures include a reduction in growth efficiency, increase in disease susceptibility, change in age of smoltification, loss of rearing habitat, and shifts in competitive advantage over non-salmonid species (Hughes and Davis 1986; Reeves *et al.* 1987; Spence *et al.* 1996). Much less is known of the potential impacts of colder nighttime and winter temperatures on streams with reduced canopy and aggraded channels. However, given the moderating climate along the coast of central California, the likelihood that there will be colder water temperatures due to timber harvesting and resultant effects to salmonids is low.

The impact of elevated water temperature tends to be cumulative on a temporal scale, such that short-term increases are less likely to be harmful compared to more chronic increases in water temperature. The potential cumulative or chronic effects associated with temperature would primarily influence juvenile coho salmon and steelhead rearing during summer and early fall.

The rate at which heat and water are delivered to the stream system is generally dictated by external drivers, which form the physical setting of the stream. These drivers include solar radiation, topographic and vegetative shade, air temperature, groundwater temperature and stream discharge (Sullivan et al. 1990, Poole and Berman 2001). Generally timber harvest on floodplains most heavily influences vegetative shade relative to the other variables that affect stream temperature.

Riparian vegetation moderates stream temperatures by providing canopy, which shades the water and reduces the amount of insolation (*i.e.* direct solar radiation) that reaches the water surface (Beschta 1991). Riparian vegetation also minimizes the temperature differential between the air and the water by creating a cool and moist microclimate near the water surface. The influence of riparian vegetation on radiation inputs also generally diminishes in a downstream direction (Spence *et al.* 1996). As streams become larger and wider, riparian vegetation shades a progressively smaller proportion of the water surface (Beschta *et al.* 1987, Gregory *et al.* 1991). The influence of heat energy transfer diminishes as stream flows increase (Beschta *et al.* 1987). Hyporheic flow can affect stream temperature and is influenced by increases in sediment loading and decreases in LWD.

Although the Little THP is relatively low within the watershed, the riparian buffers retained are expected to minimize increases in stream temperatures by retaining shade. Additionally, the Little THP also proposes to implement up to eight LWD structures within the LNFGR to enhance habitat complexity in the active channel, increase the inundation area and duration on the floodplain, increase the network of anastomosing channels, and improve winter rearing habitat. Promoting these features may enhance hyporheic flow through pools and promote stream temperature refuge within specific habitat areas. These measures to minimize effects to stream temperature and hyporheic flow are likely to reduce the probability of adverse effects to listed salmonids.

1/10/2021 366.17a

Sediment Inputs

Floodplains are generally features along a river where sediment is deposited rather than transported (Montgomery and Buffington 1993), provided that the primary beneficial features of the floodplain are not degraded (*e.g.*, thick leaf litter layer, dense canopy cover, and uncompacted soils).

The proposed Little THP contains measures for riparian management, road management, and skid trails, which will minimize sediment input. The riparian management measures are designed to reduce potential harvest-related sediment inputs into the stream channel network through tree retention within WLPZs. Timber operations will not occur in the winter period or during any time period when saturated soil conditions exist, thereby reducing the potential for sediment discharge to the LNFGR. Tractor use and yarding logs along skid trails on the floodplain may degrade some of these features by compacting soils and disturbing the forest floor. However, minimization measures (*e.g.*, limiting tractor use, the yarding of logs using existing skid trails and avoid skidding and yarding across watercourses) will reduce the potential for high flows to cause scour and sediment delivery from the floodplain to the LNFGR.

Safe Harbor Agreements

During our discussions regarding the Little THP, NMFS, and GRT also discussed our interest in salmonid recovery actions within the North Fork Gualala River more generally, including: (1) habitat restoration; (2) coho salmon re-introduction, which could be significantly advanced by reconstruction of the rearing pens on Doty Creek; and (3) fisheries and habitat monitoring. To advance these elements, GRT proposed partnering with NMFS in a Safe Harbor Agreement. We encourage GRT to continue this dialogue and are available to provide assistance.

Summary

Please be advised this letter does not authorize or exempt "take" under the ESA. Incorporating the proposed minimization measures in the Little THP will reduce the probability and magnitude of adverse effects and potential take of listed salmonids that would otherwise occur in the absence of those measures. In addition to this Technical Assistance, please also refer to our Recovery Plans (NMFS 2012 and NMFS 2016) to assist you in identifying biological goals and objectives for recovery of the Gualala River coho salmon and steelhead populations.

Thank you again for the opportunity to comment on the proposed Little THP. Please contact Mr. Dan Wilson at (707) 578-8555, or via email at dan.wilson@noaa.gov should you have any questions concerning this letter.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

1/10/2021

366.18

REFERENCES

Beschta, R. L., R. E. Bilby, et al. (1987). Stream temperature and aquatic habitat: fisheries and forestry interactions. Streamside Management: Forestry and Fishery Interactions. E. O. Salo and T. W. Cundy. Seattle, University of Washington, College of Forest Resources. Contribution No. 57: 191-232.

Beschta, R. L. 1991. Stream habitat management for fish in the northwestern United States: the role of riparian vegetation. Pages 53-58 in American Fisheries Society Symposium.

Church, T. 2012. Understanding wood-pool dynamics using long-term monitoring data from the Gualala River Watershed: What can we learn? University of California, Berkeley. https://escholarship.org/uc/item/4r6894pk

FEMAT. (1993). Forest ecosystem management: an ecological, economic, and social assessment, U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Land Management, and National Park Service; U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service; and the U.S. Environmental Protection Agency.

Gregory, S. V., F. J. Swanson, W. A. McKee, and K. W. Cummins. 1991. An ecosystem perspective of riparian zones: focus on links between land and water. BioScience 41:540-551.

Hicks, B. J., J. D. Hall, et al. (1991). Response of salmonids to habitat changes. Influences of forest and rangeland management on salmonid fishes and their habitats. W. R. Meehan, American Fisheries Society. Chapter 14.

Hughes, R. M., and G. E. Davis. 1986. Production of coexisting juvenile coho salmon and steelhead trout in heated model stream communities. ASTM (American Society for Testing and Materials) Special Technical Publications 920: 322-337.

Johnson, A. W., and D. M. Ryba (1992). A literature review of recommended buffer widths to maintain various functions of stream riparian areas. Seattle Renton, King County Surface Water Management Division: 29

Lindquist, J.L., and M.N. Palley. 1963. *Empirical Yield Tables for Young-Growth Redwood.* California Agriculture Experiment Station Bulletin 796. 477 pp.

Liquori, M., D. Martin, L. Benda, R. Coats, and D. Ganz. Scientific Literature Review of Forest Management Effects on Riparian Functions for Anadromous Salmonid. Report to the California Board of Forestry.

Lisle, T.E., L.M., Reid, and N.J. Dewey. 2008. Effects of clearcut logging on channel form in a coastal redwood forest. American Geophysical Union, Fall Meeting 2008. Abstract

1/10/2021

366,19

Ligon, F., A. Rich, et al. (1999). Report of the scientific review panel on California Forest Practice Rules and salmonid habitat. Sacramento, The Resources Agency of California and the National Marine Fisheries Service: 21.

Montgomery, D. R., and J. M. Buffington (1993). Channel classification, prediction of channel response, and assessment of channel condition: Olympia, Washington State Department of Natural Resources Report: 84.

Murphy, M. L. (1995). Forestry impacts on freshwater habitat of anadromous salmonids in the Pacific Northwest and Alaska -- requirements for protection and restoration, United States Department of Commerce, National Oceanic and Atmospheric Administration, Coastal Ocean Office: 89-101; 119-122.

NMFS and USFWS (National Marine Fisheries Service and U. S. Fish and Wildlife Service). 1997. Aquatic properly functioning condition matrix. NMFS, Southwest Region, Northern California Area Office, Santa Rosa and USFWS, Arcata, California

North Coast Regional Water Quality Control Board. 2006. Watershed-wide waste discharge requirements for timber harvesting plan activities, Salmon Creek Corporation, and the Pacific Lumber Corporation in the Elk River watershed. North Coast Regional Water Quality Control Board, Order No. R1-2006-0039.

OEI 2019a. Floodplain Study for the Little North Fork Gualala River. Prepared by O'Connor Environmental, Inc. P.O. Box 794, 447 Hudson street Healdsburg, CA 95448

OEI 2019b. Floodplain Inundation Duration Study for the Little North Fork Gualala River. Prepared by O'Connor Environmental, Inc. P.O. Box 794, 447 Hudson street Healdsburg, CA 95448

Poole, G. C., and C. H. Berman. 2001. An ecological perspective on in-stream temperature: natural heat dynamics and mechanisms of human-caused thermal degradation. Environmental Management 27:787-802.

Reeves, G. H., and F. H. Everest, et al. (1987). "Interactions between the redside shiner (*Richardsonius balteatus*) and the steelhead trout (*Salmo gairdneri*) in western Oregon: The influence of water temperature." Canadian Journal of Fisheries and Aquatic Sciences 44: 1603-1613.

Spence, B. C., G. A. Lomnnicky, R. M. Hughes, and R. P. Novitzki. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057, Management Technology.

Sullivan, K. J., K. Tooley, J. E. Doughty, and P. K. Caldwell. 1990. Evaluation of prediction models and characterization of stream temperature regimes in Washington. Timber/Fish/Wildlife Report Number TFW-WQ-90-006, Washington Department of Natural Resources, Olympia, Washington.

1/10/2021

366.20

Weaver, W. E., and Hagans, Danny K. (1994). Handbook for forest and ranch roads: a guide for planning, designing, constructing, reconstructing, maintaining and closing wildland roads.

Ziemer, R.R. 1998. Flooding and stormflows. In: Ziemer, Robert R., technical coordinator. Proceedings of the conference on coastal watersheds: the Caspar Creek story, 1998 May 6; Ukiah, CA. General Tech. Rep. PSW GTR-168. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 15-24. Available at: http://www.fs.fed.us/psw/publications/documents/gtr-168/03ziemer.pdf

Ziemer, R.R. and T.E. Lisle. 1998. Chapter 3. Hydrology. Pages 43-68, in: Naiman, R.J., and R.E. Bilby, eds. River Ecology and Management: Lessons from the Pacific Coastal Ecoregion. Springer-Verlag, N.Y. Available at: http://www.humboldt.edu/~rrz7001/pubs/Ziemer98a.PDF

1/10/2021

366.21

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404-4731

UNIT, RPF, PLANSUB, CaIT, ARV

March 30, 2020

In response refer to:
151416WCR2019SR00221

Nick Kent
Gualala Redwood Timberlands
P.O. Box 197
39951 Old Stage Road
Gualala, California 95445

Dominik Schwab
California Department of Forestry and Fire Protection
135 Ridgeway Avenue
Santa Rosa, California 95401

Dear Messrs. Kent and Schwab:

On November 21, 2020, NOAA's National Marine Fisheries Service (NMFS) commented on the proposed "Little" Timber Harvest Plan 1-18-095-MEN (Little THP) on Gualala Redwood Timberlands (GRT) property. In our letter, NMFS commented on the value of implementing up to eight Large Woody Debris (LWD) Projects along the Little North Fork Gualala River. The LWD Projects' key objective is to increase the inundation area and duration of the 20-year return interval as modeled by O'Connor Environmental Inc. (2019a and b), which is contained in the Little THP. NMFS believes these LWD Projects are very important actions, which assist recovery efforts of Endangered Species Act (ESA) listed anadromous salmonids in the Gualala River watershed.

In a field visit on January 23, 2020 and a phone conversation on March 12, 2020, NMFS and GRT evaluated the LWD projects associated with approved THPs in the Gualala River (i.e., 1-16-094-MEN Plum and 1-11-087-SON Kestrel) and reviewed the California Forest Practice Rules (CFPRs) that constrained those projects from working within the wetted channel. Based on these discussions, NMFS and GRT agree the key objective and resource would be best served, if the implementation of the LWD Projects is not conducted via the vehicle of the Little THP approval process. Therefore, we withdraw our recommendation from our 11/21/20 letter, and encourage GRT to develop the LWD Projects via collaborative efforts outside of the THP process. NMFS appreciates GRT's commitment to recovery and encourage you to work with our technical and restoration staff on these projects.

RECEIVED
MAR 16 2021
COAST AREA
RESOURCE MANAGEMENT

PART OF PLAN

RECEIVED
APR 01 2020
COAST AREA
RESOURCE MANAGEMENT

1/10/2021

366.22

Please contact Mr. Dan Wilson at (707) 578-8555, or via email at dan.wilson@noaa.gov should you have any questions concerning this letter.

Sincerely,

Robert Coey
North Coast Branch Chief
California Coastal Office

cc: Jon Hendrix CDFW Region 1. Fort Bragg, California

REFERENCES

OEI 2019a. Floodplain Study for the Little North Fork Gualala River. Prepared by O'Connor Environmental, Inc. P.O. Box 794, 447 Hudson street Healdsburg, CA 95448

OEI 2019b. Floodplain Inundation Duration Study for the Little North Fork Gualala River. Prepared by O'Connor Environmental, Inc. P.O. Box 794, 447 Hudson street Healdsburg, CA 95448

1/10/2021

366.23

Nick Kent
Gualala Redwood Timber, LLC
P.O. Box 197
39951 Old Stage Road
Gualala, CA 95445

January 31th 2020
RE: Plum THP Inventory

Gualala Redwood Timber's Plum Timber Harvest Plan (1-16-094MEN) was partially harvested in 2017. The THP consists of 19 distinct units varying in size from 1.4-acres to 21-acres, totalling 154-acres. Not all of the units were harvested in 2017, only the harvested units were the focus of this inventory. In 2019 the harvested units of the THP were inventoried by Eric Sutera (RPF #2942).

Methodology:

In ArcGIS the THP has been divided into the three zone as required in the California Forest Practice Rules – ASP Flood Plain Rules; Core Zone, Zone A and Zone B. Since no timber operations can take place in the Core Zone, plots were only cruised in the sampling area of Zones A and B. A random 3-chain by 3-chain grid was generated in GIS and randomly placed across the sampling area. Random Plots were selected from this pool for data collection. A total of 29 plots have been cruised, 10 in Zone B and 19 in Zone A.

1/10/2021

366.24

Plot Design:

The plot design is a series of three concentric plots based on the tree diameter at breast height (DBH). The inner plot was a fixed area plot 1/100th acre in size (11.78-ft radius) for measuring all live trees 1-inch to 5.5-inch DBH. All live trees greater than or equal to 5.6-inch in DBH to a maximum DBH of 42.85-inch were measured on 40-BAF prism plot. All live trees greater than 42.85-inch DBH were measured on a 1/4-acre fixed area plot (58.9-ft radius). The Limiting Distance for 42.85-inch DBH tree using a BAF 40 prism, which has a Plot Radius Factor of 1.375, is 58.9-ft, the radius of a 1/4 –acre plot. Plots centers had monument permanently with stakes and measure trees painted.

This concentric design was used to keep the plot size within the given sampling Zone A or Zone B. In most cases across the THP sampling area the Zones were too narrow for standard BAF plots to be used, trees would be sampled inappropriately in adjacent Zones.

Tree measurements consisted of recording the Species, DBH to the nearest 1/10-inch, Total Height, Crown Ratio and Defect in 16-ft logs.

The tree inventory data was compiled using FORSEE.

Inventory Results:

Stand	Species	TPA	BA/Acre
Zone A	Douglas-fir	11.1	8.4
Zone A	Redwood	193.9	396.8
Zone A	Conifers	205.1	405.2
Zone A	Hardwoods	335.7	95.8

Stand	Species	TPA	BA/Acre
Zone B	Douglas-fir	-	-
Zone B	Redwood	243.6	410.9
Zone B	Conifers	243.6	410.9
Zone B	Hardwoods	3.29	8

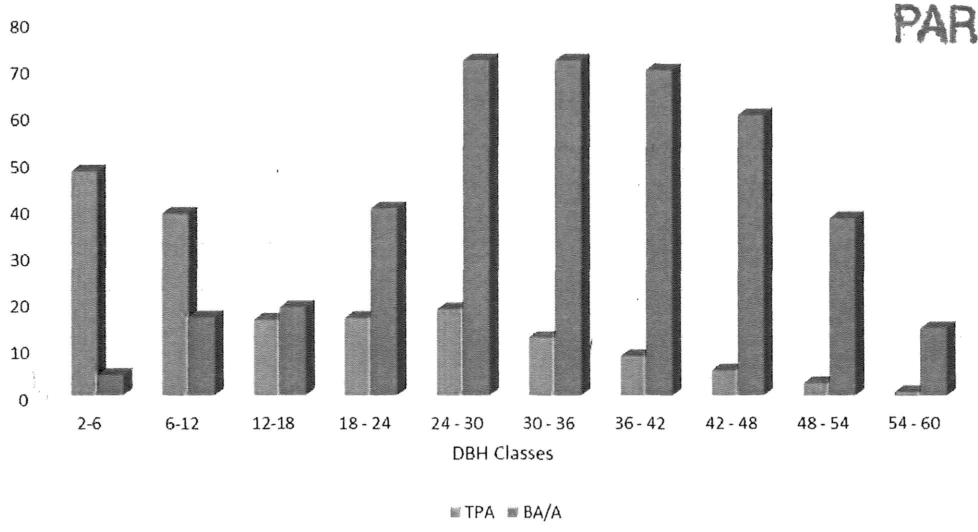
1/10/2021 366.25

Stand	*Species Group*	*DBHClass*	*TPA*	*BA/A*
Zone A	Douglas-fir	2 - 6		
Zone A	Douglas-fir	6 - 12	8.9	4.2
Zone A	Douglas-fir	12 - 18	1.7	2.1
Zone A	Douglas-fir	18 - 24		
Zone A	Douglas-fir	24 - 30		
Zone A	Douglas-fir	30 - 36		
Zone A	Douglas-fir	36 - 42	0.4	2.1
Zone A	Douglas-fir	42 - 48		
Zone A	Douglas-fir	48 - 54		
Zone A	Douglas-fir	54 - 60		

Stand	*Species Group*	*DBHClass*	*TPA*	*BA/A*
Zone A	Redwood	2 - 6	47.9	4.4
Zone A	Redwood	6 - 12	30.0	12.6
Zone A	Redwood	12 - 18	14.4	16.8
Zone A	Redwood	18 - 24	16.6	40
Zone A	Redwood	24 - 30	18.5	71.5
Zone A	Redwood	30 - 36	12.0	69.4
Zone A	Redwood	36 - 42	8.4	69.4
Zone A	Redwood	42 - 48	5.4	59.8
Zone A	Redwood	48 - 54	2.7	37.9
Zone A	Redwood	54 - 60	0.8	14.4

Stand	*Species Group*	*DBHClass*	*TPA*	*BA/A*
Zone A	Conifers	2 - 6	47.9	4.4
Zone A	Conifers	6 - 12	38.9	16.8
Zone A	Conifers	12 - 18	16.2	18.9
Zone A	Conifers	18 - 24	16.6	40
Zone A	Conifers	24 - 30	18.5	71.5
Zone A	Conifers	30 - 36	12.4	71.5
Zone A	Conifers	36 - 42	8.4	69.4
Zone A	Conifers	42 - 48	5.4	59.8
Zone A	Conifers	48 - 54	2.7	37.9
Zone A	Conifers	54 - 60	0.8	14.4

Total Conifer - Zone A



1/10/2021

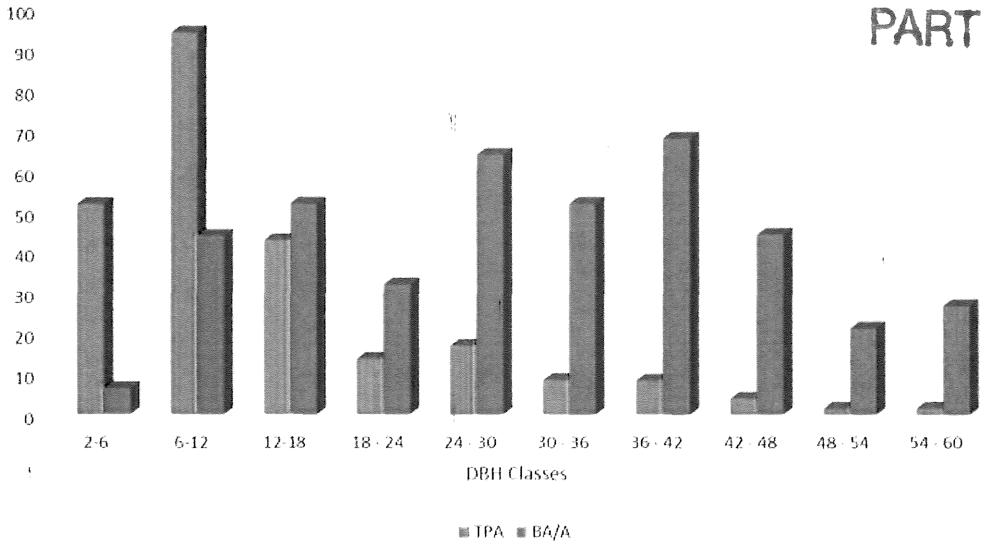
366.26

Stand	Species Group	DBHClass	TPA	BA/A
Zone B	Douglas-fir	2 - 6	-	-
Zone B	Douglas-fir	6 - 12	-	-
Zone B	Douglas-fir	12 - 18	-	-
Zone B	Douglas-fir	18 - 24	-	-
Zone B	Douglas-fir	24 - 30	-	-
Zone B	Douglas-fir	30 - 36	-	-
Zone B	Douglas-fir	36 - 42	-	-
Zone B	Douglas-fir	42 - 48	-	-
Zone B	Douglas-fir	48 - 54	-	-
Zone B	Douglas-fir	54 - 60	-	-

Stand	Species Group	DBHClass	TPA	BA/A
Zone B	Redwood	2 - 6	51.8	6.5
Zone B	Redwood	6 - 12	94	44
Zone B	Redwood	12 - 18	42.9	52
Zone B	Redwood	18 - 24	13.7	32
Zone B	Redwood	24 - 30	17	64
Zone B	Redwood	30 - 36	8.5	52
Zone B	Redwood	36 - 42	8.4	68
Zone B	Redwood	42 - 48	4	44.3
Zone B	Redwood	48 - 54	1.6	21.2
Zone B	Redwood	54 - 60	1.6	26.8

Stand	Species Group	DBHClass	TPA	BA/A
Zone B	Conifers	2 - 6	51.8	6.5
Zone B	Conifers	6 - 12	94	44
Zone B	Conifers	12 - 18	42.95	52
Zone B	Conifers	18 - 24	13.74	32
Zone B	Conifers	24 - 30	17	64
Zone B	Conifers	30 - 36	8.5	52
Zone B	Conifers	36 - 42	8.4	68
Zone B	Conifers	42 - 48	4	44.3
Zone B	Conifers	48 - 54	1.6	21.2
Zone B	Conifers	54 - 60	1.6	26.8

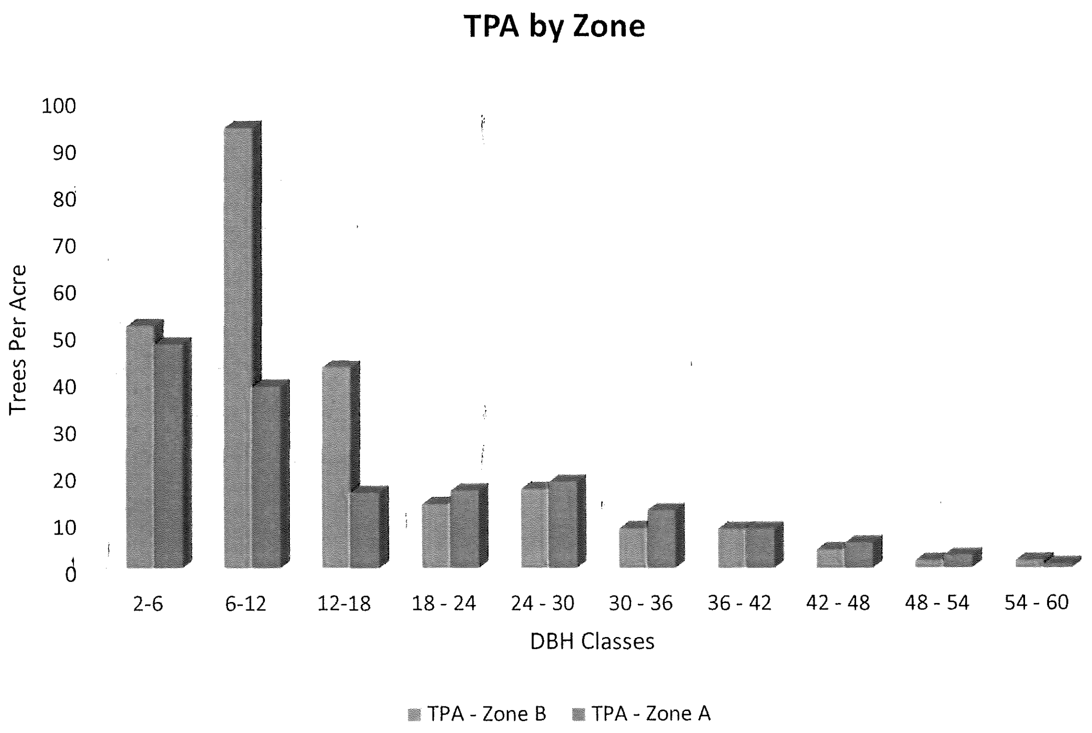
Total Conifer - Zone B

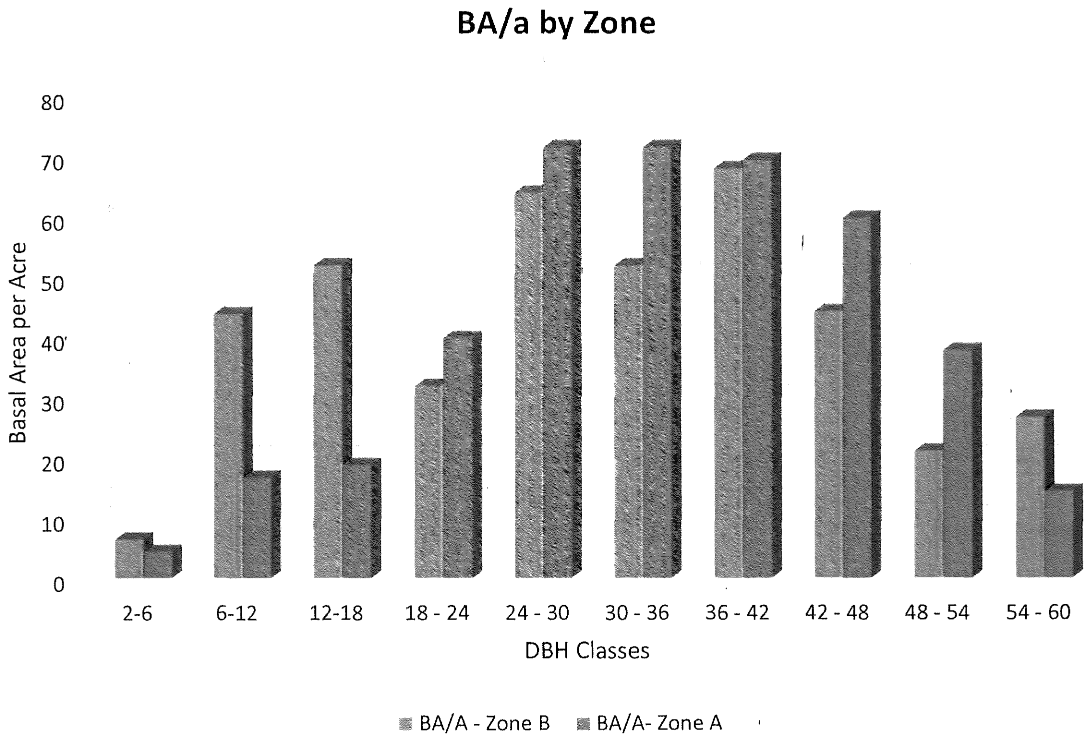


PART OF PLAN

1/10/2021

366.27





1/10/2021

366.28

Floodplain Study of the Little North Fork Gualala River

Prepared for:

Gualala Redwood Timber, LLC
39951 Old State Highway
Gualala, CA 95445

Prepared by:

OEI

O'Connor Environmental, Inc.
P.O. Box 794, 447 Hudson Street
Healdsburg, CA 95448
www.oe-i.com

Matt

PROFESSIONAL GEOLOGIST
M.D. O'Connor
No. 2449
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Matthew O'Connor, PhD, CEG #2449 (Exp. 10-31-21)
President and Principal Geomorphologist/Hydrologist

Jeremy Kobor, MS, PG #9501
Senior Hydrologist

William Creed, BS
Hydrologist

March 21, 2019
Revised June 28, 2019
Second Revision March 9, 2020

1/10/2021

366.29

Contents

1/10/2021

366.30

Introduction

This floodplain study of the Little North Fork Gualala River (Little North Fork) was performed by O'Connor Environmental, Inc. (OEI), for Gualala Redwood Timber, LLC (GRT). The purpose of this analysis was to estimate the extent of the floodplain during a flood event with a 20-year recurrence interval[1] to assist GRT to design its Timber Harvest Plan (THP) in compliance with State regulatory requirements. This study produced maps of floodplain inundation in the Little North Fork valley that are intended to provide a basis for determining the "Flood Prone Area" (FPA) as required for compliance with California Forest Practice Rules (916.9, 936.9, 956.9) referred to as the anadromous salmonid protection (ASP) rules adopted by the State Board of Forestry and Fire Protection in 2009.

The initial study dated March 21, 2019 was based on site visits conducted in late February and early March 2019, hydrologic analysis of stage and streamflow data from nearby stream gauges, and hydraulic modeling analyses that utilized publicly available coastal Mendocino County LiDAR-derived topographic data from 2017. A minor revision dated June 28, 2019 was made to maps showing extent and depth of inundation at the request of State reviewers to improve clarity; there were no substantive revisions.

This document dated February 20, 2020 includes substantive revisions that provide estimates of the extent and depth of inundation of the 20-year floodplain based on (1) a higher base elevation for backwater flooding of the North Fork Gualala and (2) an additional simulation using an alternative estimate of the magnitude of the 20-year flood event. These revisions provide estimates of the extent of the 20-yr floodplain representing the extent of floodplain inundation over a range of estimates for the 20-yr flood discharge.

Regulatory Background and Interpretation

California Department of Forestry and Fire Protection (CAL FIRE) and California Department of Fish and Wildlife (CDFW) provided guidance and interpretation regarding implementation of the applicable rules in the "ASP Rules Question and Answer Document" (June 2014). Guidance regarding the question "how will the FPA be determined in the field?" is quoted below:

> *RPFs should refer to indicators described in the ASP rule FPA definition, as well as the document titled Flood Prone Area Considerations in the Coast Redwood Zone (Cafferata et al. 2005). Other helpful tools for determining the extent of flood prone areas are USGS topographic maps; LIDAR (Light Detection and Ranging) data, which provides high resolution topography; and individual county 100-year flood hazard maps, which depict with reasonable accuracy the extent of relatively flat, floodplains adjacent to streams.*
>
> *Evidence for a flood prone area includes, but is not limited to: (1) flotsam (i.e., material floating on water) hanging in the brush and log jams on top of the surface, (2) fine sediments found in the tree moss and bark, (3) silt, sand, or gravel found immediately under the leaf layer, (4) alluvial materials consisting of silt, sand and gravel that are uncompacted and unconsolidated, (5) a wetter understory plant community with facultative wet and/or wetland obligate species present, (6) disturbance species such as willow, cottonwood and alder present in the overstory canopy, (7) evidence of flowing water, such as scour features, flattened grass or secondary channels formed*

---

[1] A so-called 20-year recurrence interval flood has a probability of occurrence of 0.05 in any single year; the 100-year recurrence interval flood has a probability of occurrence of 0.01 in any single year.

1/10/2021

366.31

> *by scour action of the modern river channel, and (8) the elevation of the surface lies near the elevation of the highest channel features (e.g., log jams and gravel bar surfaces). If some period of time has lapsed since a large flood event, evidence that relates directly to flooding of a surface may be muted (WFPB 2004).*
>
> *RPFs are encouraged to consult with DFW, CAL FIRE, the California Geological Survey (CGS), the Regional Water Quality Control Boards (RWQCBs), and others prior to laying out a project in an area suspected to be prone to flooding. Agency staff can help foresters determine if flood prone areas are present and answer questions about the ASP rules and agency expectations. (pp. 18-19)*

This guidance clearly implies that the FPA determination for any given project would be dependent on several factors, would include consideration of local conditions and watershed setting, and would involve considerable professional judgment in any case. Furthermore, the guidance specifically offers:

> *...helpful tools for determining the extent of flood prone areas are USGS topographic maps; LIDAR (Light Detection and Ranging) data, which provides high resolution topography; and individual county 100-year flood hazard maps, which depict with reasonable accuracy the extent of relatively flat, floodplains adjacent to streams.*

This hydrologic analysis utilizes LiDAR and hydraulic simulation models to represent the extent of the floodplain in a manner similar to that provided in county flood hazard maps with comparable accuracy. The FPA delineation guidance encourages utilization of objective methods as tools to support well-informed professional judgment.

The first sentence of this guidance references the definition given in the ASP rules along with the more scientifically nuanced definitions and guidance provided in the interagency Riparian Protection Committee white paper (Cafferata et al. 2005) for delineating FPA's. In that document, the FPA is defined in the following terms:

> *...the area adjacent to a watercourse or lake that is periodically covered with water and contributes to the interchange between terrestrial and aquatic components of the watershed. The frequency of inundation can vary from more than once a year to greater than every 100 years. Floodplains are a subset of flood prone areas. (pp. 6-7)*
>
> *Hydrologically, the extent of floodplains are defined in terms of their statistical frequency of inundation. (p. 7)*
>
> *Any statistical frequency of a flood event may be chosen, depending on the degree of risk that is selected for evaluation (e.g., 5-year, 20-year, 50-year floodplains). In the North and Central Coast regions, the most biologically critical area is generally considered to be that area inundated at less than or equal to every 20 years, based on coho salmon life cycle requirements. (p. 7)*

Using a relatively accurate floodplain modeling approach to define the FPA for the Little North Fork based on estimated 20-year recurrence interval flood magnitude appears to be a valid approach based on the guidance provided. Other approaches using visual observations of geomorphic indicators to define the FPA are also valid and rely heavily on professional judgment and interpretation of field observations.

1/10/2021

366.32

Summary of Revisions

The revisions in this report address substantive comments pertaining to the original report dated March 21, 2019 submitted to California Department of Forestry and Fire Protection (CAL FIRE) in the THP review process. Comments submitted by Kamman Hydrology & Engineering, Inc. dated October 2, 2019 regarding the initial version of this study dated March 21, 2019, advocated that the combined gage record for the South Fork Gualala nr Annapolis (1951-1971) and South Fork Gualala nr the Sea Ranch (2008-present) might provide a better estimate of Little North Fork discharge. Although we believe that the Navarro River gage record is a more a representative reference gage as discussed herein, we have included the combined South Fork Gualala gage record in this revised analysis and presented a flood analysis based on that record which predicts the 20-yr flood to be two-thirds greater in magnitude.

In addition, we acknowledge evidence in gaging records that the February 27, 2019 flood event was nearer a 5-yr event than a 20-yr event in the Navarro River and the South Fork Gualala River and that our interpretation of the flood event in the Little North Fork (which we reported on within four weeks of the event) incorrectly assumed that the flood event was near or equivalent to the magnitude of a 20-yr flood. Our analysis dated March 21, 2019 used the peak flood elevation reported at the North Fork Gualala River gage for the February 2019 flood event as the downstream backwater elevation and boundary condition for the hydraulic model used to estimate the floodplain extent. Consequently, the hydraulic model likely underestimated the simulated flood elevation to some degree. In this revised analysis, we set the downstream boundary condition to correspond with the elevation of silt lines on redwood trees on the lower floodplain of the Little North Fork thought to correspond to the December 2005 flood event with a recurrence interval > 20 years. This raised the downstream boundary condition by about 1.7 feet.

Finally, in a letter providing "Technical Assistance" to GRT and CAL FIRE pertaining to the THP, the National Marine Fisheries Service (NMFS) opined that there is unquantified uncertainty in the hydraulic simulations resulting from extrapolation of hydrologic inputs from other watersheds and uncertainty in the accuracy of flood elevations associated with hydraulic modeling techniques used in this analysis that report flood elevations to 0.01 ft increments. In this revised analysis, we present the extent of the 20-yr floodplain as a range bounded by two independent estimates of the 20-yr peak discharge with differences in depth of flooding on the Little North Fork floodplain mostly less than 1.0 ft. We believe that representing the estimated 20-yr flood extent in terms of a range of peak flow estimates rather than a single value is an appropriate means to provide quantitative perspective on the implicit uncertainty in this hydrologic and hydraulic simulation.

Site Description

The proposed THP is in the Little North Fork Gualala River watershed in coastal southern Mendocino County. The Little North Fork watershed has a drainage area of approximately 7.3 mi^2 and consists of a narrow, straight valley with relatively steep hillslopes (Figure 1). Elevations range from less than 50 feet on the valley bottom to between about 1,000 and 2,000 feet along the surrounding ridgelines. Based on the PRISM dataset that characterizes spatial variations in long-term precipitation for the continental U.S., mean annual precipitation ranges from 44-62 inches across the watershed (PRISM 2010).

Conditions in this watershed are typical of coastal watersheds in the North Coast region of California. Coastal redwood forest is the dominant land cover type and within the floodplain it is interspersed with riparian galleries and wetland vegetation. Based on the National Resource Conservation Service's (NRCS)

1/10/2021

366.33

Web Soil Survey (WSS), soils including the Dehaven-Hotel and Irmulco-Tramway complexes, tend to be well drained loams and gravelly loams. Tributary channels tend to be confined over most of their length except in their lower reaches where they flow onto the floodplain of the Little North Fork forming shallow alluvial fans with geomorphically-active and variable channel alignments. The valley floor of the Little North Fork coincides with the San Andreas Fault, a major tectonic plate boundary and active fault. The floodplain of the Little North Fork, where most of the proposed THP boundary is situated, is characterized by various levels of incision with secondary high flow channels and perennial wetland areas in the less incised reaches. At its downstream end, the Little North Fork flows into the North Fork Gualala approximately one mile upstream of its confluence with the South Fork Gualala. These much larger watersheds create a backwater condition that inundates a significant portion of the valley bottom of the Little North Fork.

1/10/2021

366.34

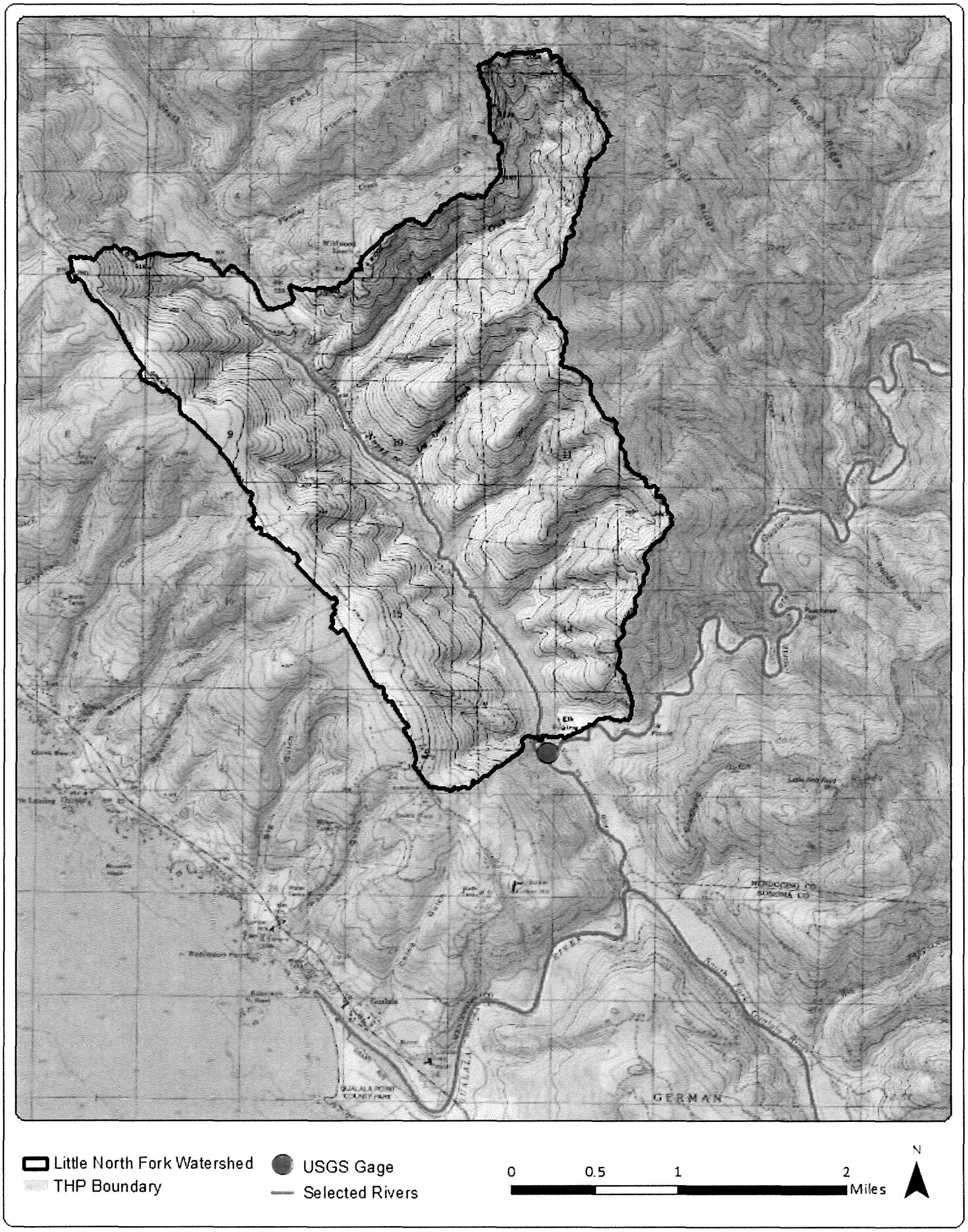


Figure 1: Location of proposed THP within the Little North Fork of the Gualala River watershed.

1/10/2021

366.35

Hydrologic Analysis

Approach

No stream gages or precipitation gages are present in the Little North Fork watershed. We considered various approaches to estimating stream discharge within the Little North Fork. Owing to insufficient data for model calibration and a lack of high-quality local historic precipitation data, it is not possible to directly simulate stormflow runoff driven by precipitation data within the Little North Fork watershed to estimate the 20-year flood discharge with an acceptable degree of certainty. Consequently, the approach to estimating discharge of the Little North Fork was to apply area-normalized discharge from flood frequency analyses performed on larger gaged watersheds within the same coastal region.

Discharge records are available from several other gages in nearby coastal watersheds (Figure 2, Table 1). These include gages operated by the U.S. Geological Survey (USGS) by O'Connor Environmental, Inc. (OEI) in the South Fork Gualala watershed during water years 2006 – 2012 as part of a hydrologic monitoring campaign to establish baseline conditions for a proposed project. Although only two of these gages have a period of record long enough to perform flood-frequency analyses (the minimum is considered to be 10 years for Bulletin 17B methods), observed discharges are useful for evaluating the applicability of area-normalized discharge for estimating flow in the Little North Fork.

Three of these gages were active during the December 31, 2005 flood (the annual peak for Water Year 2005) which is the highest magnitude flood in the Gualala River watershed in the recent history of gaging and the highest peak in the Navarro River since 1974. The 2005 flood was estimated to be a 34-year recurrence interval event based on the flood frequency analysis at the Navarro River gage (Appendix B). Normalized by drainage area, reported peak discharge of the 2005 flood in these three watersheds are quite consistent (195 – 230 cfs/mi^2) across a wide range of drainage areas (1.8 to 303 mi^2, Table 1). These discharges are all within 12% of the normalized discharge of 205 cfs/mi^2 for this event on the Navarro River; the value for the Navarro is in the center of this range of values. Despite local variations in precipitation intensity and other factors, the comparison of area-normalized discharges from these gages suggests that discharges from the Navarro River for relatively low-frequency, high-magnitude floods are representative of area-normalized discharges in other smaller watersheds in the coastal mountains of southern Mendocino County and northern Sonoma County. The Navarro River gage record was initially selected as the primary reference hydrologic record for the Little North Fork because of the length of its hydrologic record and because area normalized peak discharge for the Navarro River is a good estimator of area normalized peak discharge cross a range of drainage areas as shown in Table 1.

Table 1: Area normalized discharges from the December 31, 2005 flood for nearby gaged watersheds.

Gage Name	Opperator	HUC Code	Watershed Area (mi^2)	Length of Record (yrs)	Peak Discharge (cfs)	Peak Discharge (cfs/mi^2)
Navarro River nr Navarro	USGS	11468000	303	69	62,000	205
SF Gualala R nr the Sea Ranch	USGS	11467510	161	33*	N/A	N/A
SF Gualala AB Wheatfield Fk	USGS	11467295	48	3	10,200	212
Wheatfield Fork Gualala AB SF	USGS	11467490	111	5	21,700	195
Francini Creek	OEI	-	1.8	7	414	230

1/10/2021

366.36

PART OF PLAN

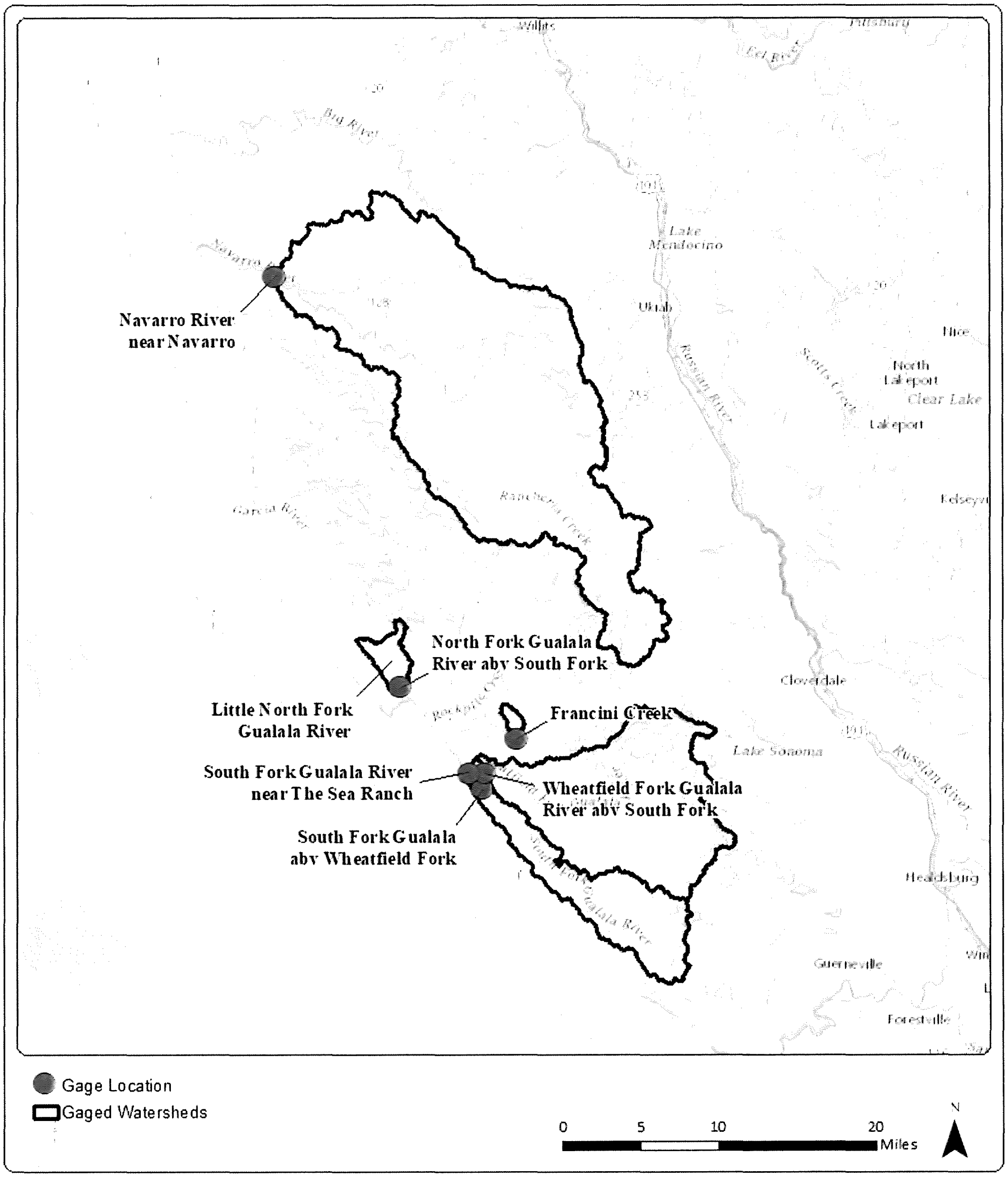


Figure 2: Location of gaged watersheds

Data from the North Fork Gualala gage (USGS 11467553) was also reviewed. Discharge data from 2009 to present from this gage at its current location about 0.1 mile downstream of the Little North Fork confluence is not rated for flow above 400 cubic feet per second (cfs). Stage data from this gage was referenced for the initial model simulations. This gage was also operated in three intervals between October 2000 and September 2006 when it was located approximately 0.7 miles downstream of the

1/10/2021

366.37

confluence with the Little North Fork. The highest discharge measured for this gage location was 1,410 cfs, about one-tenth the peak discharge reported for annual peak in WY 2006 (13,600 cfs) and far above the validated range of the rating curve. Furthermore, this reported flood discharge is potentially erroneous because of backwater effects from peak flow in the South Fork Gualala, the confluence of which is less than one mile downstream on a low slope gradient. Normalized by area, peak discharges reported for the North Fork Gualala gage were as much as eight times higher than other regional gages. Based on the limited extent of high flow measurements used to construct the rating curve for the North Fork Gualala gauge and anomalies in reported annual peak discharges relative other regional gages, we concluded that the discharge data for this site was likely inaccurate and we did not use it in our analysis. It is also worth noting that once the gage was re-installed in 2009, the USGS only reports stage and discharges less than 400 cfs. This is presumably because of the lack of high flow discharge measurements available to constrain the rating curve and/or backwater effects during periods of high flow.

Comparison of Hydrologic Characteristics

In considering the relative applicability of the gage records from the Navarro and the South Fork Gualala as predictors of flood flows in the Little North Fork, we evaluated mean annual precipitation, 25-yr recurrence 24-hr precipitation, and mean saturated hydraulic conductivity of soils in the three watersheds. The two precipitation factors are expected to be positively correlated with the magnitude of peak discharge; the soil factor is expected to be negatively correlated with the magnitude of peak discharge. A more detailed discussion of this comparison is attached (Appendix A); the comparison is summarized in Table 2.

Table 2: Comparison precipitation and soil characteristics between the Little North Fork Gualala River, the Navarro River, and South Fork Gualala River watersheds; mean annual precipitation from Flint & Flint (2014), 25-yr, 24-hour storm depth from NOAA Atlas 14, and saturated hydraulic conductivity from USDA (2007). All values are watershed averages from spatially distributed data.

Watershed	Mean Annual Precip. (in)	MAP Ratio to LNF	Mean 25-yr 24-hr Precip. (in)	Mean 25-yr Ppt. Ratio to LNF	Mean Soil Saturated Hydraulic Conductivity (in/hr)	Mean K-sat Ratio to LNF
Little North Fork	49.8	1	8.3	1	3.4	1
Navarro	46.6	0.94	7.3	0.88	2.4	0.71
South Fork Gualala	57.0	1.14	9.9	1.19	1.1	0.32

It remains our opinion that estimated peak flows in the Little North Fork watershed based on flood frequency analysis for the Navarro River are reasonable. Precipitation and soil characteristics believed to be indicators of peak flow magnitude of the Navarro are more representative of the Little North Fork than those of the South Fork. We believe that estimating peak flows for the Little North Fork based on flood frequency analysis for the South Fork Gualala would substantially overestimate peak flows in the Little North Fork. The longer period of record and verifiable rating curve for the Navarro reduces uncertainty in the estimates relative to uncertainty associated with estimates that could be made from the South Fork hydrographic data.

1/10/2021

366.38

Area-Normalized Discharges: Navarro River near Navarro

A flood frequency analysis was performed on annual peak discharge data from the U.S. Geological Survey (USGS) gage on the Navarro River near Navarro (Gage #11468000, Figure 3). The Navarro gage was selected for this purpose because it is the nearest gage in a coastal watershed with a long period of record to estimate the magnitude of a 20-year recurrence interval flow event with relatively high confidence. It has a continuous streamflow record from 1951 to 2019 and 69 years of reported annual peak discharge data. Although the 303 mi^2 watershed above this gage is significantly larger than the Little North Fork, its climate, landcover, and geomorphology are generally similar to that of the Gualala River watershed.

The flood frequency analysis was performed using USGS's PeakFQ software which implements the USGS's Bulletin 17B flood frequency analysis protocols (Flynn et al., 2006). Based on this analysis, peak stream discharge associated with the 20-year event at the Navarro gage is estimated to be 52,500 cfs (Appendix B). Normalized by watershed area, this is equivalent to 173 cfs/mi^2 or 1,263 cfs in the Little North Fork watershed.

Area-Normalized Discharges: SF Gualala River near the Sea Ranch

Long-term discharge records are also available for the South Fork Gualala River. A 33-year discontinuous record of peak discharges is available from two USGS gages located immediately downstream of the confluence of the mainstem South fork Gualala and the Wheatfield Fork Gualala. A 21-year period of record is available from the USGS gage on the South Fork Gualala River near Annapolis (Gage #11467500; Water Years 1951 – 1971), and a 12-year period of record is available from the USGS gage on the South Fork Gualala River near the Sea Ranch (Gage #11467510; Water Years 2008 – 2019). The current gage location is approximately 0.3 mile downstream of the previous location, and no significant tributaries enter the South Fork Gualala over this distance. Consequently, it is reasonable to combine these data for analysis as a discontinuous record for a single gage site. The rating curve for the current gage includes several high flow discharges measurements of between 10,000 and 20,000 cfs, and likely provides a relatively accurate estimate of peak discharges. Field measurements taken concurrent with the 1951 – 1971 installation of the previous gage are not published on the USGS's National Water Information System (NWIS). However, given that peak discharges from both installations are similar, the rating curves used at the prior installation are also likely reasonably accurate.

A flood frequency analysis was performed using the U.S. Army Corps of Engineers HEC-SSP 2.2 software; outputs from this analysis are provided in Appendix C. This program is capable of a wide variety of hydrologic analyses, including the methodology from the USGS's Bulletin 17C. Using the Bulletin 17C methodology, the 20-year peak discharge for the South Fork Gualala River near the Sea Ranch is estimated to be 46,595 cfs, equivalent to 289 cfs/mi^2. Extrapolated to the Little North Fork watershed (approximately 7.3 mi^2), this yields an estimate for the 20-year peak discharge of approximately 2,106 cfs.

1/10/2021

366.39

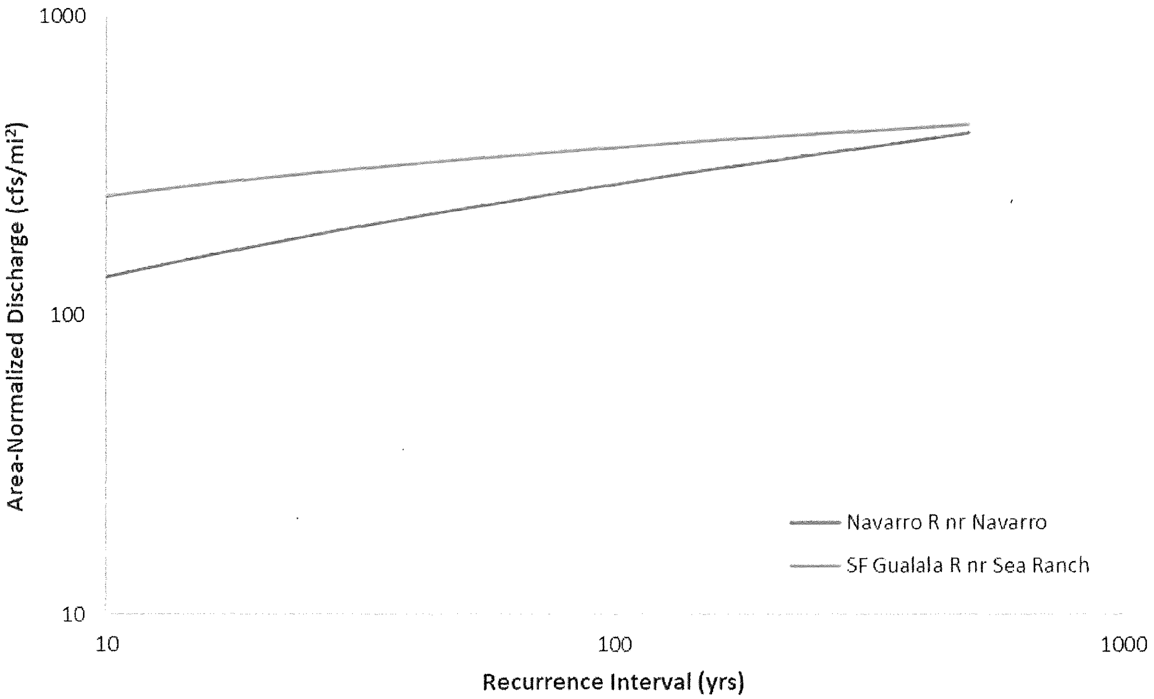


Figure 3: Results of flood frequency analysis for USGS gages on the Navarro River near Navarro and South Fork Gualala River.

Hydraulic Analysis

The area inundated during the 20-year recurrence interval flood event was simulated using the MIKE FLOOD hydraulic model. This model performs both one and two-dimensional hydraulic analyses for different reaches of a single channel and floodplain system. The one-dimensional component of the model (MIKE 11) calculates water levels and discharges using an implicit finite-difference formulation to solve the one-dimensional St. Venant equations for open channel flow (DHI, 2017a). The two-dimensional component (MIKE 21) calculates water levels and discharges using an Alternating Direction Implicit (ADI) technique to integrate the equations for mass and momentum conservation (DHI, 2017b). The model was used to perform a steady-state simulation of 20-year event flow conditions. Separate simulations were run for the two discharge magnitudes identified above. Together these represent the range within which the 20-year peak discharge of Little North Fork is estimated. Consequently, the simulations show the potential range of floodplain area inundated by a 20-year flood event in the Little North Fork.

The model domain consists of the Little North Fork above its confluence with the North Fork of the Gualala River, major tributaries, and associated floodplains. The model was split into upper and lower sections based on a transition from largely confined to more active floodplain conditions (Figure 4). The upper portion of the mainstem, where the channel is largely confined, is represented using a one-dimensional model component. Within the upper portion, inundation is only modeled along the mainstem of the Little North Fork. With the exception of Doty Creek, which is located outside the proposed THP boundaries, all

1/10/2021

366.40

tributaries in the upper portion are small, steep, confined channels with no significant floodplain development. The lower portion of the Little North Fork model domain, which has a relatively wide floodplain and numerous side channels, was represented using a two-dimensional model component. Within the lower portion, inundation was modeled along the mainstem, the nine largest tributaries, and their associated floodplains. Smaller tributaries were not modeled because they are not considered to be significant sources of floodplain inundation and because the LiDAR-based model topography was not sufficiently detailed to accurately capture the geometry of these smaller channels. Runoff from these tributaries was nevertheless simulated and routed to the valley floor.

Topography

Topography in both the 1- and 2-dimensional components of the model was based on a one-meter resolution LiDAR-derived Digital Elevation Model (DEM) of coastal Mendocino County. This LiDAR dataset was flown in 2017 and meets the USGS's standards for Quality Level 1 (QL1) LiDAR topographic data (The Dewberry Companies, Inc., 2017; Heidemann, 2018). Based on field surveys conducted by OEI staff on February 15, 2019, this LiDAR dataset represents the cross-sectional geometry of the mainstem Little North Fork with a reasonable degree of accuracy. It is generally capable of identifying the location and width of smaller tributary channels but may underestimate the depth of these channels, particularly if they are deeply incised (Appendix D).

For the 1-dimensional component of the model, cross-sections were extracted from the LiDAR-derived DEM at regular 100-foot intervals and extended at least one meter above the modeled water surface elevation. Cross-sections were reviewed and alignments and/or locations were adjusted as needed to best represent the variations in cross-sectional geometry along the channel. For the two-dimensional component of the model, the raw one-meter resolution DEM was used as the topographic input. Minor revisions were made to the DEM based on field measurements and professional judgement. Specifically, at several bridges in the model domain, the DEM had been "hydro-flattened" and the resulting bridge spans were significantly wider than measured in the field. The openings of these bridges were revised based on field measurements. In other locations, the forest canopy fully or partially obscured small portions of otherwise well-defined tributary channels in the DEM. The DEM was edited in approximately 15 locations where errors resulted in the filling of otherwise confined sections of channel.

1/10/2021

366.41

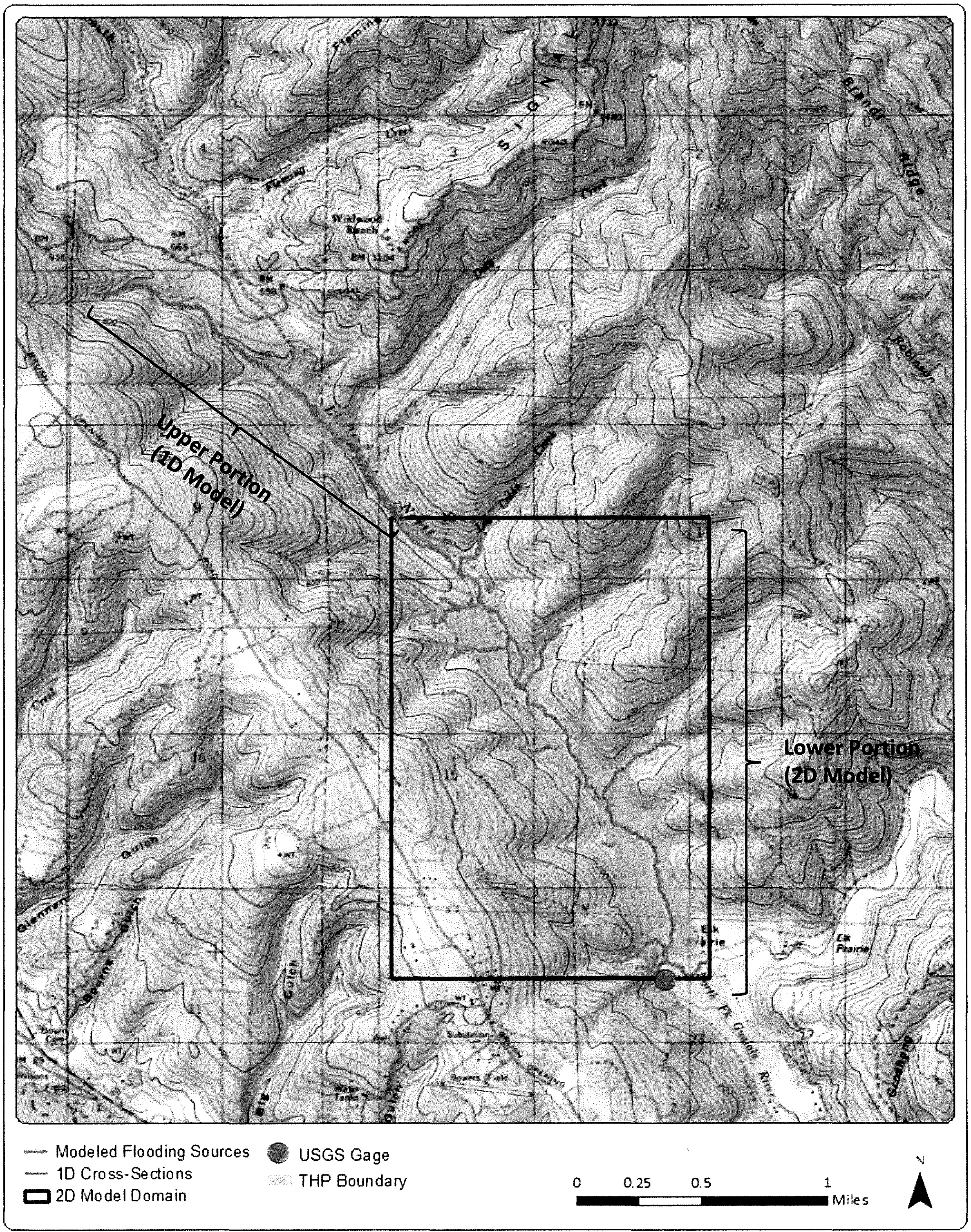


Figure 4: Model domain, upper and lower segments

1/10/2021

366.42

Hydrologic Inputs

The higher magnitude estimate of the area-normalized 20-year peak discharge derived from the South Fork Gualala hydrologic record and the lower magnitude estimate derived from the Navarro hydrologic record were simulated is separate model runs. Separate inputs were developed for both the high and low estimates of the 20-year peak flows; in other respects the two model runs use the same boundary conditions and hydraulic parameters.

The Little North Fork watershed was divided into a series of subwatersheds to facilitate development of hydrologic inputs for the hydraulic model. Discharge from each subwatershed was calculated as the product of subwatershed area and the area-normalized 20-year peak discharge. For the 1-dimensional component of the model, subwatersheds were delineated for all tributaries with a drainage area of 0.10 mi^2 or greater and for discrete reaches of the mainstem between these tributaries (Figure 5). Inflows from significant tributaries were applied to the mainstem as point sources. Inflows from the subwatersheds not associated with tributaries were distributed along the length of each stream reach in the 1-d model.

All inflows to the 2-dimensional component of the model were applied as point sources. For the mainstem and the nine modeled tributaries, subwatersheds were delineated to the upstream-most modeled point and inflows were applied at these locations. For smaller, un-modeled tributaries, subwatersheds were delineated where these channels intersected the floodplain. Flow contributions from the residual valley bottom areas were assigned to the various tributary subwatersheds proportionally based on the relative subwatershed areas (Figure 5).

Boundary Conditions

The water surface elevation at the downstream boundary of the model, which is controlled by complex backwater phenomena of the North and South Fork Gualala Rivers and possibly including tidal influences, was set at a constant elevation. In the absence of an observed water surface elevation from a 20-year event along the North Fork Gualala River, the elevation of this backwater was estimated from silt lines on trees within the lower Little North Fork watershed. Based on measurements taken by OEI staff on February 19, 2019, these silt lines show a maximum backwater elevation of approximately 47.5 feet NAVD near the confluence with the North Fork Gualala (Figure 6).

These silt lines are believed to correspond to the December 31, 2005 flood. On the Navarro, this was the highest magnitude flood since January 1974. A preliminary assessment published by the USGS estimates that for the only nearby gage active at this time with a sufficient period of record to perform a flood frequency analysis, the Navarro River near Navarro gage, this event had between a 10- and 25-year recurrence interval. However, there are discrepancies between the peak discharges published in the preliminary assessment and published in the USGS's National Water Information System (NWIS). Specifically, the preliminary assessment lists a peak discharge of 55,700 cfs whereas NWIS lists a peak discharge of 62,000 cfs. Using this higher discharge and the full period of record used in the Bulletin 17B analysis used to develop hydrologic inputs for this model (WY 1951 – 2019), this event is estimated to have a 34- year recurrence interval. In either case, these silt lines are likely associated with an event with a 20-year or greater return interval and provide a conservative estimate of the backwater elevation that serves as the downstream boundary condition for the hydraulic model.

1/10/2021

366.43

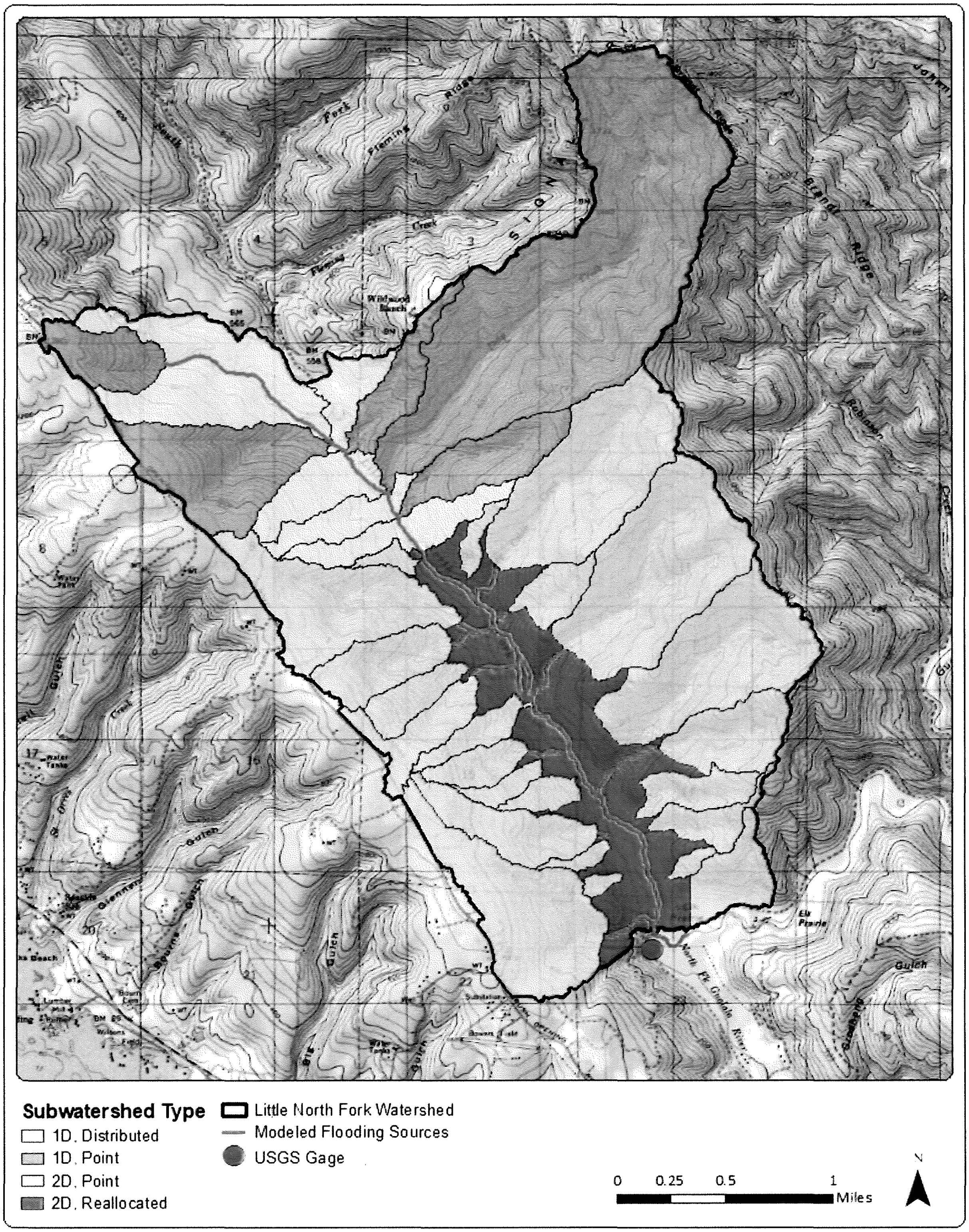


Figure 5: Subwatersheds used to determine hydrologic inputs to the hydraulic model.

PART OF PLAN

O E I

1/10/2021

366.44

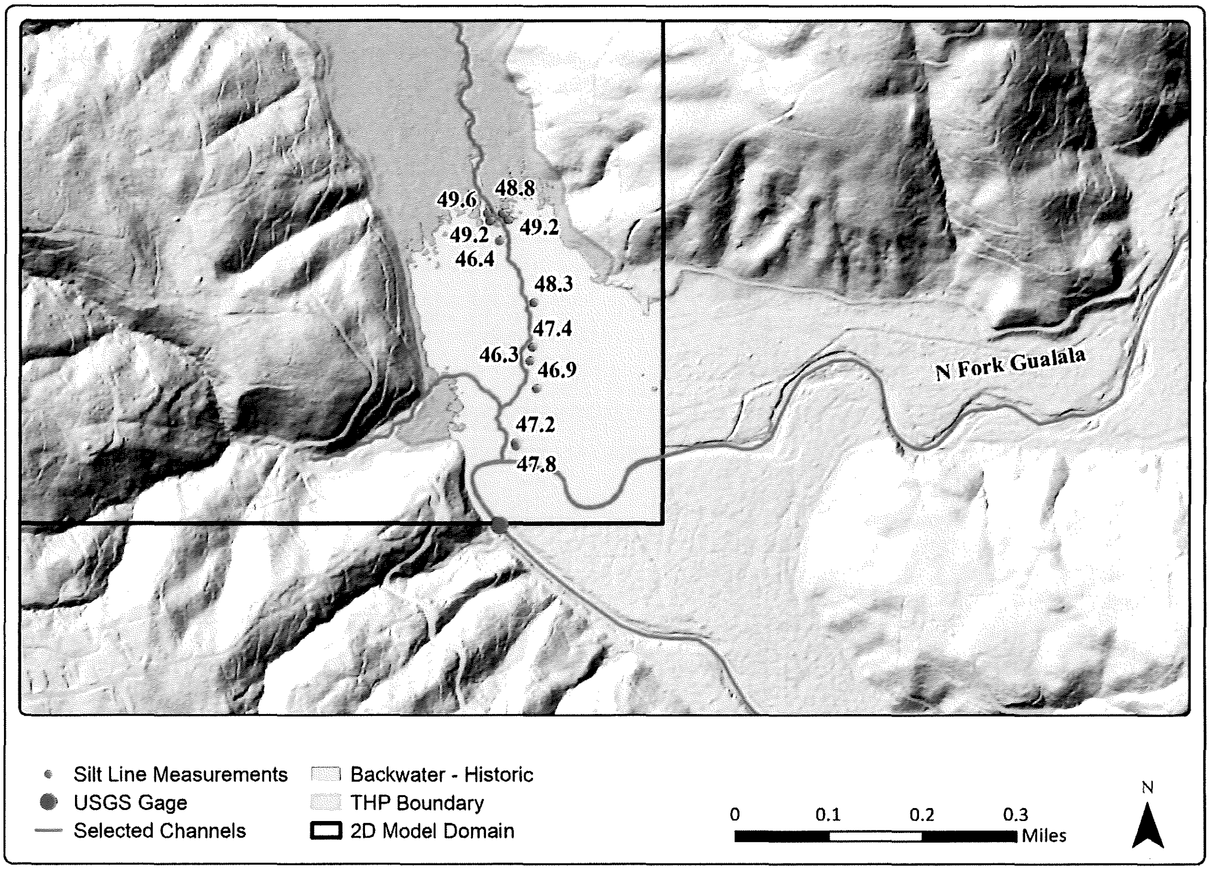


Figure 6: Location of silt lines measurements and estimated backwater extents

Roughness Coefficients

A range of Manning's roughness coefficient (n) was used to represent conditions within the Little North Fork watershed. An n-value of 0.06 was used to represent the mainstem Little North Fork in both components of the model. This value was selected to represent the channel, which is characterized by coarse substrate, modest to large quantities of large woody debris, and relatively dense vegetation along its banks. It was applied between the left and right top-of-bank. Tributary channels also have cobble and gravel-dominated beds but typically do not contain significant bank vegetation or large woody debris. An n-value of 0.04 was used to represent these channels (Chow, 1959) and was applied between the tops of bank. An n-value of 0.10 was used to represent the floodplains which typically contain a mixture of redwoods and riparian tree species with relatively little downed wood, and an herbaceous understory, along with low-relief topographic complexity. These roughness coefficients were used in both the 1- and 2-dimensional components of the model.

Results & Interpretation

The 1- and 2-dimensional model results for both discharge magnitudes were used to generate detailed maps of the range of areas inundated during the 20-year event as shown in Figures 7 and 8 for the full model domain. Larger-scale maps are provided in Appendix E (lower discharge magnitude estimate from the Navarro hydrologic record) and Appendix F (higher discharge magnitude estimate from the South Fork Gualala hydrologic record). Figure 9 compares the extent of inundation predicted with both estimates of

1/10/2021

366.45

the flood magnitude for the 20-year recurrence interval event. The following evaluation of differences in extent of inundation between the two simulations references different portions of the Little North Fork valley identified in Figure 9.

Within the 1-dimensional component of the model in the upstream portion of the model domain flows were confined within the river's banks (between A and B in Figure 9). Some low-lying bars, particularly near the confluence with Doty Creek, are inundated but no widespread, overbank flooding was predicted.

Within the 2-dimensional component of the model domain covering most of the THP, flows in the mainstem Little North Fork are either near bankfull or spilling onto the surrounding floodplain. Characteristics of flooding may be described and interpreted with respect to four distinct zones.

The first of these zones is between B and C in Figure 9. In this area the floodplain across much of the valley bottom is inundated at both discharges. Inundation spans most of the width of the valley bottom and the extent of inundation is not sensitive to increases in discharge. Instead of spreading out, the depth of inundation becomes slightly greater. Comparing Figures 7 and 8, inundation depths are typically between 0.3 and 2.0 feet for the low-end discharge estimate and between 1.0 and 2.0 feet for the high-end discharge estimate.

The second zone extends between C and D in Figure 9. For the lower discharge simulation, flows are largely contained within the main and side channel network, exceeding bankfull depths in a few isolated locations. For the higher discharge simulation, flow exceeds the capacity of the channel and inundates a substantial portion of the valley bottom, expanding the inundated portion of the floodplain by a factor of two or more in most of this zone. Depth of inundation is mostly less than 2.0 feet.

The third zone extends between D and E in Figure 9. Here numerous side channels, old skid roads, and floodplain areas are activated across the width of the valley. While some additional areas are inundated at the higher discharge, these are typically isolated high points between areas already inundated at the lower discharge. Consequently, the perimeter of the inundated area is not very sensitive to changes in discharge. Depths are similar to those in the first zone.

The fourth zone consists of the backwater from the North Fork Gualala River and is downstream of E in Figure 9. In this area, the entire valley bottom in inundated, typically to depths of 4 – 6 feet. Because water surface elevations are controlled by the backwater rather than discharge within the Little North Fork watershed, the depth and extent of inundation is very similar for the two discharges simulated.

Summary

The maps of floodplain inundation in the Little North Fork valley are intended to provide a basis for determining the "Flood Prone Area" (FPA) as required for compliance with California Forest Practice Rules (916.9, 936.9, 956.9) referred to as the anadromous salmonid protection (ASP) rules adopted by the State Board of Forestry and Fire Protection in 2009. This revised analysis provides estimates of the 20-year floodplain for two different estimates of the magnitude of the 20-year flood in the Little North Fork. The lower of these two estimates (1,263 cfs) was derived from flood frequency analysis of the Navarro River gage data and was the estimate used in our initial analysis dated March 21, 2019. The higher estimate (2,106 cfs) was derived from flood frequency analysis of the South Fork Gualala River gage data and is included in this revised analysis in part to represent quantitative uncertainty implicit in this methodology.

1/10/2021

366.46

Although delineating the FPA as a range of values explicitly acknowledges uncertainty in the quantitative methods used, this presents additional challenges regarding how this information should be incorporated in the THP. Consideration of the differential extent of the FPA in relation to the WLPZ zones and protective measures under the ASP rules should be the primary basis for evaluating THP specifications when interpreting the FPA defined by a range rather than a single value.

1/10/2021

366.47

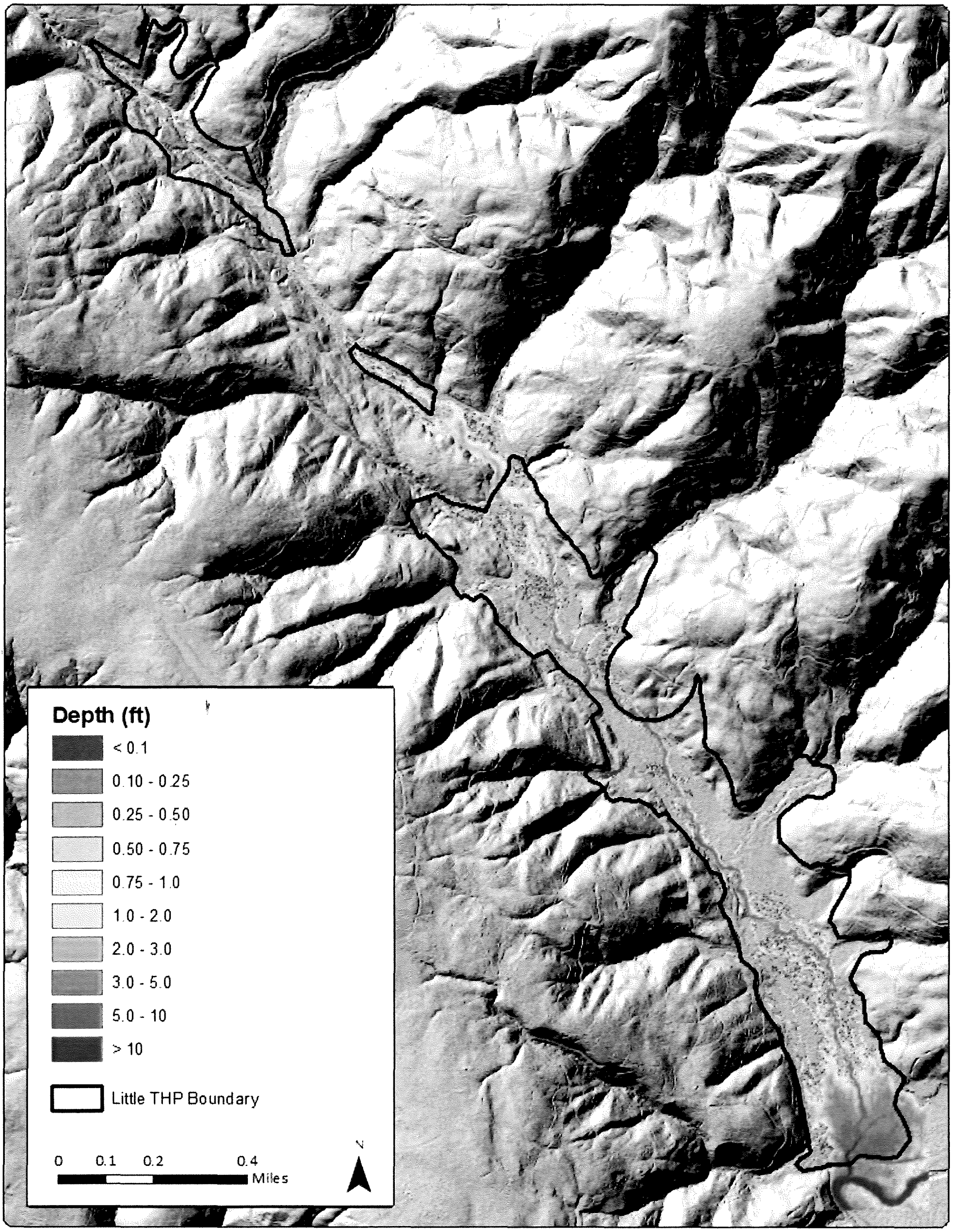


Figure 7: Extent of inundation of estimated 20-yr recurrence interval flood in the Little North Fork watershed using lower discharge estimate based on flood frequency analysis of Navarro River.

1/10/2021

366.48

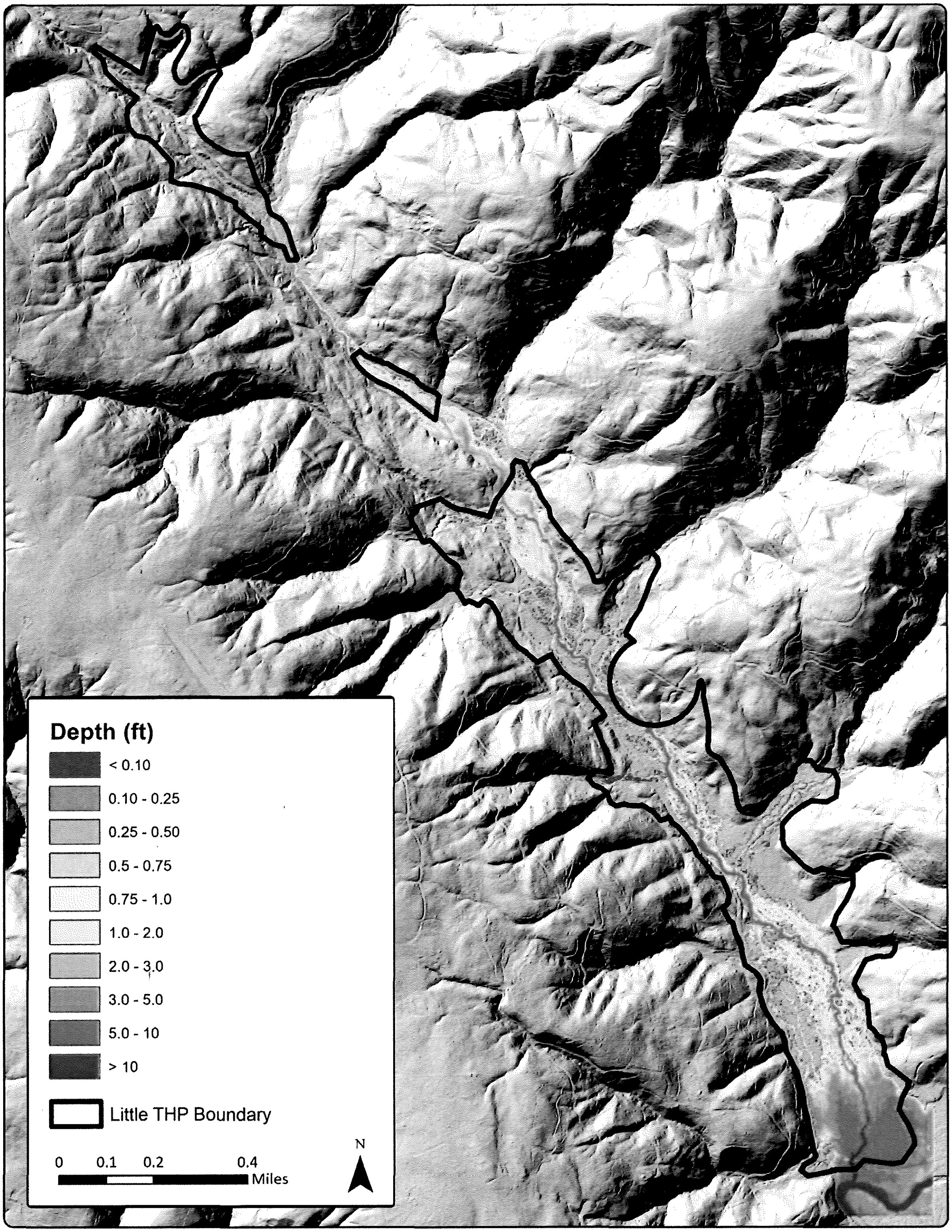


Figure 8: Extent of inundation of estimated 20-yr recurrence interval flood in the Little North Fork watershed using higher discharge estimate based on flood frequency analysis of the South Fork Gualala River.

1/10/2021

366.49

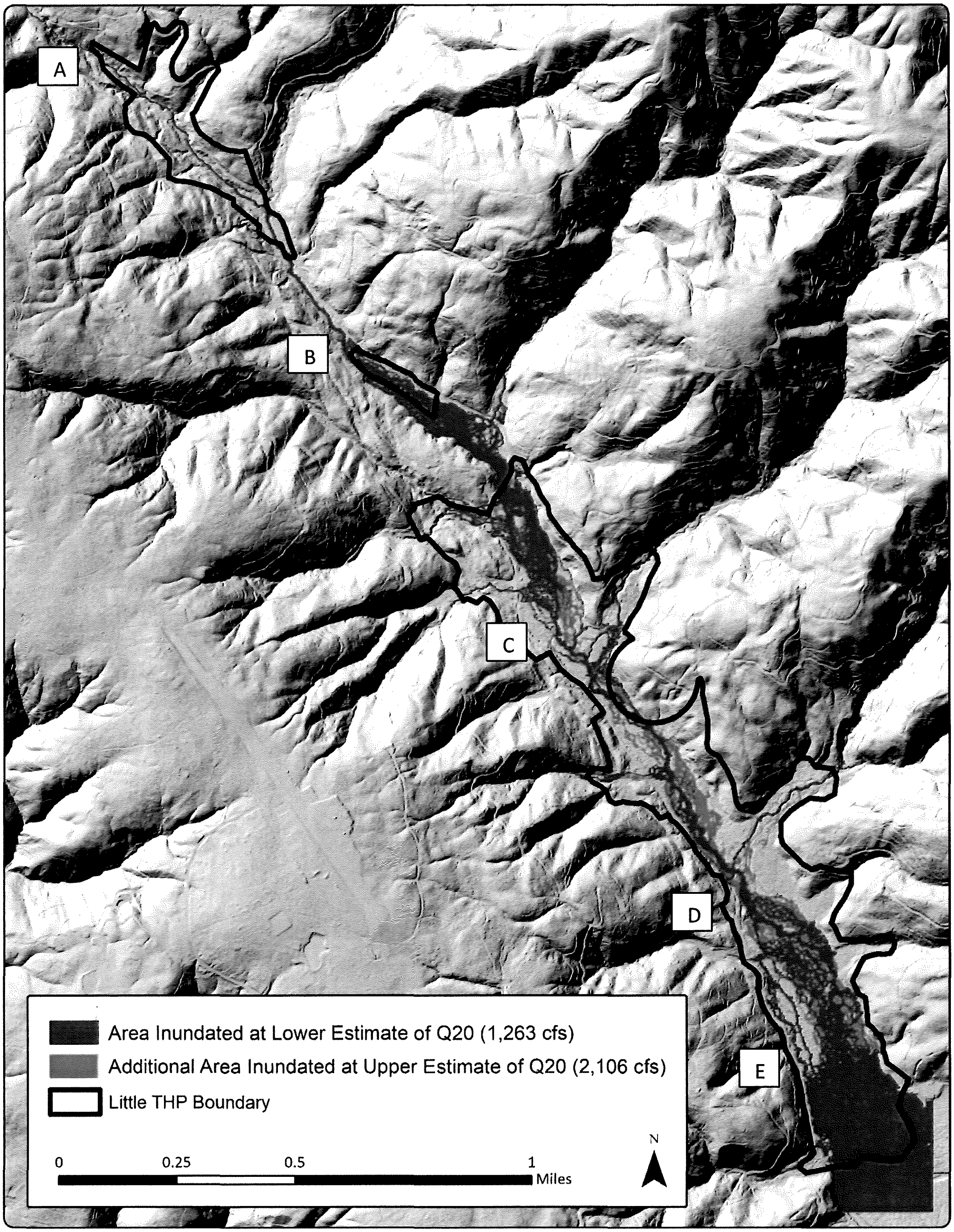


Figure 9: Range in extent of inundation of estimated 20-yr recurrence interval flood modeled in the Little North Fork watershed. See text for discussion and interpretation regarding points A-E.

1/10/2021

366.50

References

Chow, V.T., 1959. Open Channel Hydraulics. The Blackburn Press.

The Dewberry Companies, Inc., 2017. Dewberry to Lead LiDAR Project Covering Six Area in Northern California. The Dewberry Companies, Inc.. http://www.dewberry.com/news/article/2017/08/16/dewberry-to-lead-lidar-project-covering-six-areas-in-northern-california

DHI, 2017a. MIKE 11 – A Modeling System for Rivers and Channels: Reference Manual.

DHI, 2017n. MIKE 21 Flow Model & MIKE 21 Flood Screening Tool – Hydrodynamic Module: Scientific Documentation.

Flynn, K.M., Kirby, W.H., Hummel, P.R., 2006. User's Manual for Program PeakFQ, Annual Flood-Frequency Analysis Using Bulleting 17B Guidelines. Techniques and Methods 4-B4. U.S. Department of the Interior U.S. Geological Survey.

Heidemann, H.K., 2018. National Geospatial Program LiDAR Base Specification Version 1.3. Chapter 4 of Section B of Book 11 – Collection and Delineation of Spatial Data. U.S. Department of the Interior U.S. Geological Survey.

Parrett, C and Hunrichs, R.A., 2006. Storms and Flooding in California in December 2005 and January 2006 – A Preliminary Assessment. Open-File Report 2006-1182. U.S. Department of the Interior U.S. Geological Survey.

PRISM, 2010. 30 arcsecond resolution gridded total precipitation data for the conterminous United States, PRISM Climate Group, Oregon State University, www.prismclimate.org.

1/10/2021

366.51

APPENDIX A

COMPARISON OF HYDROLOGIC FACTORS FOR LITTLE NORTH FORK GUALALA RIVER, NAVARRO RIVER AND SOUTH FORK GUALALA RIVER

1/10/2021

366.52

There are several factors to be considered when choosing among alternative stream gage records to be extrapolated to an ungaged watershed. One of the chief factors is the duration of the gaging record, which correlates with statistical uncertainty of flood frequency analysis. The Navarro River data are clearly preferable with respect to this criterion. The Navarro River gage record spans a period of 69 years through Water Year 2019. The South Fork Gualala River gage record encompasses 33 Water Years, with a 37-year gap between two separate periods of gaging.

Another set of factors that can be considered are hydrologic characteristics that are associated with generation of peak streamflow from storm runoff. In reviewing our initial selection of the Navarro River hydrologic data as the basis for estimating peak flows in the Little North Fork, we compared three watershed hydrologic factors likely to correlate with the relative magnitude of peak discharge across the Navarro, the South Fork Gualala, and the Little North Fork Gualala watersheds. We compared spatial averages of two precipitation characteristics (mean annual precipitation and depth of the 25-yr 24-hr precipitation event) and saturated hydraulic conductivity of the soil column (K-sat). The two precipitation factors are expected to be positively correlated with the magnitude of peak discharge; the soil factor is expected to be negatively correlated with the magnitude of peak discharge. The comparison of these factors is summarized in Table A1.

Table A1: Comparison precipitation and soil characteristics between the Little North Fork Gualala River, the Navarro River, and South Fork Gualala River watersheds; mean annual precipitation from Flint & Flint (2014), 25-yr, 24-hour storm depth from NOAA Atlas 14, and saturated hydraulic conductivity from USDA (2007). All values are watershed averages from spatially distributed data.

Watershed	Mean Annual Precip. (in)	MAP Ratio to LNF	Mean 25-yr 24-hr Precip. (in)	Mean 25-yr Ppt. Ratio to LNF	Mean Soil Saturated Hydraulic Conductivity (in/hr)	Mean K-sat Ratio to LNF
Little North Fork	49.8	1	8.3	1	3.4	1
Navarro	46.6	0.94	7.3	0.88	2.4	0.71
South Fork Gualala	57.0	1.14	9.9	1.19	1.1	0.32

The date in Table A1 indicate that the characteristics of the Navarro watershed more closely match those of the Little North Fork Gualala than do those of the South Fork Gualala. The ratio of the value of each hydrologic characteristic to the value of the characteristic in the Little North Fork provides a semi-quantitative measure of relative similarity.

Based on mean annual precipitation data (Figure A1) from the regional rainfall-runoff simulation Basin Characterization Model (Flint & Flint, 2014), the South Fork receives approximately 14% more precipitation on an annual basis than the Little North Fork. Based on precipitation-frequency relationships from NOAA Atlas 14 (Figure A2), the South Fork also receives 19% more precipitation than the Little North Fork during the 25-year, 24-hour storm. In comparison, the Navarro is somewhat drier than the Little North Fork receiving approximately 7% less precipitation on an annual basis and 12% less during a 25-yr 24-hr storm.

Another critical factor affecting peak stream discharge is the capacity of the soil to infiltrate precipitation; when precipitation rates approach or exceed infiltration rates, the rate of storm runoff increases. A commonly used measure of soil infiltration capacity is saturated hydraulic conductivity of the soil (K-sat).

1/10/2021

366.53

We compiled K-sat data for the three watersheds (Figure A3) from the Soil Survey Geographic Database (USDA, 2007) and found that the average K-sat for the South Fork is only 32% of the value for the Little North Fork, whereas the average value for the Navarro is 71%. Although precipitation rates rarely exceed infiltration rates in this region where saturation overland flow is the typical surface process generating storm runoff, the lower K-sat values in the gauged watersheds would be expected to correlate with higher runoff rates relative to the Little North Fork. The average soil infiltration rate in the Navarro is more representative of the Little North Fork than that of the South Fork. The low K-sat values in the South Fork suggest that this watershed would generate relatively high rates of runoff per unit of precipitation during high-magnitude, low-frequency storm events compared to the Little North Fork.

Finally, the lower soil infiltration rates in the Navarro River compared to the Little North Fork would tend to counteract the effect of the lower precipitation rates in the Navarro that would be expected to produce underestimates of peak discharge in the Little North Fork. In contrast, the much lower infiltration rate in the South Fork Gualala relative to the Little North Fork reinforces the effect of higher precipitation rates in the South Fork Gualala relative to the Little North Fork. Hence, we believe the Navarro may somewhat underpredict peak discharge in the Little North Fork Gualala and that the South Fork Gualala is likely to overpredict peak discharge in the Little North Gualala.

In summary, it is our opinion that estimated peak flows in the Little North Fork watershed based on flood frequency analysis for the Navarro River are reasonable. We believe that estimating peak flows for the Little North Fork based on flood frequency analysis for the South Fork Gualala would significantly overestimate peak flows in the Little North Fork. The longer period of record and verifiable rating curve for the Navarro reduces uncertainty in the estimates relative to uncertainty associated with estimates that could be made from the South Fork hydrographic data. More importantly, precipitation and soil characteristics believed to strongly influence peak flow magnitudes of the Navarro are more representative of the Little North Fork than those of the South Fork.

References Cited

Flint, L.E. and Flint, A.L., 2014, California Basin Characterization Model: A Dataset of Historical and Future Hydrologic Response to Climate Change, (ver. 1.1, May 2017): U.S. Geological Survey Data Release, https://doi.org/10.5066/F76T0JPB.

Perica, S. et al., 2011, NOAA Atlas 14, Precipitation-Frequency Atlas of the United States, Vol. 6 Version 2.3: California. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Silver Spring, MD. Revised 2014

United States Department of Agriculture (USDA), 2007. Natural Resource Conservation Service, Soil Survey Geographic Database (SSURGO) for Sonoma County and Mendocino County, California, Washington DC, http://soildatamart.nrcs.usda.gov.

1/10/2021

366.54

PART OF PLAN

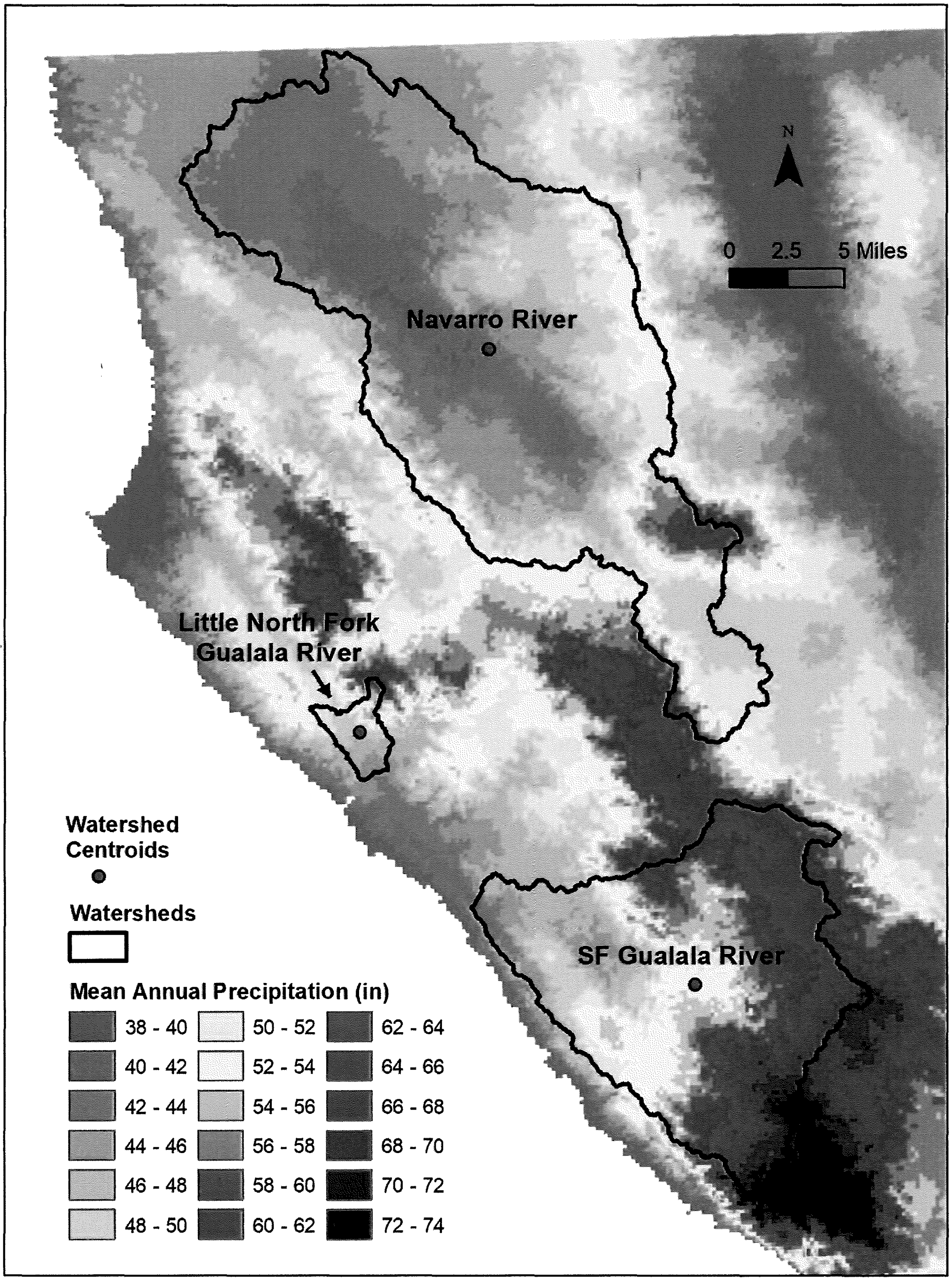


Figure A1: Mean annual precipitation from 1981-2010 (Flint & Flint, 2014) in the Little North Fork Gualala River, Navarro River, and South Fork Gualala River watersheds.

1/10/2021

366.55

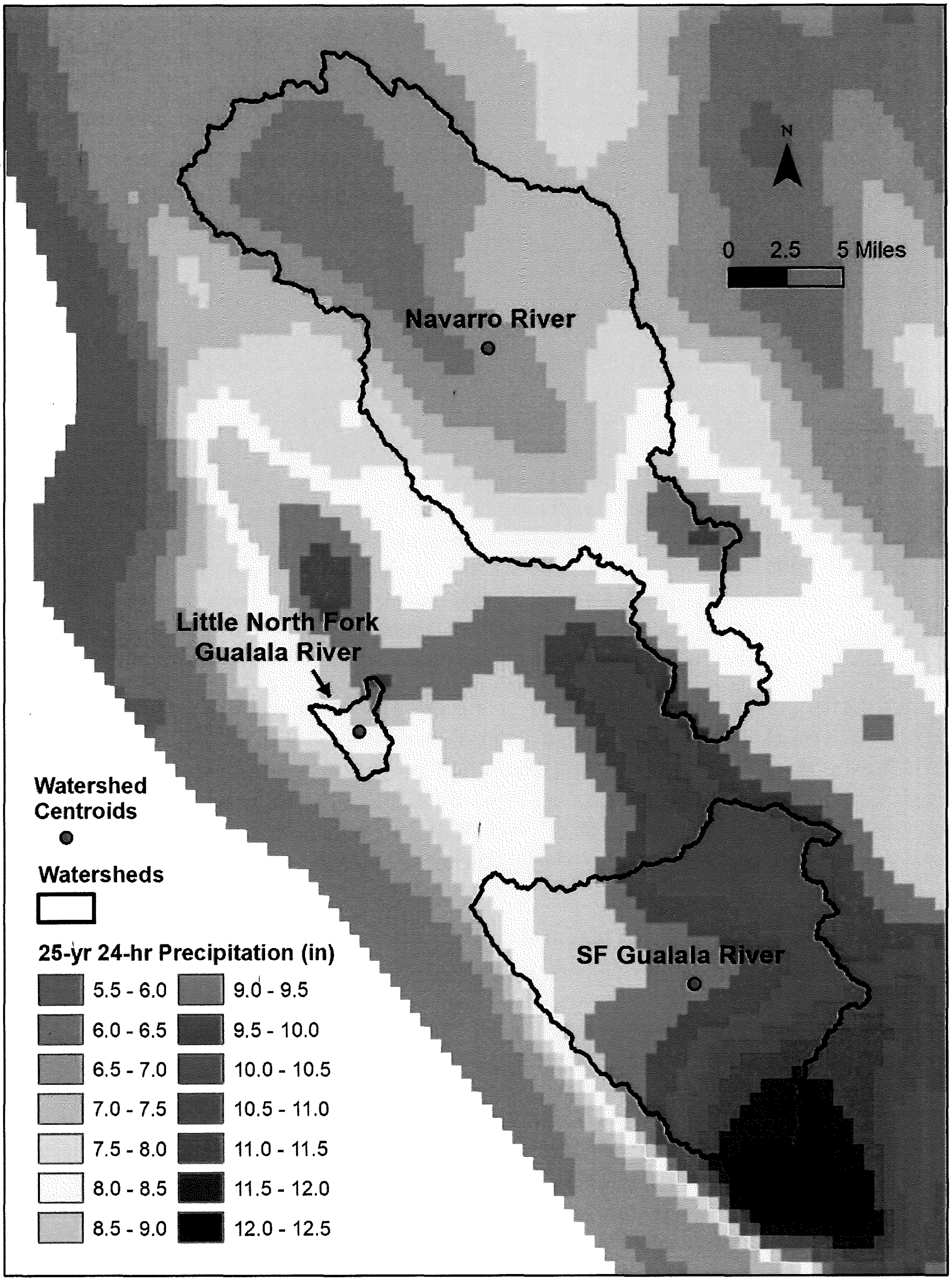


Figure A2: NOAA Atlas 14 25-yr 24-yr total precipitation in the Little North Fork Gualala River, Navarro River, and South Fork Gualala River watersheds.

1/10/2021

366.56

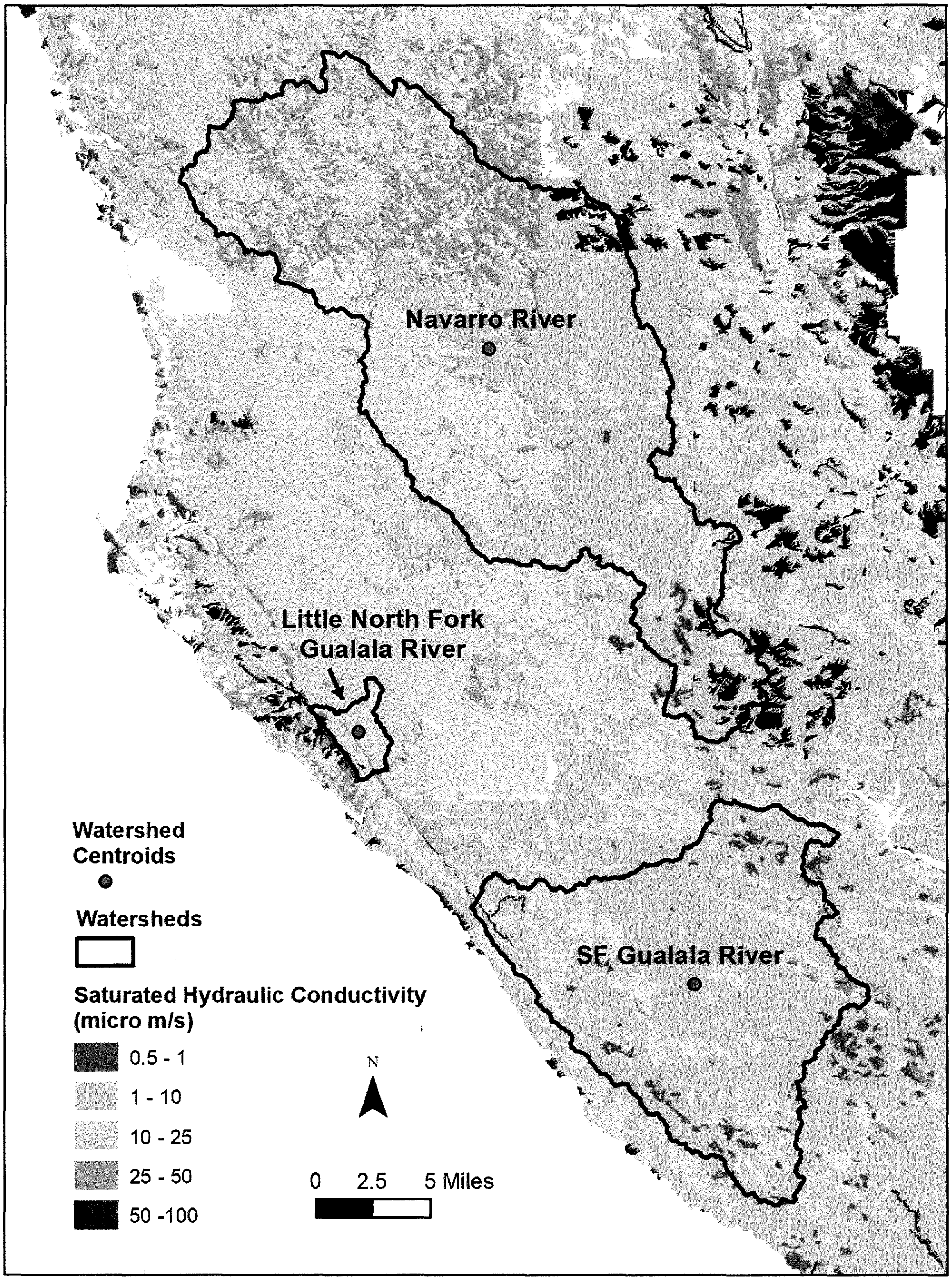


Figure A3: Soil saturated hydraulic conductivities (Ksat) in the Little North Fork Gualala River, Navarro River, and South Fork Gualala River watersheds (USDA, 2007).

1/10/2021

366.57

APPENDIX B

FLOOD FREQUENCY ANALYSIS OF USGS NAVARRO RIVER NEAR NAVARRO GAGE

1/10/2021

366.58

PEAKFQ SUMMARY REPORT: Station - 11468000 NAVARRO R NR NAVARRO CA

TABLE 1 - INPUT DATA SUMMARY

Number of peaks in record = 68

Peaks not used in analysis = 1

Gaged peaks in analysis = 67

Historic peaks in analysis = 0

Beginning Year = 1938

Ending Year = 2017

Historical Period Length = 80

Skew option = STATION SKEW

Regional skew = --

Standard error = --

Mean Square error = --

Gage base discharge = 0.0

User supplied high outlier threshold = --

User supplied PILF (LO) criterion = --

Plotting position parameter = 0.00

Type of analysis BULL.17B

PILF (LO) Test Method MGBT

Perceptible Ranges = Not Applicable

Interval Data = Not Applicable

1/10/2021

366.59

TABLE 2 - DIAGNOSTIC MESSAGE AND PILF RESULTS

```
 *WCF107I-ACCEPTED GEN SKEW OUTSIDE MAP LIMITS.-999.000  -0.400   0.800
**WCF109W-PEAKS WITH MINUS-FLAGGED DISCHARGES WERE BYPASSED.      1
**WCF113W-NUMBER OF SYSTEMATIC PEAKS HAS BEEN REDUCED TO NSYS =   67
  WCF134I-NO SYSTEMATIC PEAKS WERE BELOW GAGE BASE.              0.0
  EMA003I-LOW OUTLIERS WERE DETECTED USING MULTIPLE GRUBBS-BECK TEST      7     7510.0
   THE FOLLOWING PEAKS (WITH CORRESPONDING P-VALUES) WERE DROPPED:
      630.0    (0.0007)
     2790.0    (0.0644)
     2860.0    (0.0062)
     4340.0    (0.0594)
     4550.0    (0.0193)
     4930.0    (0.0097)
     5440.0    (0.0076)
  WCF163I-NO HIGH OUTLIERS OR HISTORIC PEAKS EXCEEDED HHBASE.    101289.5
**WCF164W-HISTORIC PERIOD IGNORED.    80.0
 *WCF151I-17B WEIGHTED SKEW REPLACED BY USER OPTION.  -229.630    0.212  -1
  WCF002J-CALCS COMPLETED.  RETURN CODE =  2


            Kendall's Tau Parameters


                         MEDIAN   No. of
            TAU    P-VALUE    SLOPE   PEAKS
        ----------------------------------------
  GAGED PEAKS    -0.108     0.198    -91.892    67
```

1/10/2021

366.60

TABLE 3 - ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

```
              FLOOD BASE            LOGARITHMIC
          --------------------- ------------------------------
                EXCEEDANCE            STANDARD
          DISCHARGE PROBABILITY    MEAN    DEVIATION    SKEW
          ----------------------------------------------------
SYSTEMATIC RECORD     0.0    1.0000    4.2249    0.3568    -1.123
BULL.17B ESTIMATE     0.0    0.8955    4.2717    0.2627    0.212
BULL.17B ESTIMATE OF MSE OF AT-SITE SKEW     0.0904
```

TABLE 4 - ANNUAL FREQUENCY CURVE -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

```
  ANNUAL                  <-- FOR BULLETIN 17B ESTIMATES -->
EXCEEDANCE  BULL.17B SYSTEMATICLOG VARIANCE    CONFIDENCE INTERVALS
PROBABILITY ESTIMATE   RECORD     OF EST.   5% LOWER   95% UPPER
  0.9950              875.8       --        --       --
  0.9900              1314.       --        --       --
  0.9500              3531.       --        --       --
  0.9000              5579.       --        --       --
  0.8000  11180.   9120.      ----      9575.0     12770.0
  0.6667  14160.   13600.     ----      12370.0    16030.0
  0.5000  18300.   19510.     ----      16180.0    20680.0
  0.4292  20390.   22280.     ----      18060.0    23110.0
  0.2000  30870.   33660.     ----      27040.0    36000.0
  0.1000  41080.   41520.     ----      35300.0    49430.0
  0.0400  56250.   49420.     ----      47010.0    70480.0
  0.0200  69260.   54000.     ----      56700.0    89370.0
  0.0100  83810.   57660.     ----      67260.0    111200.0
  0.0050  100100.   60590.     ----      78800.0    136400.0
  0.0020  124600.   63590.     ----      95720.0    175600.0
```

366.61

1/10/2021

TABLE 5 - INPUT DATA LISTING

WATER YEAR	PEAK VALUE	PEAKFQ CODES
1938	-8888.0	
1951	20700.0	
1952	19400.0	
1953	18700.0	
1954	30400.0	
1955	4340.0	
1956	64500.0	
1957	14200.0	
1958	34100.0	
1959	19600.0	
1960	24800.0	
1961	9510.0	
1962	22300.0	
1963	33100.0	
1964	17900.0	
1965	52100.0	
1966	33100.0	
1967	16100.0	
1968	11300.0	
1969	20400.0	
1970	43900.0	
1971	20000.0	
1972	2860.0	
1973	18700.0	
1974	61000.0	
1975	17800.0	
1976	2790.0	
1977	630.0	
1978	22500.0	
1979	10400.0	
1980	25600.0	
1981	10700.0	
1982	32900.0	
1983	45800.0	
1984	16500.0	
1985	12500.0	
1986	49000.0	
1987	9420.0	
1988	12300.0	
1989	10900.0	
1990	4930.0	
1991	11500.0	
1992	11300.0	
1993	48200.0	
1994	8370.0	
1995	51400.0	
1996	16200.0	
1997	40600.0	
1998	20900.0	
1999	16400.0	
2000	14600.0	
2001	9560.0	
2002	9890.0	
2003	30400.0	
2004	32000.0	
2005	7510.0	
2006	62000.0	
2007	9190.0	
2008	24900.0	
2009	5440.0	
2010	16200.0	
2011	18300.0	
2012	16400.0	
2013	27900.0	
2014	4550.0	
2015	18600.0	
2016	13400.0	
2017	24400.0	

1/10/2021

366.62

TABLE 6 - EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER RANKED
SYSTEMATIC B17B
YEAR DISCHARGE
RECORD ESTIMATE

1956	64500.0	0.0147
2006	62000.0	0.0294
1974	61000.0	0.0441
1965	52100.0	0.0588
1995	51400.0	0.0735
1986	49000.0	0.0882
1993	48200.0	0.1029
1983	45800.0	0.1176
1970	43900.0	0.1324
1997	40600.0	0.1471
1958	34100.0	0.1618
1963	33100.0	0.1765
1966	33100.0	0.1912
1982	32900.0	0.2059
2004	32000.0	0.2206
1954	30400.0	0.2353
2003	30400.0	0.2500
2013	27900.0	0.2647
1980	25600.0	0.2794
2008	24900.0	0.2941
1960	24800.0	0.3088
2017	24400.0	0.3235
1978	22500.0	0.3382
1962	22300.0	0.3529
1998	20900.0	0.3676
1951	20700.0	0.3824
1969	20400.0	0.3971
1971	20000.0	0.4118
1959	19600.0	0.4265
1952	19400.0	0.4412
1953	18700.0	0.4559
1973	18700.0	0.4706
2015	18600.0	0.4853
2011	18300.0	0.5000
1964	17900.0	0.5147
1975	17800.0	0.5294
1984	16500.0	0.5441
1999	16400.0	0.5588
2012	16400.0	0.5735
1996	16200.0	0.5882
2010	16200.0	0.6029
1967	16100.0	0.6176
2000	14600.0	0.6324
1957	14200.0	0.6471
2016	13400.0	0.6618
1985	12500.0	0.6765
1988	12300.0	0.6912
1991	11500.0	0.7059
1968	11300.0	0.7206
1992	11300.0	0.7353
1989	10900.0	0.7500
1981	10700.0	0.7647
1979	10400.0	0.7794
2002	9890.0	0.7941
2001	9560.0	0.8088
1961	9510.0	0.8235
1987	9420.0	0.8382
2007	9190.0	0.8529
1994	8370.0	0.8676
2005	7510.0	0.8824
2009	5440.0	0.8971
1990	4930.0	0.9118
2014	4550.0	0.9265
1955	4340.0	0.9412
1972	2860.0	0.9559
1976	2790.0	0.9706
1977	630.0	0.9853
1938	-8888.0	-- --

1/10/2021

366.63

APPENDIX C

FLOOD FREQUENCY ANALYSIS FOR COMPOSITE OF USGS GAGES
SOUTH FORK GUALALA RIVER NR ANNAPOLIS
SOUTH FORK GUALALA RIVER NR SEA RANCH

1/10/2021

366.64

```
<< EMA Representation of Data >>
SF Gualala Nr Sea Ranch
----------------------------------------------------------------------------------
|                        |            Value              |       Threshold        |      |
| Year        Peak       |     Low          High         |    Low        High     | Type |
|------------------------|-------------------------------|------------------------|------|
| 1951  34,100.000  |  34,100.000  34,100.000 |   1.0E-99     1.0E99 | Syst |
| 1952  29,500.000  |  29,500.000  29,500.000 |   1.0E-99     1.0E99 | Syst |
| 1953  33,900.000  |  33,900.000  33,900.000 |   1.0E-99     1.0E99 | Syst |
| 1954  35,900.000  |  35,900.000  35,900.000 |   1.0E-99     1.0E99 | Syst |
| 1955    9,870.000  |    9,870.000    9,870.000 |   1.0E-99     1.0E99 | Syst |
| 1956  55,000.000     55,000.000  55,000.000 |   1.0E-99     1.0E99 | Syst |
| 1957    8,760.000  |    8,760.000    8,760.000 |   1.0E-99     1.0E99 | Syst |
| 1958  35,400.000  |  35,400.000  35,400.000 |   1.0E-99     1.0E99 | Syst |
| 1959  19,100.000  |  19,100.000  19,100.000 |   1.0E-99     1.0E99 | Syst |
| 1960  33,700.000  |  33,700.000  33,700.000 |   1.0E-99     1.0E99 | Syst |
| 1961  15,900.000  |  15,900.000  15,900.000 |   1.0E-99     1.0E99 | Syst |
| 1962  37,700.000  |  37,700.000  37,700.000 |   1.0E-99     1.0E99 | Syst |
| 1963  23,000.000  |  23,000.000  23,000.000 |   1.0E-99     1.0E99 | Syst |
| 1964  15,000.000  |  15,000.000  15,000.000 |   1.0E-99     1.0E99 | Syst |
| 1965  21,400.000  |  21,400.000  21,400.000 |   1.0E-99     1.0E99 | Syst |
| 1966  47,800.000  |  47,800.000  47,800.000 |   1.0E-99     1.0E99 | Syst |
| 1967  28,900.000  |  28,900.000  28,900.000 |   1.0E-99     1.0E99 | Syst |
| 1968  15,200.000  |  15,200.000  15,200.000 |   1.0E-99     1.0E99 | Syst |
| 1969  29,100.000  |  29,100.000  29,100.000 |   1.0E-99     1.0E99 | Syst |
| 1970  35,800.000  |  35,800.000  35,800.000 |   1.0E-99     1.0E99 | Syst |
| 1971  27,900.000  |  27,900.000  27,900.000 |   1.0E-99     1.0E99 | Syst |
| 2008  26,800.000  |  26,800.000  26,800.000 |   1.0E-99     1.0E99 | Syst |
| 2009  10,400.000  |  10,400.000  10,400.000 |   1.0E-99     1.0E99 | Syst |
| 2010  20,500.000  |  20,500.000  20,500.000 |   1.0E-99     1.0E99 | Syst |
| 2011  19,400.000  |  19,400.000  19,400.000 |   1.0E-99     1.0E99 | Syst |
| 2012  20,400.000  |  20,400.000  20,400.000 |   1.0E-99     1.0E99 | Syst |
| 2013  23,800.000  |  23,800.000  23,800.000 |   1.0E-99     1.0E99 | Syst |
| 2014  15,000.000  |  15,000.000  15,000.000 |   1.0E-99     1.0E99 | Syst |
| 2015  28,500.000  |  28,500.000  28,500.000 |   1.0E-99     1.0E99 | Syst |
| 2016  13,900.000  |  13,900.000  13,900.000 |   1.0E-99     1.0E99 | Syst |
| 2017  21,300.000  |  21,300.000  21,300.000 |   1.0E-99     1.0E99 | Syst |
| 2018  12,400.000  |  12,400.000  12,400.000 |   1.0E-99     1.0E99 | Syst |
| 2019  33,400.000  |  33,400.000  33,400.000 |   1.0E-99     1.0E99 | Syst |
|-------------------|--------------------------|-------------------------|------|
```

1/10/2021

366.65

```
------------------------------------------------------------------------------------------
 Fitted log10 Moments                     Mean      Variance   Std Dev     Skew
------------------------------------------------------------------------------------------
 EMA at-site data w/o regional info          4.363778   0.039342   0.198348   -0.362444
 EMA w/ regional info and B17b MSE(G)          4.363778   0.039342   0.198348   -0.362444
 EMA w/ regional info and specified MSE(G)      4.363778   0.039342   0.198348   -0.362444
------------------------------------------------------------------------------------------


 EMA Estimate of MSE[G at-site]             0.182161
 MSE[G at-site systematic]               0.182161
 Equivalent Record Length [G at-site]         33.000000
 Equivalent Record Length [Syst+Hist-LowOutl]   33.000000
 Grubbs-Beck Critical Value              0.000000
```

366.66

1/10/2021

```
--- Final Results ---

<< Plotting Positions >>
SF Gualala Nr Sea Ranch
----------------------------------------------------------------------------------
|  Events Analyzed          |         Ordered Events              |
|              FLOW          |      Water      FLOW     H-S       |
| Day Mon Year       CFS    | Rank  Year     CFS         Plot Pos |
|---------------------------|-------------------------------------|
| 03 Dec 1950  34,100.000 |  1     1992  55,000.000    2.94     |
| 01 Dec 1951  29,500.000 |  2     2002  47,800.000    5.88     |
| 07 Dec 1952  33,900.000 |  3     1998  37,700.000    8.82     |
| 17 Jan 1954  35,900.000 |  4     1990  35,900.000   11.76     |
| 21 Apr 1955   9,870.000  |  5     2006  35,800.000   14.71     |
| 22 Dec 1955  55,000.000 |  6     1994  35,400.000   17.65     |
| 23 Feb 1957   8,760.000  |  7     1987  34,100.000   20.59     |
| 24 Feb 1958  35,400.000 |  8     1989  33,900.000   23.53     |
| 16 Feb 1959  19,100.000 |  9     1996  33,700.000   26.47     |
| 08 Feb 1960  33,700.000 | 10     2019  33,400.000   29.41     |
| 31 Jan 1961  15,900.000 | 11     1988  29,500.000   32.35     |
| 13 Feb 1962  37,700.000 | 12     2005  29,100.000   35.29     |
| 31 Jan 1963  23,000.000 | 13     2003  28,900.000   38.24     |
| 20 Jan 1964  15,000.000 | 14     2015  28,500.000   41.18     |
| 21 Dec 1964  21,400.000 | 15     2007  27,900.000   44.12     |
| 04 Jan 1966 47,800.000  | 16     2008  26,800.000   47.06     |
| 21 Jan 1967  28,900.000 | 17     2013  23,800.000   50.00     |
| 10 Jan 1968  15,200.000 | 18     1999  23,000.000   52.94     |
| 13 Jan 1969  29,100.000 | 19     2001  21,400.000   55.88     |
| 23 Jan 1970  35,800.000 | 20     2017  21,300.000   58.82     |
| 03 Dec 1970  27,900.000 | 21     2010  20,500.000   61.76     |
| 04 Jan 2008  26,800.000 | 22     2012  20,400.000   64.71     |
| 22 Feb 2009  10,400.000 | 23     2011  19,400.000   67.65     |
| 20 Jan 2010  20,500.000 | 24     1995  19,100.000   70.59     |
| 29 Dec 2010  19,400.000 | 25     1997  15,900.000   73.53     |
| 27 Mar 2012  20,400.000 | 26     2004  15,200.000   76.47     |
| 23 Dec 2012  23,800.000 | 27     2014  15,000.000   79.41     |
| 08 Feb 2014  15,000.000 | 28     2000  15,000.000   82.35     |
| 11 Dec 2014  28,500.000 | 29     2016  13,900.000   85.29     |
| 21 Dec 2015  13,900.000 | 30     2018  12,400.000   88.24     |
| 10 Jan 2017  21,300.000 | 31     2009  10,400.000   91.18     |
| 06 Apr 2018  12,400.000 | 32     1991   9,870.000   94.12     |
| 01 Jan 2019  33,400.000 | 33     1993   8,760.000   97.06     |
|--------------------------|-------------------------------------|
* Low outlier plotting positions are computed using Median parameters.
```

1/10/2021

366.67

```
<< Frequency Curve >>
SF Gualala Nr Sea Ranch
--------------------------------------------------------------------------

| Computed     Variance    | Percent  |    Confidence Limits     |
|  Curve      Log(EMA)    | Chance   |      0.05        0.95    |
|      FLOW, CFS          | Exceedance |      FLOW, CFS          |
|-----------------------------|-------------|-----------------------------|
|  70,542.992    0.01010  |  0.200   |  115,691.781   51,461.317 |
|  64,160.354    0.00700  |  0.500   |   97,126.459   49,385.903 |
|  59,136.055    0.00510  |  1.000   |   84,606.230   47,356.683 |
|  53,908.119    0.00358  |  2.000   |   73,136.551   44,765.708 |
|  46,597.059    0.00218  |  5.000   |   59,123.786   40,093.747 |
|  40,647.900    0.00156  | 10.000   |   48,997.947   35,358.047 |
|  34,137.654    0.00130  | 20.000   |   39,586.542   29,718.693 |
|  23,753.960    0.00139  | 50.000   |   27,455.934   20,507.465 |
|  15,895.844    0.00194  | 80.000   |   18,579.018   13,008.485 |
|  12,680.459    0.00289  | 90.000   |   15,104.526    9,602.494 |
|  10,432.786    0.00448  | 95.000   |   12,770.250    7,053.191 |
|   7,084.396    0.01110  | 99.000   |    9,412.096    3,307.716 |
|-----------------------------|-------------|-----------------------------|
```

```
<< Multiple Grubbs-Beck Test P-Values >>
SF Gualala Nr Sea Ranch
--------------------------------

|  Number Of  | P-Values  |
| Low Outliers |          |
|----------------|-------------|
|          1 |  4.276E-1 |
|          2 |  2.339E-1 |
|          3 |  7.837E-2 |
|          4 |  1.679E-1 |
|          5 |  2.599E-1 |
|          6 |  3.061E-1 |
|          7 |  1.168E-1 |
|          8 |  3.945E-2 |
|          9 |  2.139E-2 |
|         10 |  3.402E-1 |
|         11 |  2.212E-1 |
|         12 |  2.778E-1 |
|         13 |  1.331E-1 |
|         14 |  1.221E-1 |
|         15 |  4.133E-2 |
|         16 |  8.485E-2 |
|----------------|-------------|
* = p-value corresponds to a zero flow value.
```

366.68

1/10/2021

```
<< Systematic Statistics >>
SF Gualala Nr Sea Ranch
--------------------------------------------------------------
|     Log Transform:      |                     |
|       FLOW, CFS         |    Number of Events      |
|-------------------------|-------------------------|
| Mean            4.364  |  Historic Events       0  |
| Standard Dev      0.198  |  High Outliers       0    |
| Station Skew     -0.362  |  Low Outliers        0    |
| Regional Skew        ---  |  Zero Events        0    |
| Weighted Skew        ---  |  Missing Events      0    |
| Adopted Skew      -0.362  |  Systematic Events      33  |
|-------------------------|-------------------------|

--- End of Analytical Frequency Curve ---
```

366.69

1/10/2021

APPENDIX D

MENDOCINO COUNTY LIDAR EVALUATION

1/10/2021

366.70

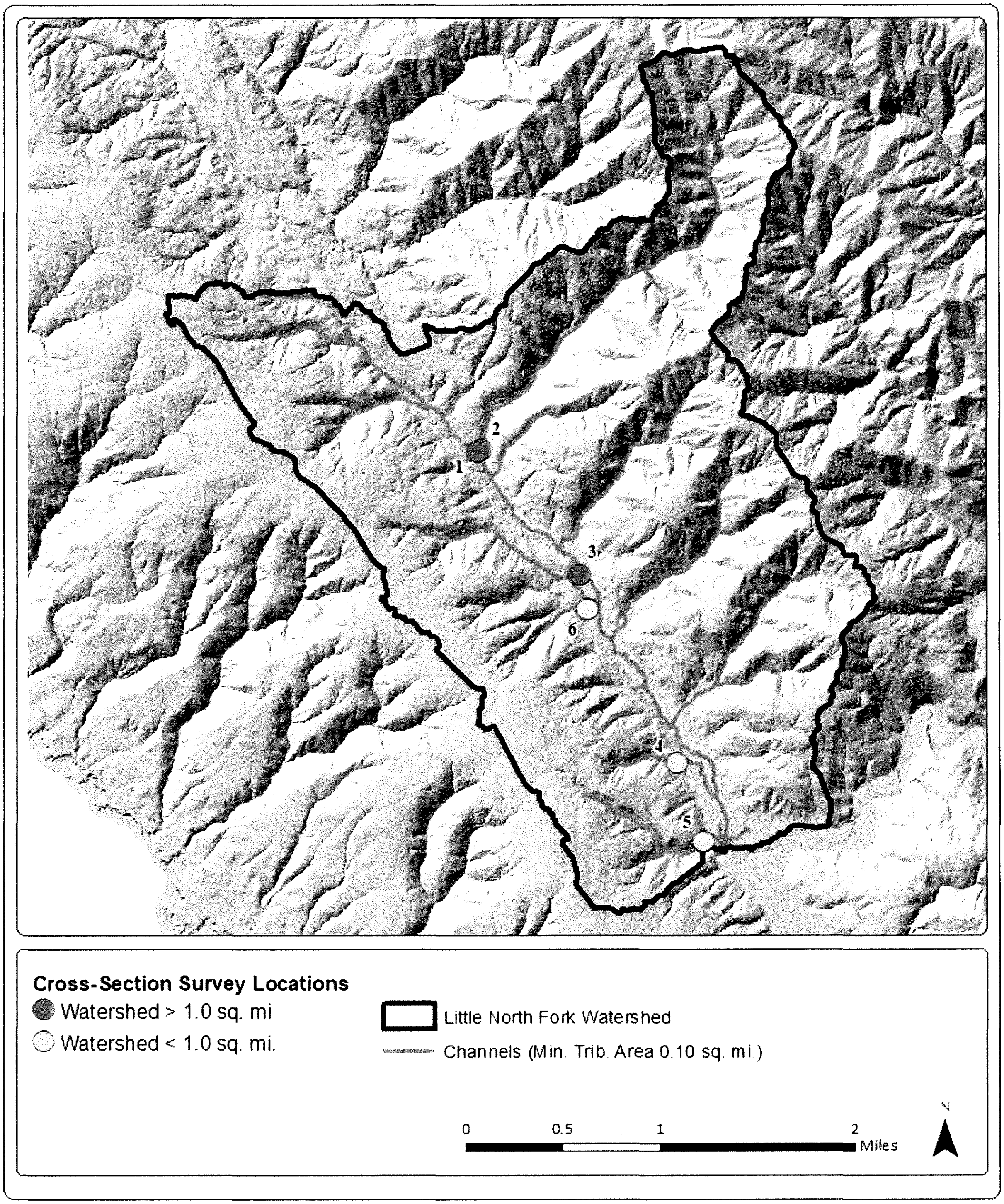
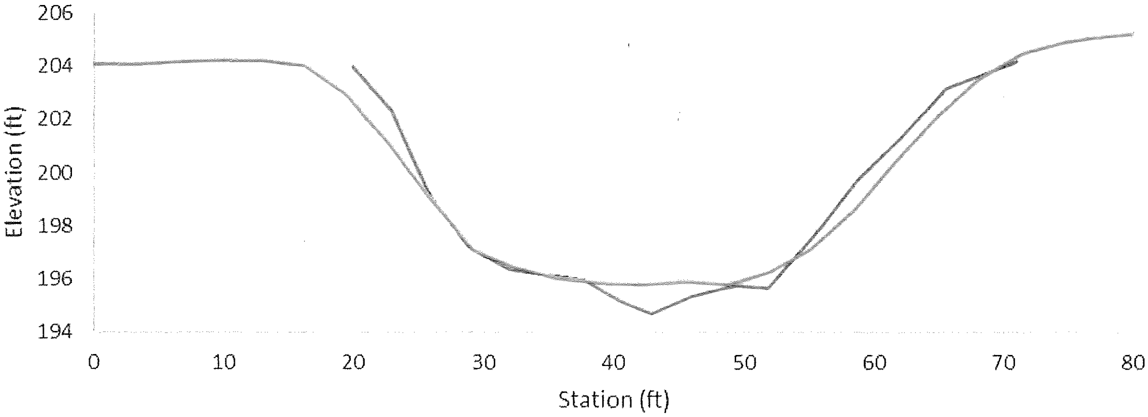


Figure B.1: Location of cross-section surveys used in the LiDAR Evaluation

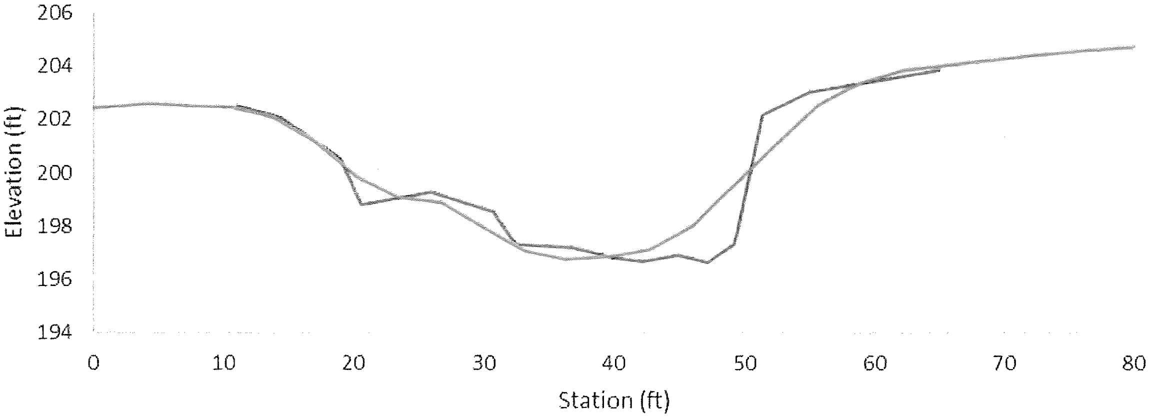
1/16/2021

366.71

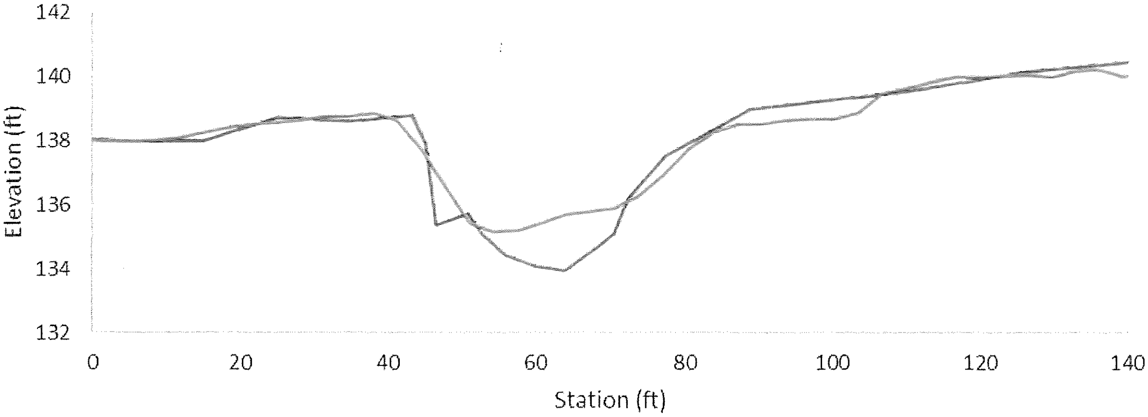
1



2



3



1/10/2021

366.72

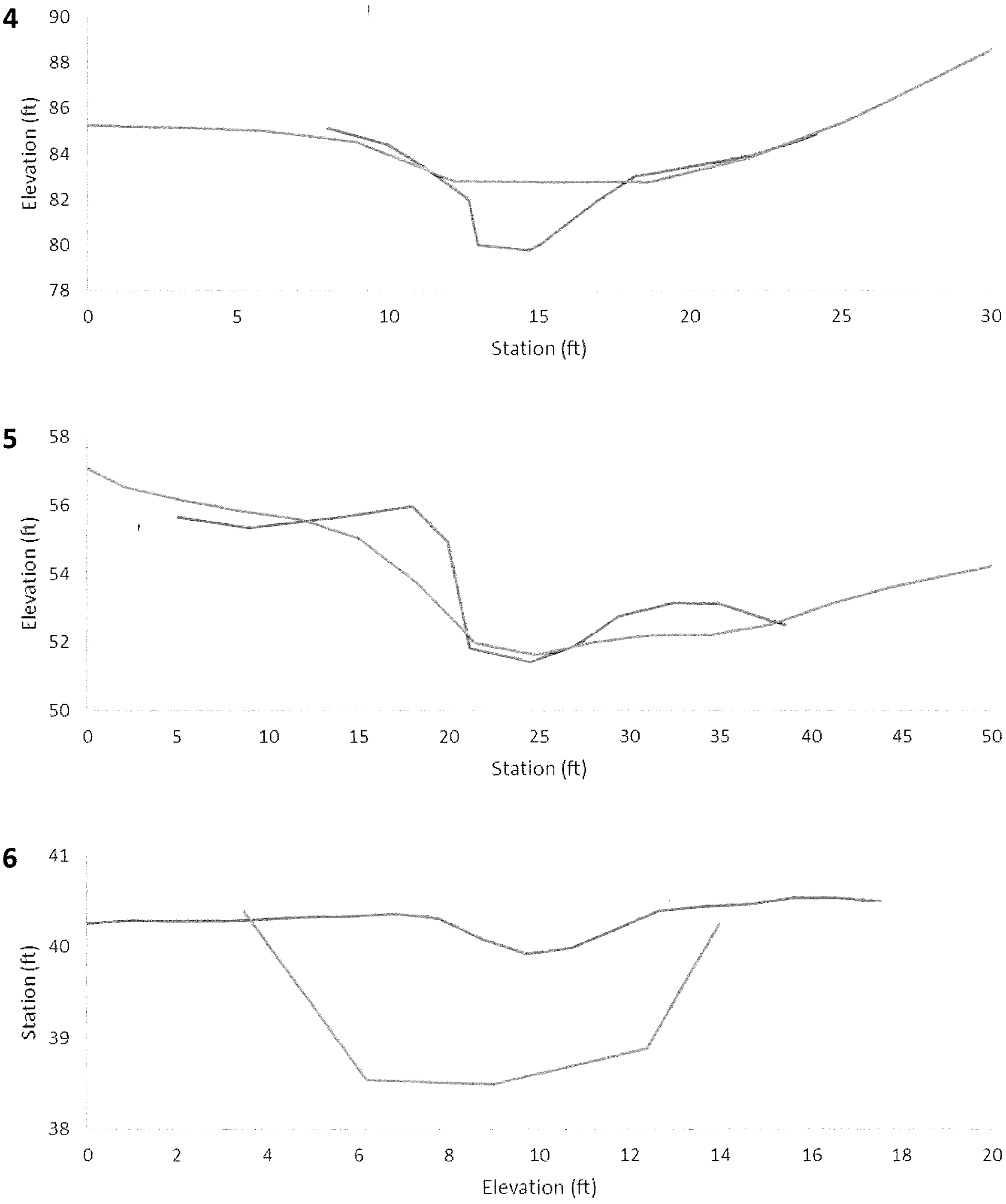


Figure B.2: Comparison of LiDAR-derived cross-sections to surveyed cross-sections. LiDAR-derived cross-sections shown in blue. Surveyed cross-sections shown in orange. All cross-sections were surveyed by OEI staff using an auto level and were georeferenced using a high-accuracy GPS unit.

1/10/2021

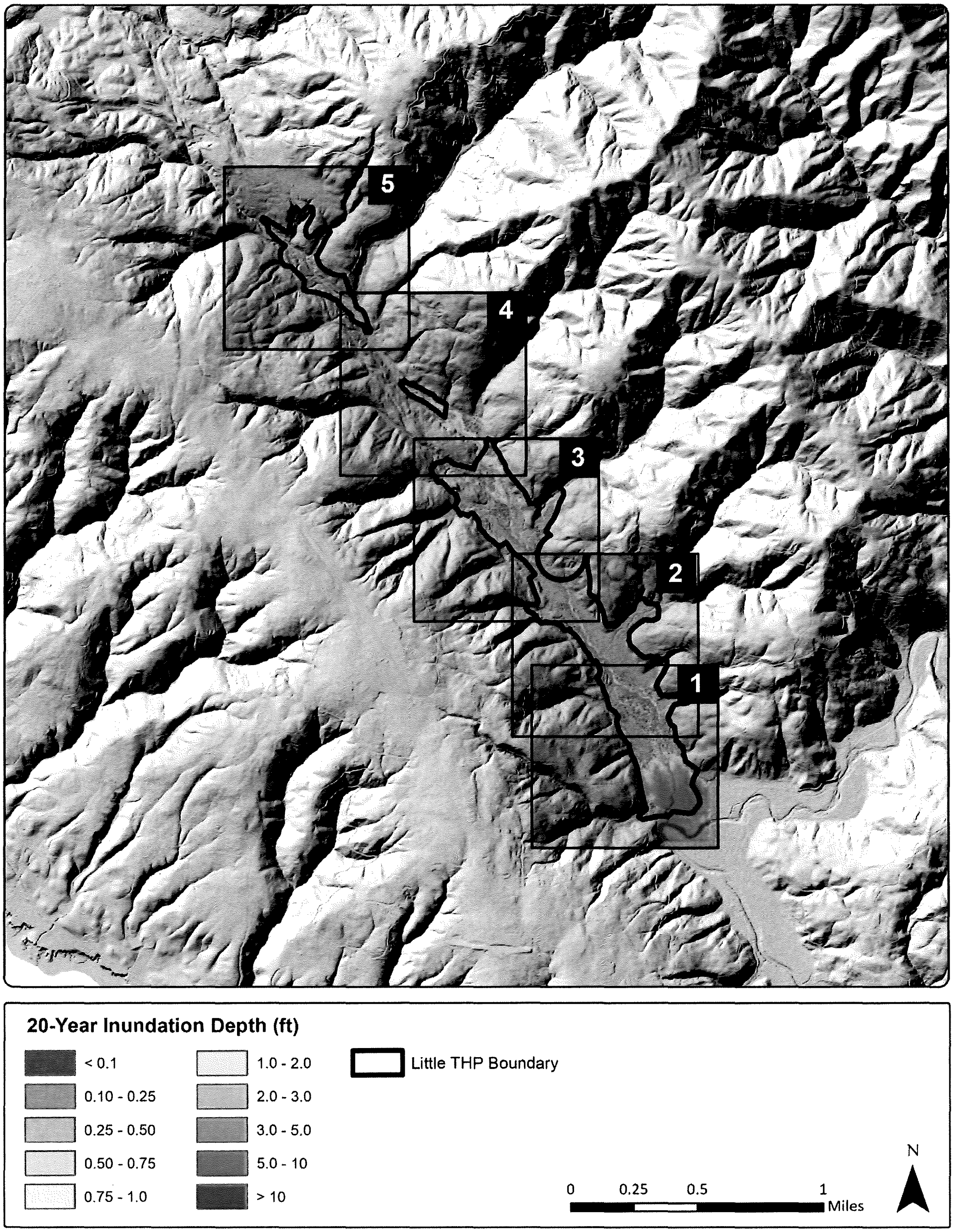
366.73

APPENDIX E

20-YR INUNDATION MAPS FOR SIMULATED DISCHARGE OF 1,263 CFS

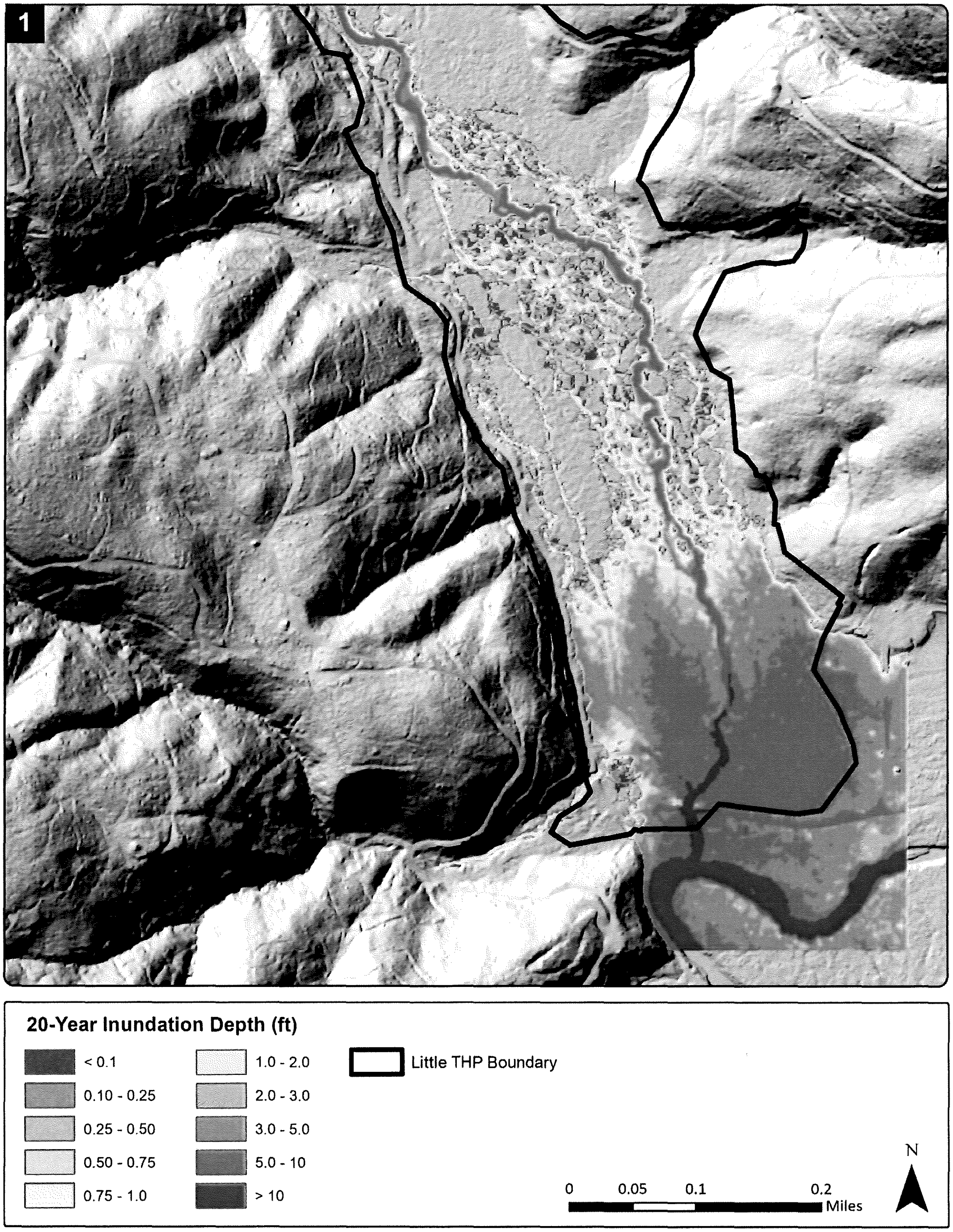
1/10/2021

366.74



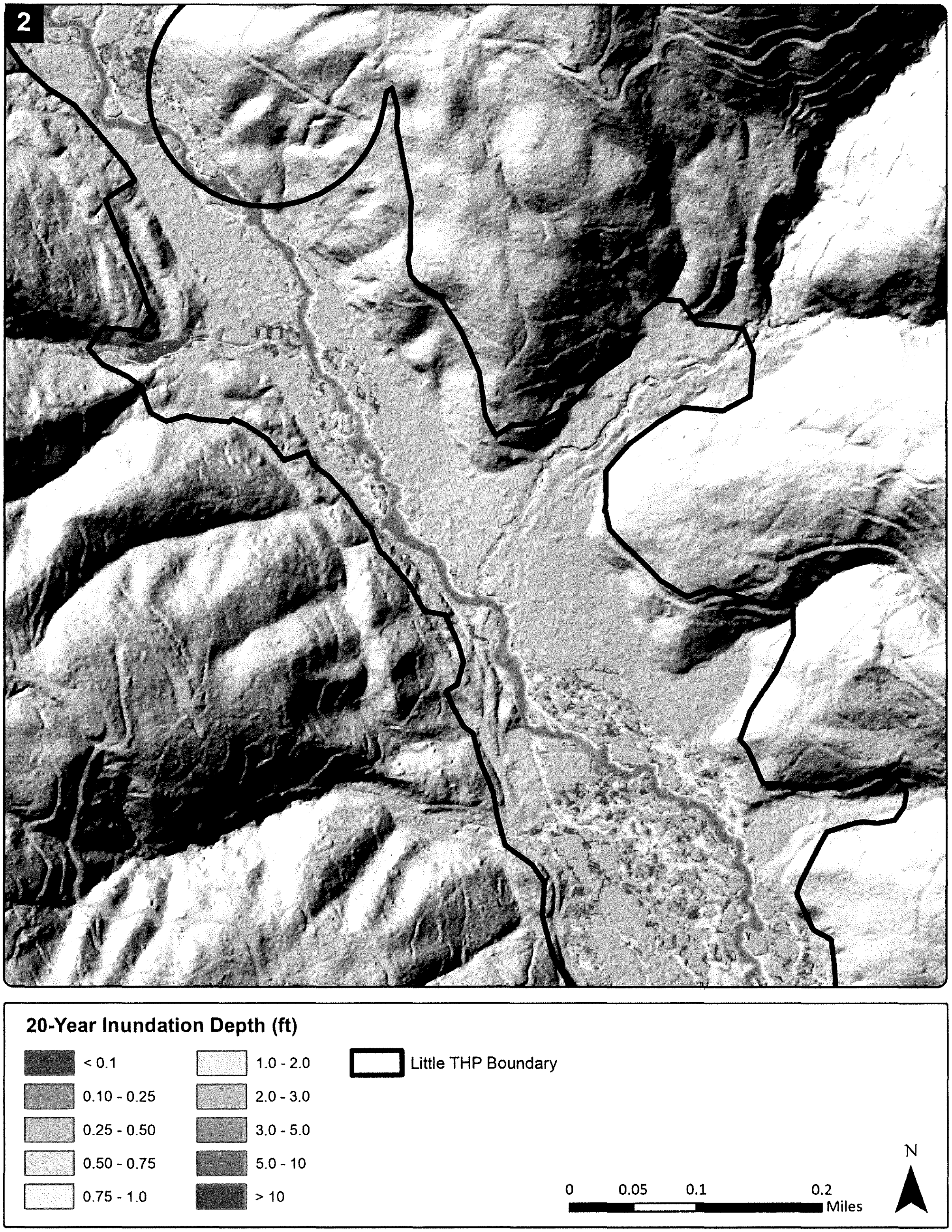
366.75

1/10/2021



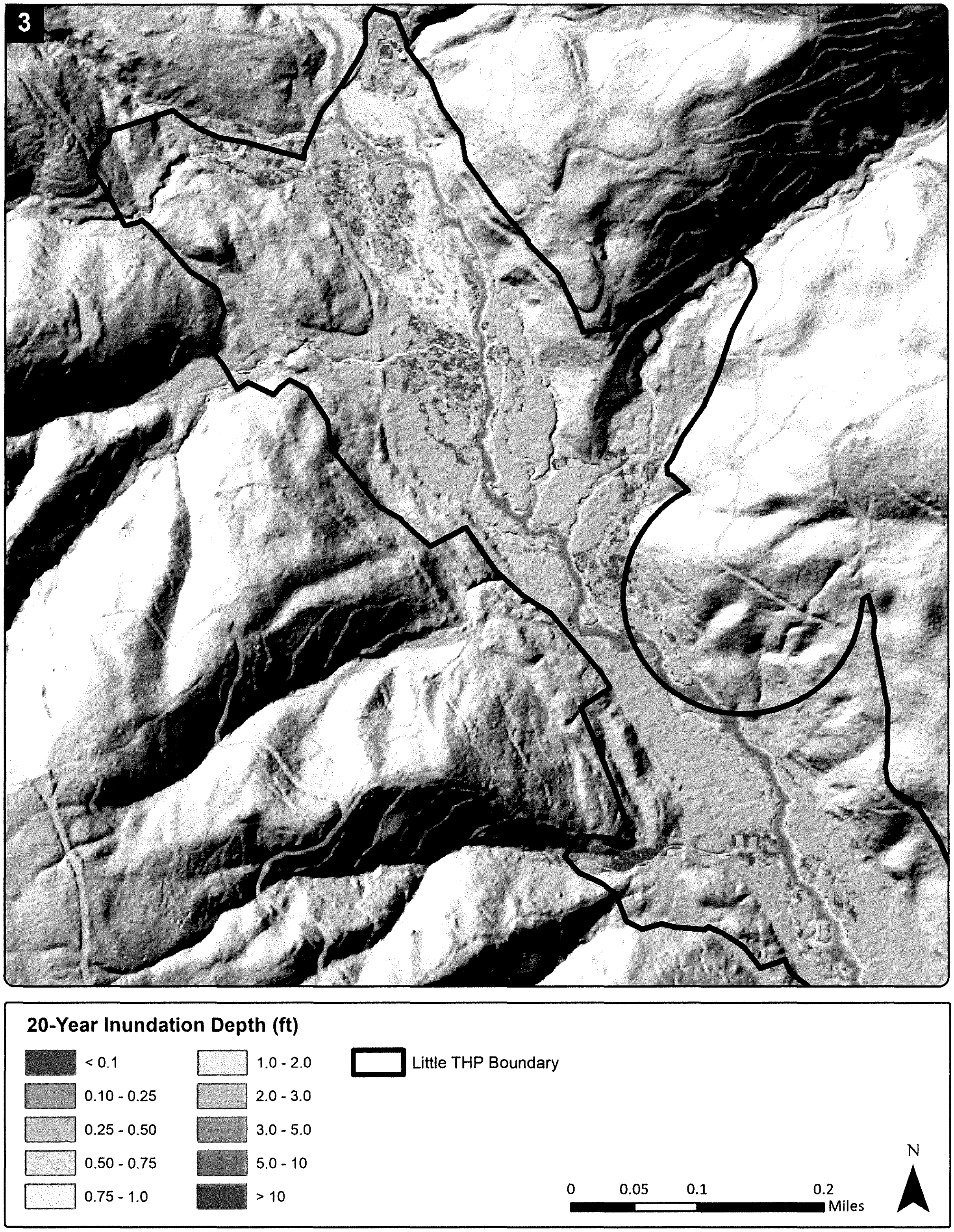
366.76

1/10/2021



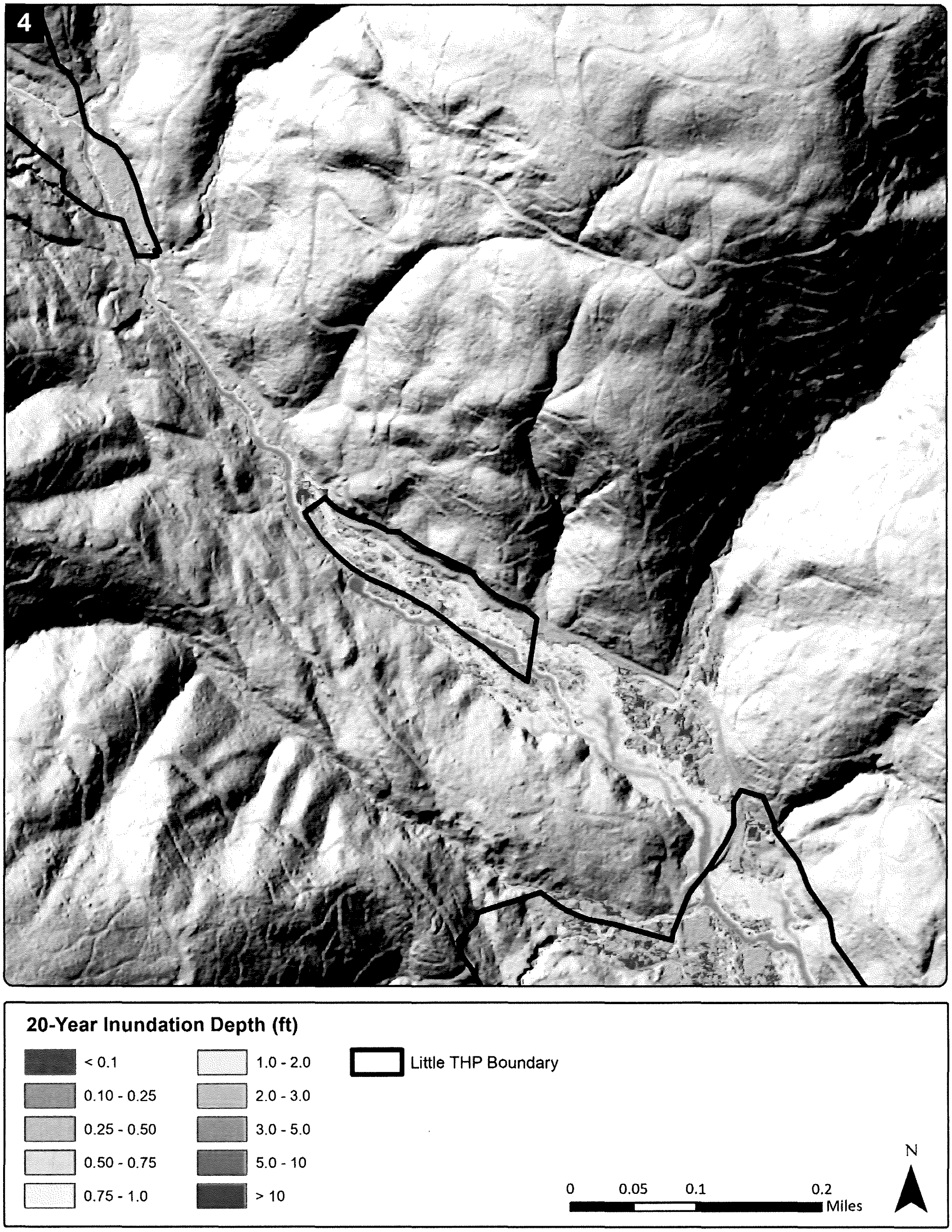
1/10/2021

366,77



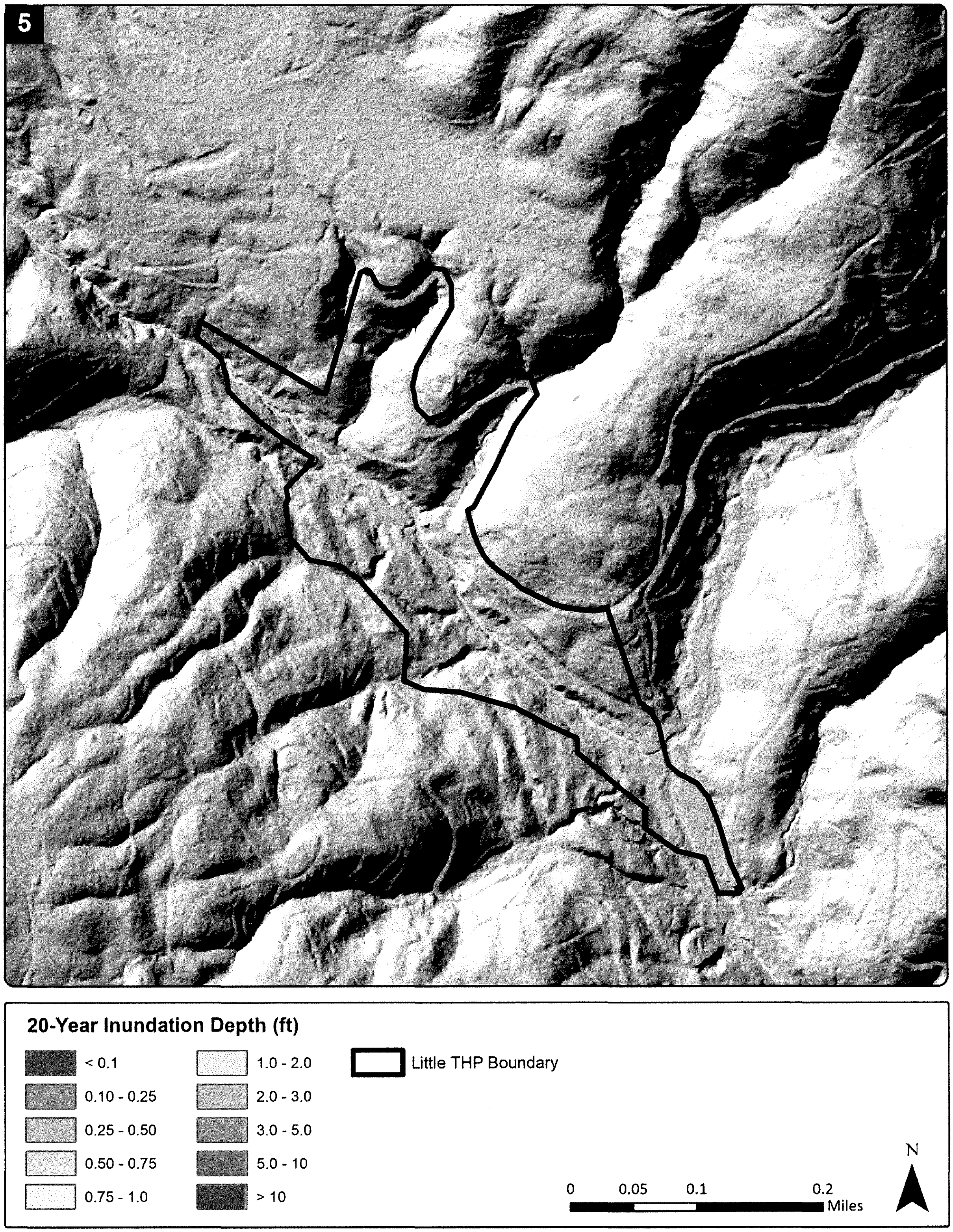
1/10/2021

366.78



1/10/2021

366.79



1/10/2021

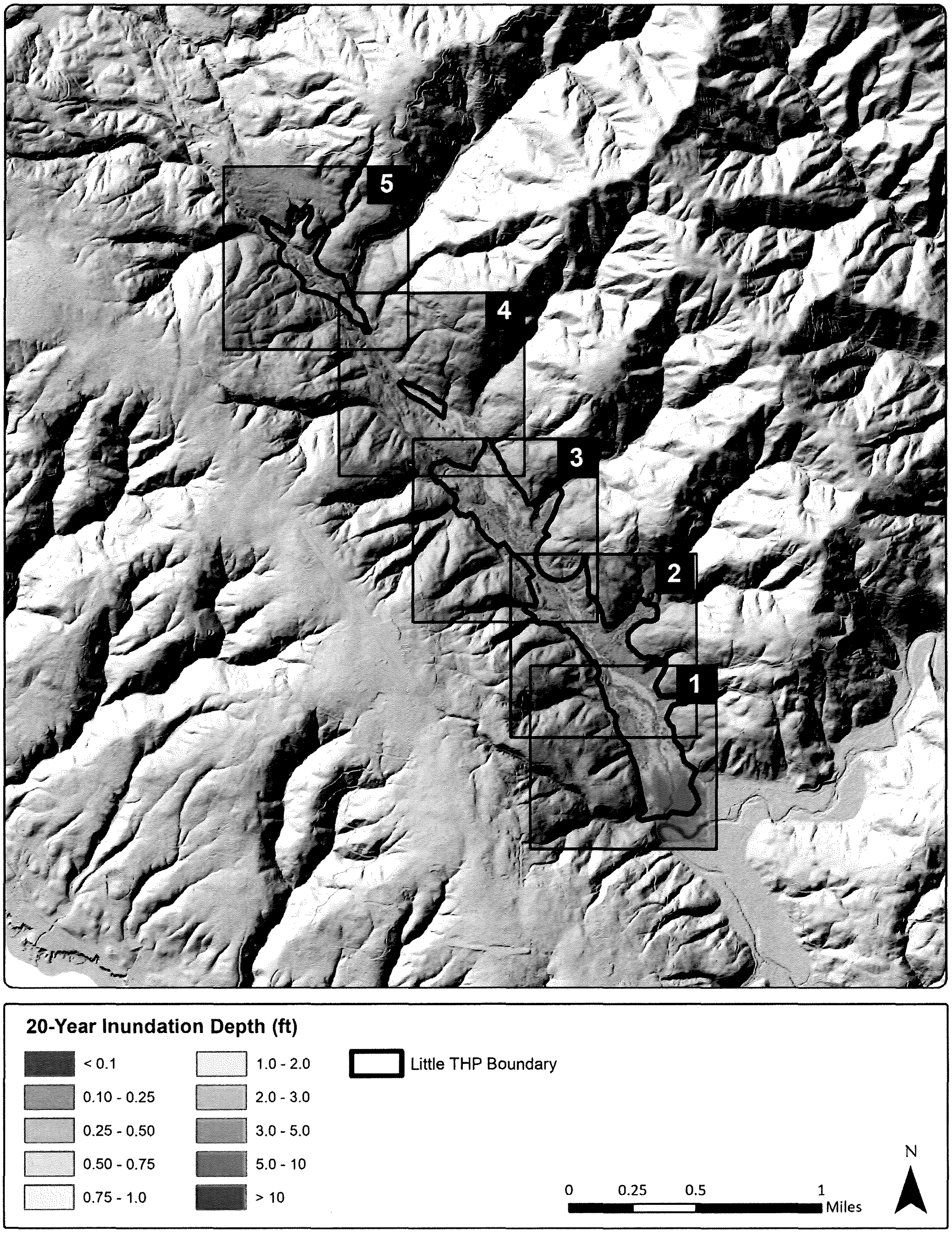
366.80

APPENDIX F

20-YR INUNDATION MAPS FOR SIMULATED DISCHARGE OF 2,106 CFS

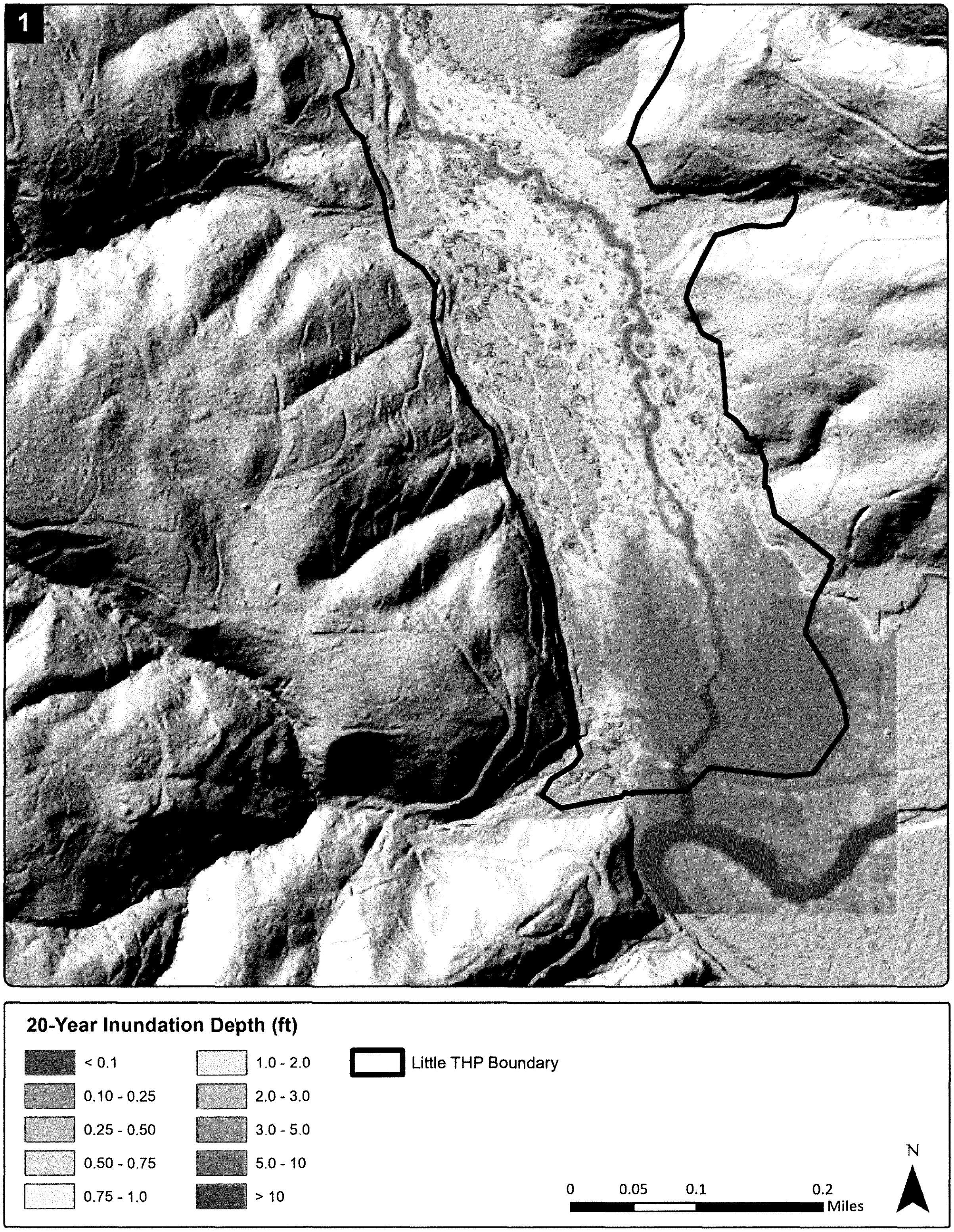
1/10/2021

366.81



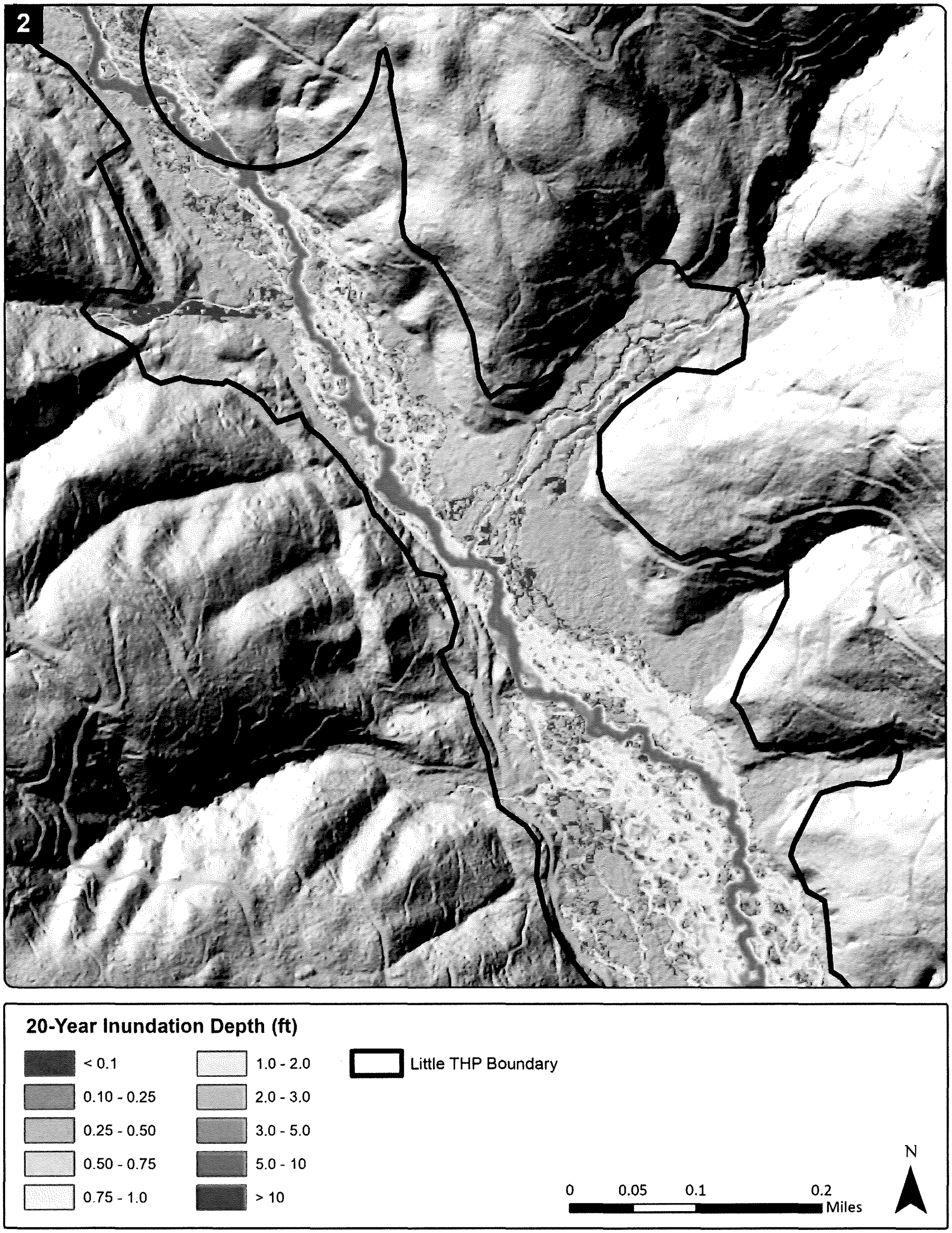
1/10/2021

366.82



1/10/2021

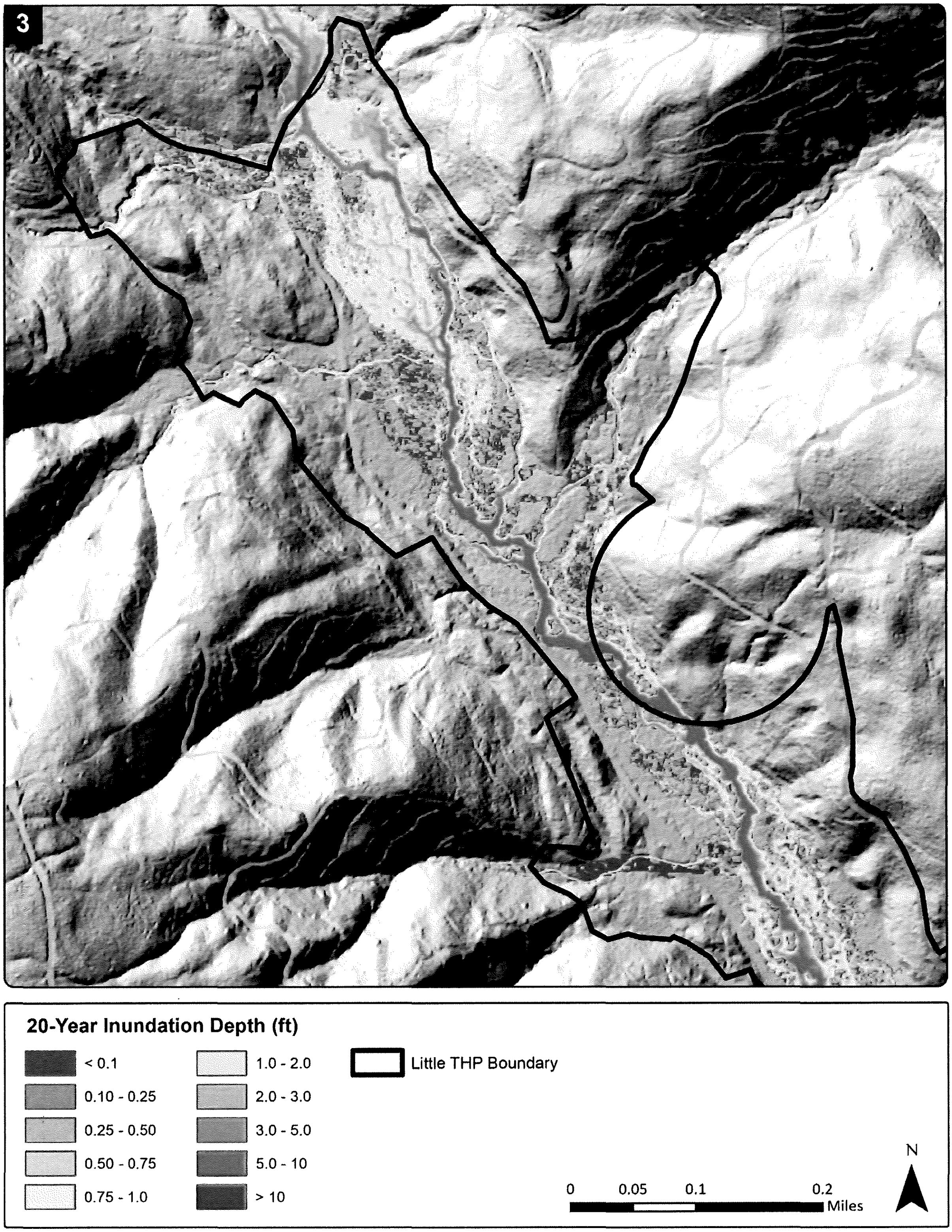
366,83



PART OF PLAN

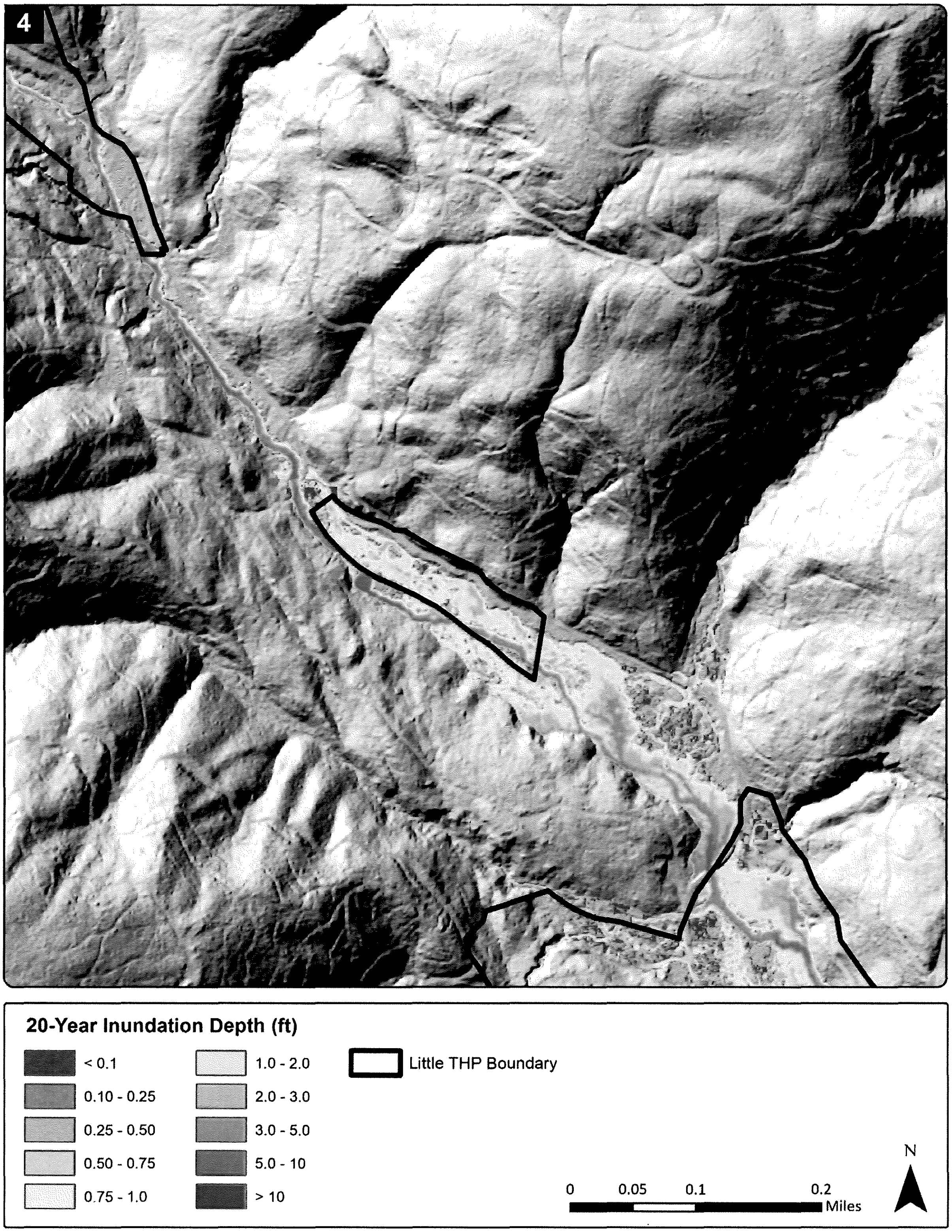
1/10/2021

366.84



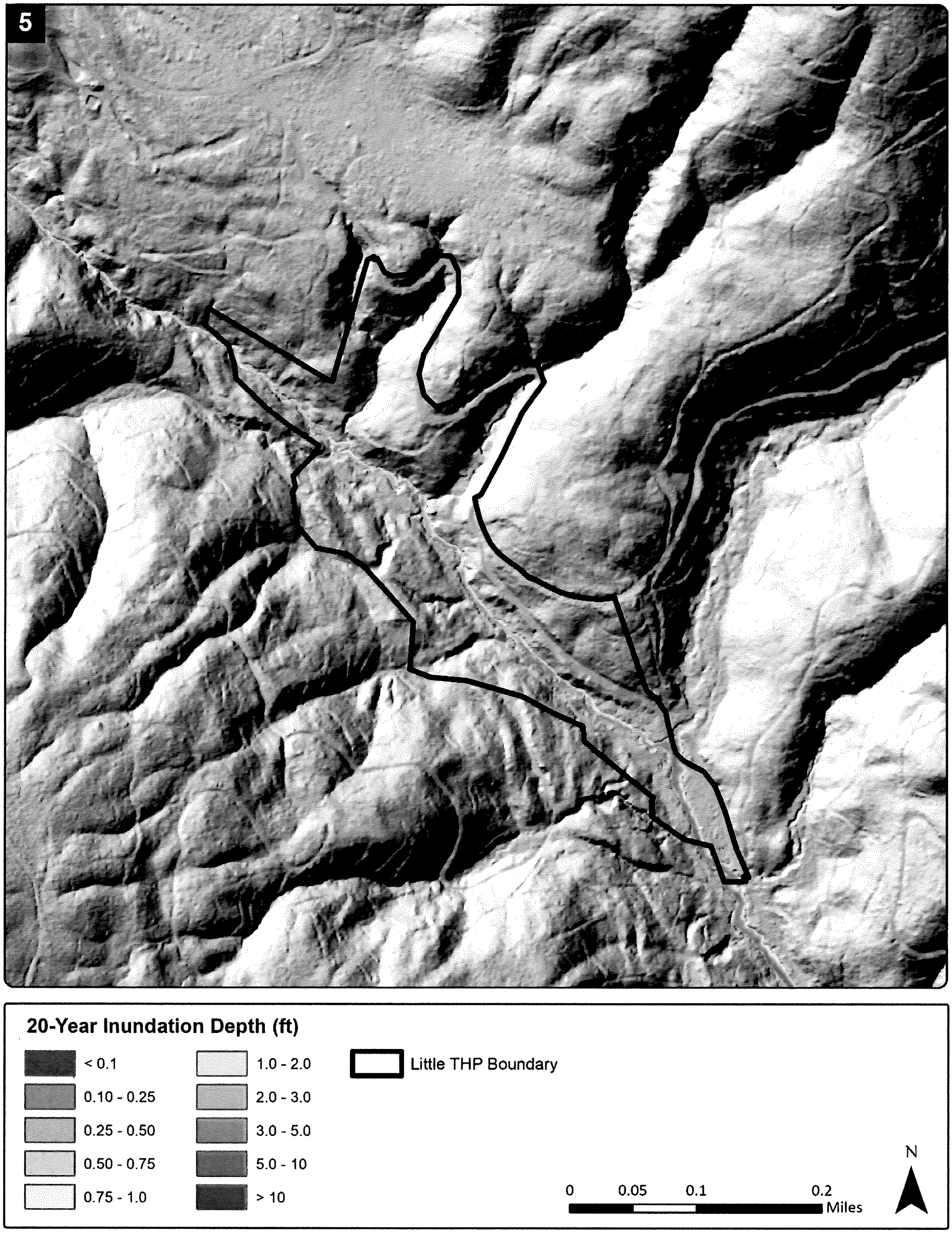
1/10/2021

366.85



1/10/2021

366.86



1/10/2021

366.87

Channel Migration Zone Evaluation for the Little Timber Harvest Plan, Little North Fork Gualala River, Mendocino County

Prepared for:

Gualala Redwood Timber, LLC
39951 Old State Highway
Gualala, CA 95445

Prepared by:

OEI

O'Connor Environmental, Inc.
P.O. Box 794, 447 Hudson Street
Healdsburg, CA 95448
www.oe-i.com

M.D. O'Connor
No. 2449
CERTIFIED ENGINEERING GEOLOGIST

Matthew O'Connor, PhD, CEG #2449 (Exp. 10-31-19)
President and Principal Geomorphologist/Hydrologist

August 2, 2019

1/10/2021

366,88

Contents

PART OF PLAN

1/10/2021

366, 89

Introduction

This evaluation of potential "channel migration zones" (CMZs) within the Little Timber Harvest Plan (THP) was performed by O'Connor Environmental, Inc. (OEI), for Gualala Redwood Timber, LLC. The purpose of this evaluation is to determine whether CMZs as defined by California Forest Practice Rules are present in the THP area, and if so, delineate them. In addition, we evaluate two specific locations identified by California Department of Fish and Wildlife (CDFW) during a May 14, 2019 Pre-Harvest Inspection of the THP where CDFW believes CMZs are present. This CMZ evaluation follows from OEI's "Floodplain Study for the Little North Fork Gualala River" (Floodplain Study) dated March 21, 2019 which documents an hydrologic and hydraulic simulation model implemented to estimate the extent of the 20-year floodplain to assist in compliance with Forest Practice Rules pertaining to "flood prone areas".

The Floodplain Study utilized a steady-state hydraulic model to simulate the distribution and depth of flooding for the estimated 20-year flood discharge of the Little North Fork Gualala (LNFG) including the hydraulic backwater effects of flooding in the North Fork Gualala River (NFG). The Floodplain Study was supplemented by a second hydrologic and hydraulic simulation focused on the duration of floodplain inundation and floodplain drainage ("Floodplain Inundation Duration Study for the Little North Fork Gualala River" dated July 10, 2019). The Inundation Duration Study utilized newly available precipitation records from a gage operated by Sonoma Water located near Annapolis. These precipitation data enabled us to develop a hydraulic model with unsteady flow that simulates flooding in the LNFG over a 60-hour period February 25-27, 2019 that is believed to have been a 20-year flood or greater. The Inundation Duration Study enabled us to simulate the complex pattern of flooding that occurs in LNFG and is relevant to the CMZ evaluation because it simulates the timing of floodplain flows and the stream discharge in the LNFG associated with initiation of floodplain flows throughout the model domain.

Descriptions of the LNFG watershed (Figure 1) are provided in the Floodplain Study and the Inundation Duration Study, as well as in the Little THP, and are not repeated here.

Qualifications

The CMZ evaluation has been prepared by Dr. Matthew O'Connor, PG #6847, CEG #2449 (California) and LEG #2680 (Washington). Dr. O'Connor has extensive experience in watershed hydrology and geomorphology in forested environments of northern California and the Pacific Northwest gained over the past 30 years. Dr. O'Connor has observed and evaluated CMZs in several watershed-scale study areas in the Olympic Mountains and Cascade Range in Washington, in the Rocky Mountains in Montana, and in the northern California Coast Range. In addition, Dr. O'Connor has conducted in-depth studies of CMZ processes and occurrence in the Pacific Northwest[1] and in coastal watersheds in Mendocino County[2]. Dr. O'Connor's *curriculum vitae* can be made available if a complete account of his qualifications is of interest.

---

[1] O'Connor, M. and Watson, G. 1999. Geomorphology of Channel Migration Zones and Implications for Riparian Forest Management. IN Design of Effective Riparian Management Strategies for Stream Resource Protection in Montana, Idaho, and Washington-Native Fish Habitat Conservation Plan Technical Report No. 7, Plum Creek Timber Company.

[2] O'Connor, M. 1998. Channel migration zone investigation. Draft Report prepared for The Timber Company, Ft. Bragg, CA. O'Connor Environmental, Inc., Healdsburg, CA. 12 p.

1/10/2021

366,90

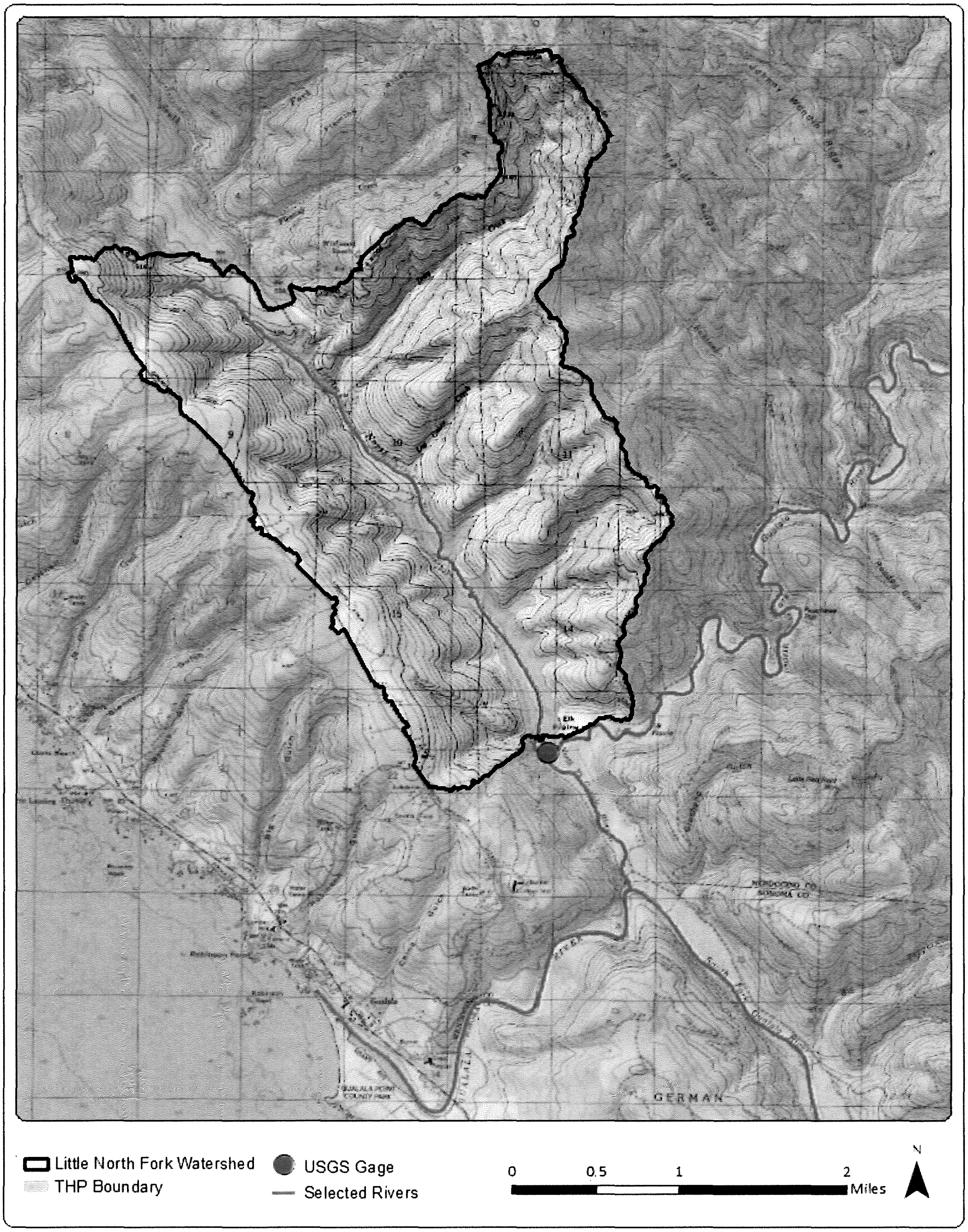


Figure 1: Location of proposed THP within the Little North Fork of the Gualala River watershed.

1/10/2021

3 66,91

Methods

The California Forest Practice Rules 2019 provide an incomplete definition of CMZs (refer to Subchapter 1, Article 1-Abbreviations and Definitions, p. 5, and Subchapter 4, 5 and 6, Article 6-916.9, 936.9, 956.9 Protection and Restoration of the Beneficial Functions of the Riparian Zone in Watersheds with Listed Anadromous Salmonids, pp. 81-104). At the direction of the California Board of Forestry, the Department of Forestry and Fire Protection and the Department of Fish and Wildlife developed a guidance document[3] to assist Registered Professional Foresters, landowners, regulatory personnel, and other professionals in application of Anadromous Salmonid Protection (ASP) rules. On page 17 of this guidance document, the question is posed and answered as follows:

> *How is the CMZ to be determined in the field? Provide greater clarity on factors to observe in the field to make this determination.*
>
> The CMZ is defined as "the area where the main channel of a watercourse can reasonably be expected to shift position on its floodplain laterally through avulsion or lateral erosion during the period of time required to grow forest trees from the surrounding area to a mature size, except as modified by a permanent levee or dike." RPFs are encouraged to review the document titled Standard Methods for Identifying Bankfull Channel Features and Channel Migration Zones (WFPB 2004) for detailed information on how to determine if a CMZ is present. This document provides a flowchart for CMZ determination. RPFs may also refer to A Framework for Delineating Channel Migration Zones (Rapp et al. 2003). Both documents are available online (the websites are listed in the references section). Determination of a CMZ can be conducted by RPFs that have knowledge regarding riparian landforms and channel morphology.
>
> It is most appropriate to determine if channel migration has historically occurred using a combination of office methods (e.g., a series of aerial photographs covering a wide time frame, topographic maps) and field inspection. CMZs are found in areas with unconfined channels (i.e., valley floor width is greater than two (2) times the bankfull channel width). Field inspections will reveal past lateral movement of the channel, often age-progressive bands of trees (e.g., red alder) on the floodplain, and at least one side channel on the floodplain at or below bankfull elevation of the main channel (WFPB 2004).

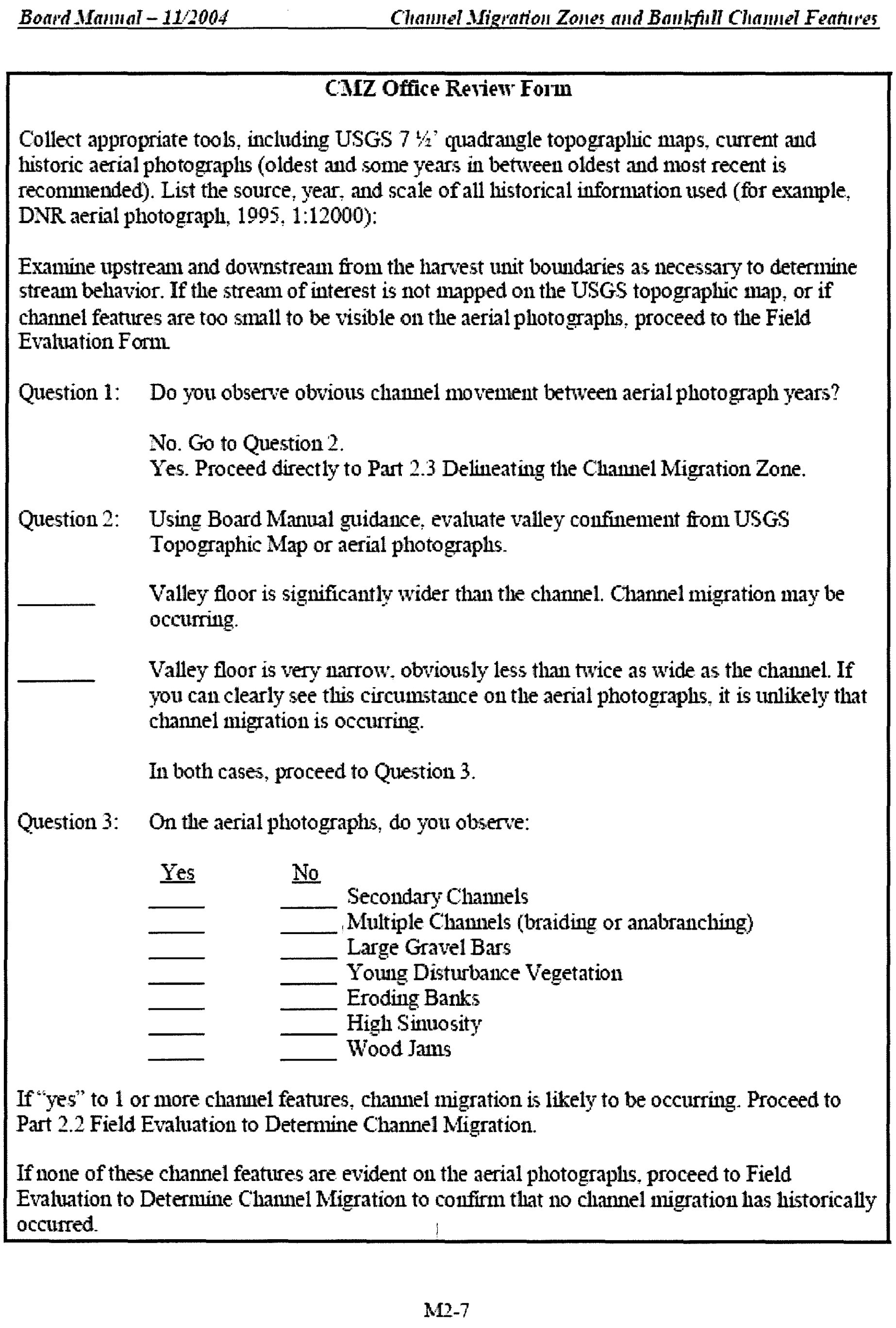
In conformance with the ASP guidance document recommendations, and to provide an organizing structure for our independent evaluation of channel migration in the LNFG, we utilized the procedures described in the Washington Forest Practices Board (WFPB) pertaining to channel migration zones. The WFPB procedure to determine the presence of CMZs begins with an office-based review of maps and aerial photographs and is followed by a field evaluation. The WFPB guidance document provides forms that summarize the office (Figure 2) and field (Figure 3) review procedures. These procedures have been followed and the findings are reported below.

---

[3] Anadromous Salmonid Protection Rules: Revised Interpretive Question and Answers for RPF's and Landowners. 2014. Prepared by California Dept. of Forestry and Fire Protection and California Dept. of Fish and Wildlife. June 16, 2014. 54 p.

1/10/2021

366.92



Board Manual – 11/2004 *Channel Migration Zones and Bankfull Channel Features*

CMZ Office Review Form

Collect appropriate tools, including USGS 7 ½' quadrangle topographic maps, current and historic aerial photographs (oldest and some years in between oldest and most recent is recommended). List the source, year, and scale of all historical information used (for example, DNR aerial photograph, 1995, 1:12000):

Examine upstream and downstream from the harvest unit boundaries as necessary to determine stream behavior. If the stream of interest is not mapped on the USGS topographic map, or if channel features are too small to be visible on the aerial photographs, proceed to the Field Evaluation Form.

Question 1: Do you observe obvious channel movement between aerial photograph years?

No. Go to Question 2.
Yes. Proceed directly to Part 2.3 Delineating the Channel Migration Zone.

Question 2: Using Board Manual guidance, evaluate valley confinement from USGS Topographic Map or aerial photographs.

_______ Valley floor is significantly wider than the channel. Channel migration may be occurring.

_______ Valley floor is very narrow, obviously less than twice as wide as the channel. If you can clearly see this circumstance on the aerial photographs, it is unlikely that channel migration is occurring.

In both cases, proceed to Question 3.

Question 3: On the aerial photographs, do you observe:

Yes	No	
_____	_____	Secondary Channels
_____	_____	Multiple Channels (braiding or anabranching)
_____	_____	Large Gravel Bars
_____	_____	Young Disturbance Vegetation
_____	_____	Eroding Banks
_____	_____	High Sinuosity
_____	_____	Wood Jams

If "yes" to 1 or more channel features, channel migration is likely to be occurring. Proceed to Part 2.2 Field Evaluation to Determine Channel Migration.

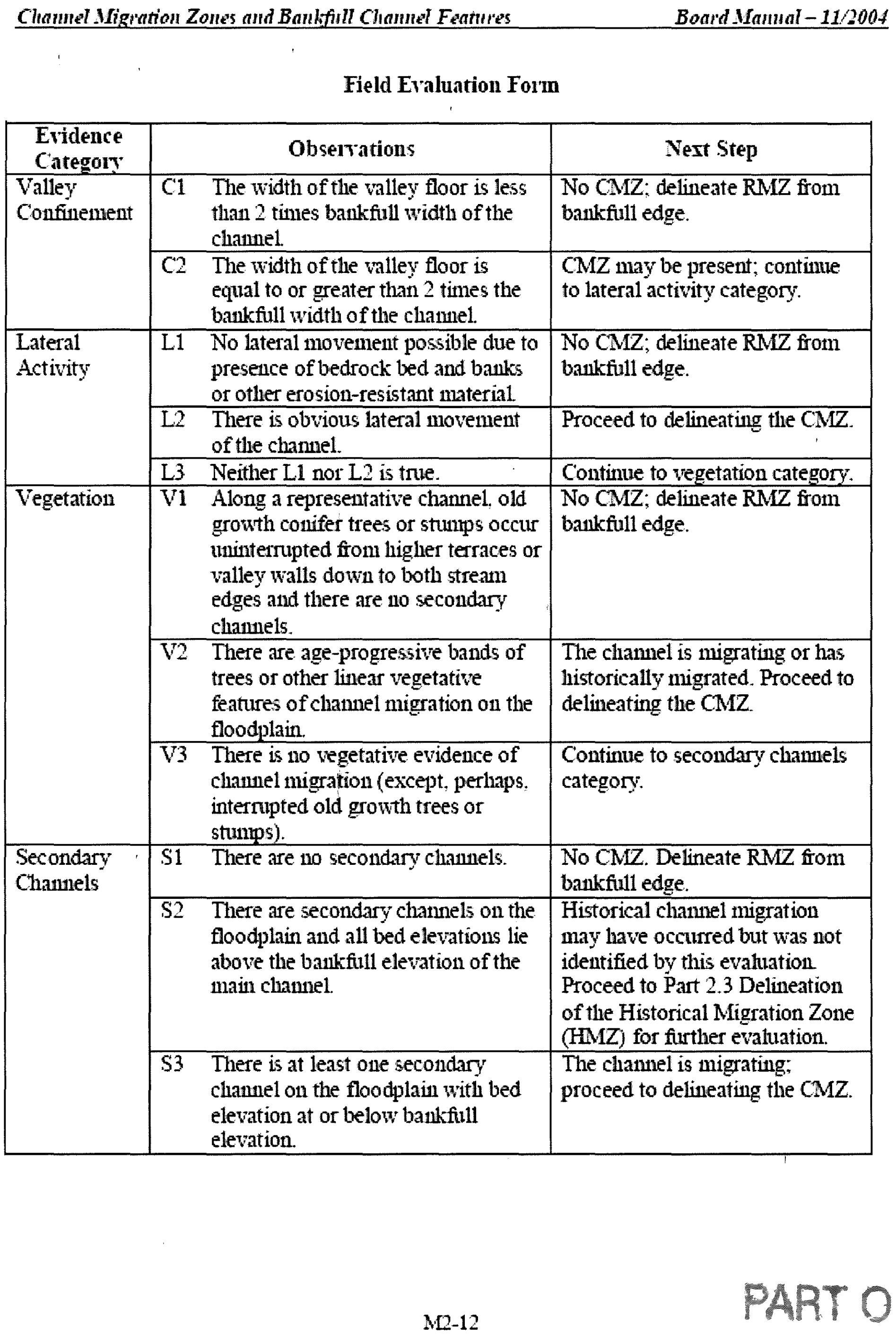
If none of these channel features are evident on the aerial photographs, proceed to Field Evaluation to Determine Channel Migration to confirm that no channel migration has historically occurred.

M2-7

Figure 2. WFPB form for CMZ office review.

1/10/2021

366.93



Field Evaluation Form

Evidence Category		Observations	Next Step
Valley Confinement	C1	The width of the valley floor is less than 2 times bankfull width of the channel.	No CMZ; delineate RMZ from bankfull edge.
	C2	The width of the valley floor is equal to or greater than 2 times the bankfull width of the channel.	CMZ may be present; continue to lateral activity category.
Lateral Activity	L1	No lateral movement possible due to presence of bedrock bed and banks or other erosion-resistant material.	No CMZ; delineate RMZ from bankfull edge.
	L2	There is obvious lateral movement of the channel.	Proceed to delineating the CMZ.
	L3	Neither L1 nor L2 is true.	Continue to vegetation category.
Vegetation	V1	Along a representative channel, old growth conifer trees or stumps occur uninterrupted from higher terraces or valley walls down to both stream edges and there are no secondary channels.	No CMZ; delineate RMZ from bankfull edge.
	V2	There are age-progressive bands of trees or other linear vegetative features of channel migration on the floodplain.	The channel is migrating or has historically migrated. Proceed to delineating the CMZ.
	V3	There is no vegetative evidence of channel migration (except, perhaps, interrupted old growth trees or stumps).	Continue to secondary channels category.
Secondary Channels	S1	There are no secondary channels.	No CMZ. Delineate RMZ from bankfull edge.
	S2	There are secondary channels on the floodplain and all bed elevations lie above the bankfull elevation of the main channel.	Historical channel migration may have occurred but was not identified by this evaluation. Proceed to Part 2.3 Delineation of the Historical Migration Zone (HMZ) for further evaluation.
	S3	There is at least one secondary channel on the floodplain with bed elevation at or below bankfull elevation.	The channel is migrating; proceed to delineating the CMZ.

Figure 3. WFPB form for CMZ field evaluation.

1/10/2021

366.94

Office Review to Determine Channel Migration

The office-based review as set forth in WFPB guidance (Figure 2) relies on topographic maps and aerial photographs. For this CMZ evaluation and the aforementioned hydraulic models, we have utilized the highly accurate LiDAR-derived digital elevation model for the project area for 2017. The LiDAR DEM is publicly available data that we obtained through the US Geological Survey National Map Viewer website. Hydraulic model output displayed on maps of the LNFG valley represent the extent and depth of flooding on the LNFG floodplain for a ~20-yr recurrence interval flood event that occurred in February 2019. The map of floodplain inundation and floodplain flow paths (Figure 7 from the Floodplain Study and reproduced in this document as Figure 3) provides a direct representation of the channel of the LNFG and its depth along with flows outside of the channel of the LNFG, including any existing flow paths that could be interpreted as existing or potential channels. A portion of Figure 7 from the Floodplain Study is reproduced here as Figure 5; it points out two locations (CDFW 1 and CDFW 2) identified by CDFW during the PHI in May 2019 as examples of migration channels subject to CMZ restrictions under the ASP rules.

Per step 1 of the WFPB guidance and our own professional experience, we first obtained the available aerial photography for the LNFG valley and the Little THP. Gualala RedwoodTimber provided the aerial photographs listed in Table 1 spanning a 58-year period. Dr. Matthew O'Connor reviewed each set of photographs using a Topcon MS-3 Mirror Stereoscope with 3x binoculars.

Table 1. Aerial photographs reviewed.

Date	Type	Scale	Photo Numbers	Vendor (if known)
1952 (Sept. 22)	B&W	~1:20,000	AV-101 04 01,02	Sunderland Aerial Photographs, Oakland
1953 (Aug. 4)	B&W	1:20,000	CSH-9K-125,126	n.a.
1956	B&W	~1;12,000	SSM-6 11-21, 12-22,23 13-22,23	Western Aerial Contractors, Eugene
1959 (May 4)	B&W	1:15,000	AV-325 02-03,04,05 03-05,06,07	Hammon, Jensen & Wallen, Oakland
1965 (Sept. 29)	B&W	~1:15,000	AV-688-02-06,07	Hammon, Jensen & Wallen, Oakland
1971 (Sept. 15)	B&W	1:15,000	AV-1008-2-1,2,3,4	n.a.
1973 (Oct. 17)	B&W	1:12,000	AV-1122-03-04,05,06,07,08,09	n.a.
1988 (Aug. 16)	B&W	1:15,840	AV 3375 2-4,5,6 3-6,7,8	n.a.
1993 (June 26)	B&W	1:15,840	AV 4473 3-4,5,6,7	n.a.
1994 (June 8)	B&W	1:15,840	AV 4666 3-4,5,6	n.a.
1996 (July 1)	Color	1:15,840	KAV 5184 3-4,5,6,7	n.a.
1998 (July 17)	Color	1:15,840	KAV 5971 3-4,5,6,7	n.a.
2004 (June 16)	Color	~1:12,000	CO-OP 2004 10-23-6,7,8,9,10	n.a.
2010 (July 19)	Color	1:16,000	GRI 1-124,126,128,130,132	n.a.

Per Question 1 of the WFPB office review, Dr. O'Connor did not observe evidence of significant channel movement between aerial photograph years. For the most part, the channel of the LNFG was not visible under the forest canopy. There were a few locations where short lengths of the LNFG channel were visible depending on sun angle, shadows and the presence of gaps in the forest canopy.

The negative finding to Question 1 leads to Question 2, which inquires whether the valley floor is significantly wider than the channel. In the southerly "compartment" of the Little THP (demarcated for this description at its northern end by the bridge crossing of the principal road along the LNFG valley; this is also just upstream of Site 5 on Figure 4), the valley floor is typically several times the width of the channel, which suggests the potential for channel migration. Regardless of the answer to Question 2, the procedure leads on to the next question.

1/10/2021

366,95

Question 3 asks for additional detail regarding features of interest pertaining to potential evidence of channel migration. Of the seven features on this list, only "Young Disturbance Vegetation" was observed. This feature was observed in the first 0.2 miles of the LNFG within the northern boundary of the southern compartment of the Little THP (near Sites 4 and 5, Figure 4), and became noticeable in color photographs in 1998. In this same area, along the east edge of the LNFG valley floor, numerous snags were evident and persisted in this area thereafter.

One portion of the LNFG channel that was generally visible in aerial photography is at the location CDFW 2. In one of the earliest sets of photographs (1953), the bend in the channel of the LNFG to the east away from the southerly floodplain flow path associated with CDFW 2 was visble. This easterly bend is frequently visible in subsequent aerial photographs. In the 1988 photos, there are noticeable changes in the forest canopy at CDFW 2; there is also a linear road grade feature that can be seen on the LNFG floodplain that terminates about 600 ft south of CDFW 2. There was not, however, any clear evidence of significant flow or channel-forming process along the floodplain flow path at CDFW 2, and in the next set of photos (1993), the subtle change in canopy at CDFW 2 was no longer evident. There was never any indication in any of the aerial photographs of channel development from the LNFG along the floodplain flow path at CDFW 2.

<u>The absence of the characteristic signature of channel migration in historic aerial photography is a significant finding</u>. Significant channel migration by gradual bank erosion or by avulsion erodes the floodplain or terraces to a depth comparable to the existing channel; this erosion would undermine existing forest vegetation leaving linear or curvilinear gaps in the forest canopy that are readily apparent in aerial photography. If channel migration processes are present, there is typically evidence of past channel migration in the form of distinctive patterns of vegetation corresponding to seral stages of forest vegetation associated with disturbance. <u>In my professional and academic experience, significant channel migration on a valley floodplain of this size would be evident in this aerial photo record, particularly considering the large number of photo sets (14), their frequency (the longest gap was only 15 years from 1973-1988), and quality (photo sets complete with stereo pairs in good condition)</u>.

Regardless of the findings of the CMZ office review (positive or negative regarding evidence of channel migration), the procedure directs the review to proceed to "Field Evaluation".

Field Evaluation to Determine Channel Migration

Field criteria to identify indicators of channel migration per the WFPB procedure are summarized in Figure 3. The WFPG guidance is generally helpful in identifying field criteria but does not address how to select field areas for evaluation in the absence of evidence of channel migration from aerial photographs. Field reconnaissance was guided by inspection of results from hydraulic modeling, topographic data, prior reconnaissance in March 2019 to validate hydraulic model predictions, and two locations identified by CDFW as evidence of existing or potential channel migration. Six sites, each about 0.1 mile or more in length (Figure 4), were visited on May 31, 2019 to evaluate channel migration. Conditions at each site are discussed below with respect to criteria in the WFPB methodology and other observations relevant to channel migration processes. Field observations pertaining directly to the "Field Evaluation Form" (Figure 3) from each site are summarized in Table 2. Figure 6a, 6b, 6c and 6d provide maximum predicted water depth from hydraulic model simulations developed for the Inundation and Drainage Study; these maps were used to estimate depth of flow in the main channel of the LNFG as well as secondary channels and floodplain flow features. Figures 6a-d also locate CMZs identified based on field reconnaissance.

1/10/2021

366,96

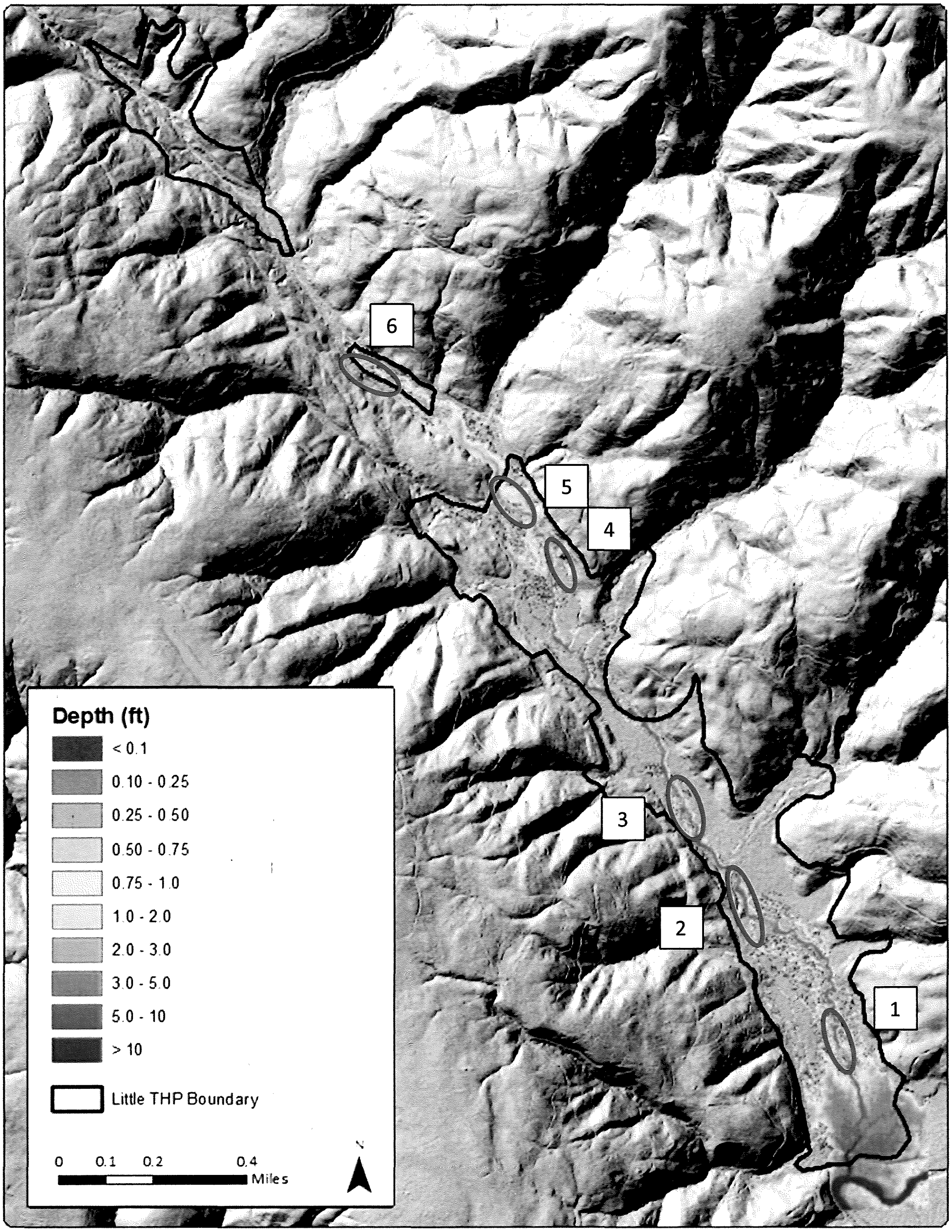


Figure 4. Extent and depth of simulated 20-yr recurrence interval flooding in LNFG. Numbered blue ovals refer to field reconnaissance areas for channel migration.

1/10/2021

366.97

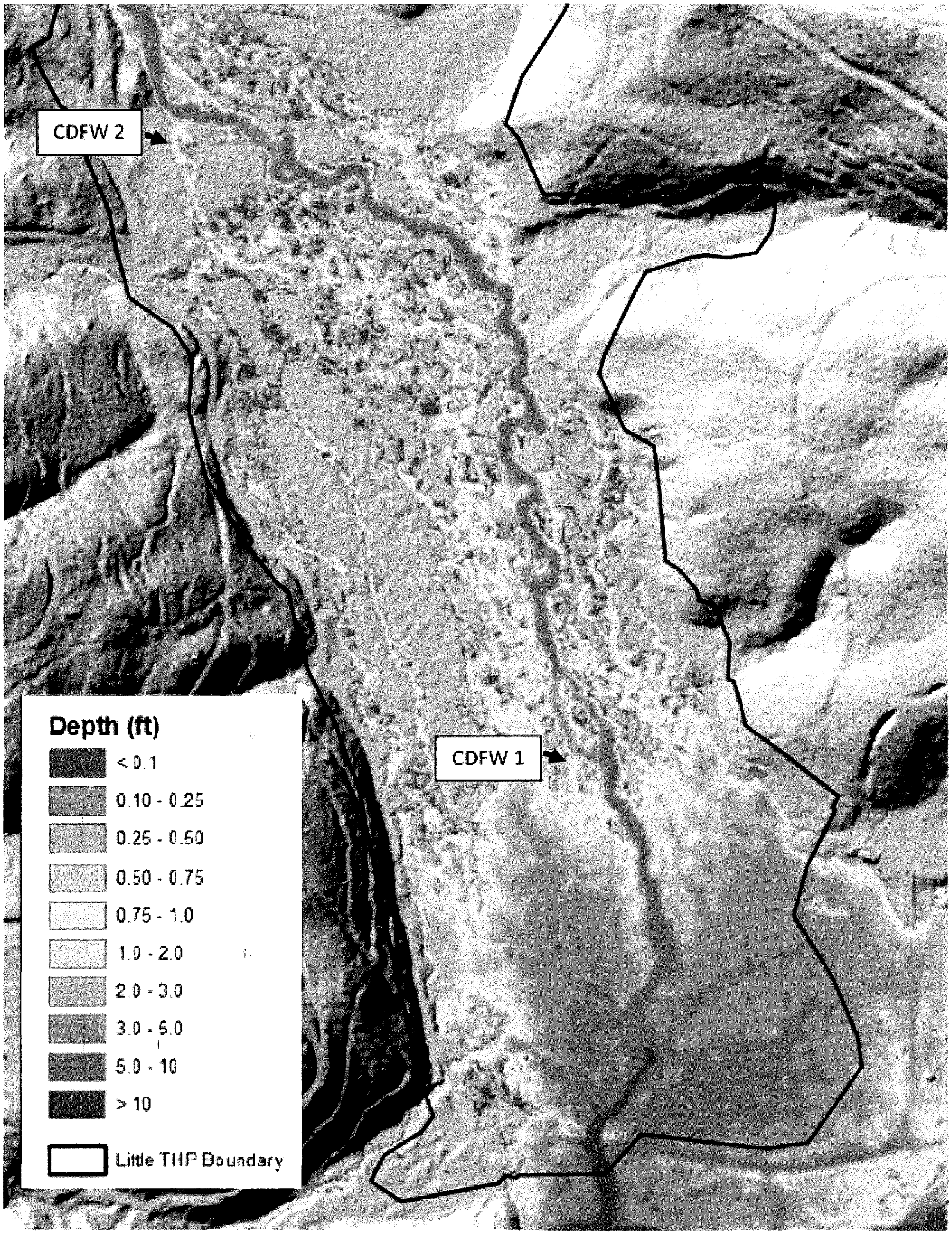


Figure 5. Hydraulic simulation of extent and depth of 20-year flood in the lower LNFG watershed.

1/10/2021

366.98

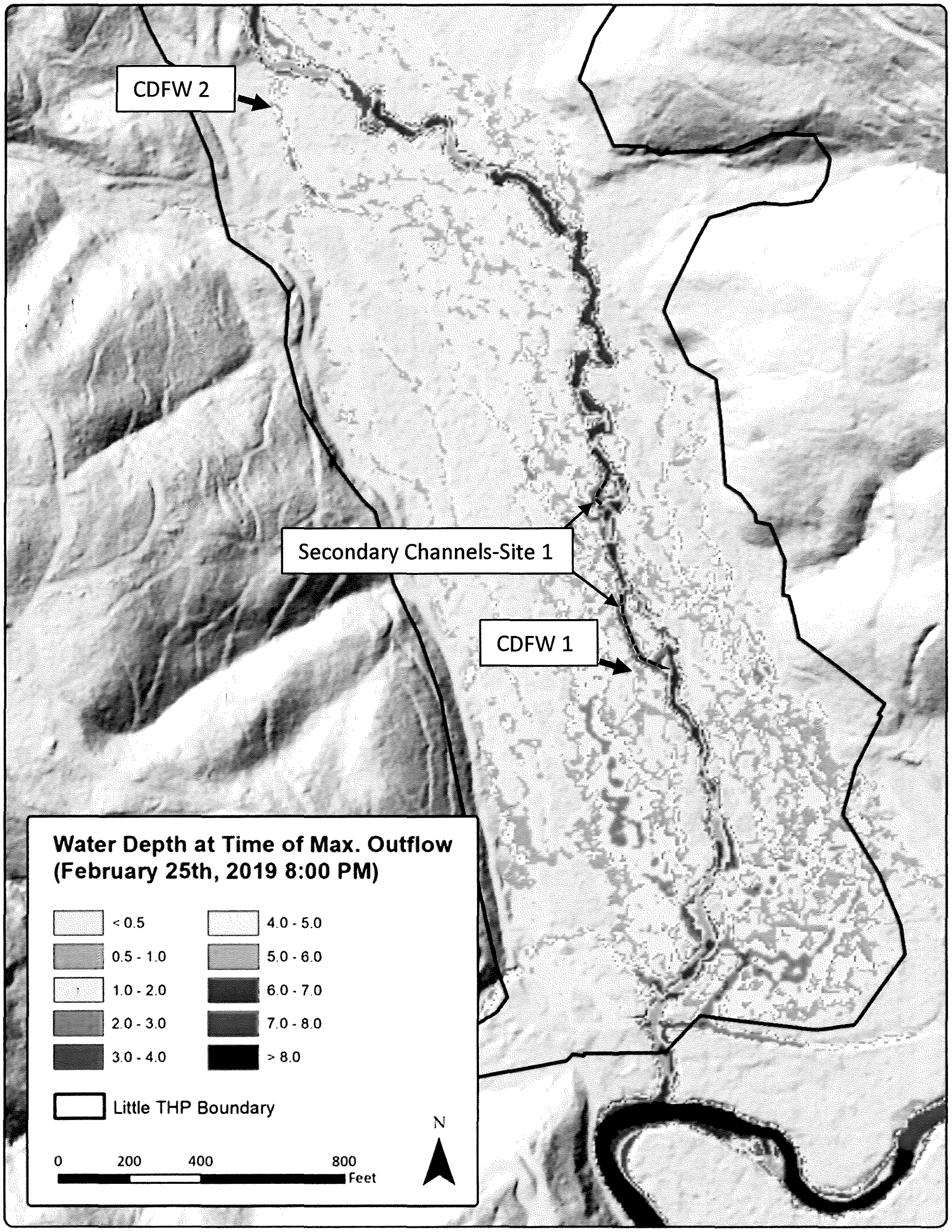


Figure 6a. Maximum extent and depth of February 25-27, 2019 flood from hydraulic simulation model from the Inundation and Drainage Study of the lower LNFG watershed (downstream portion, map 1 of 4).

1/10/2021

366.99

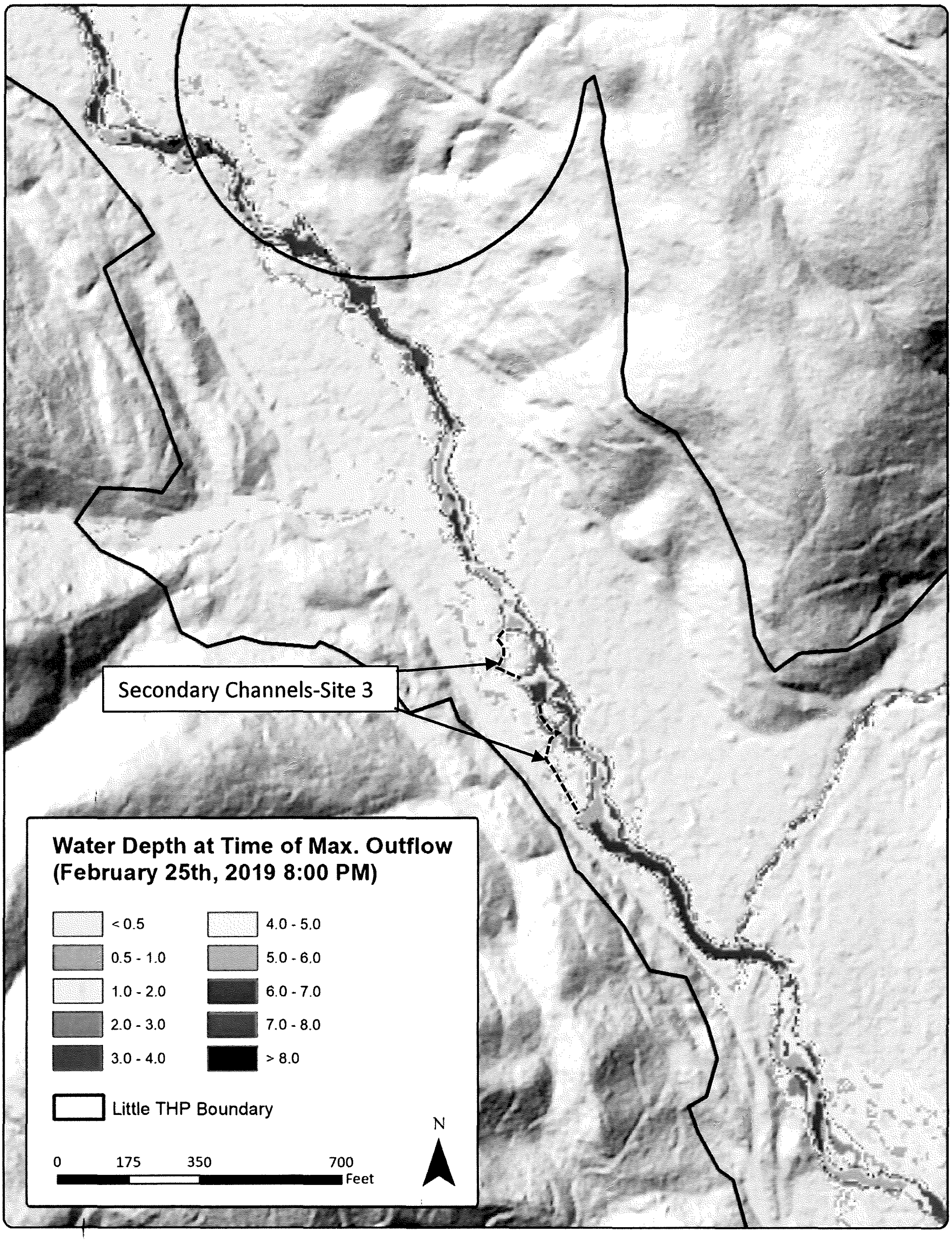


Figure 6b. Maximum extent and depth of February 25-27, 2019 flood from hydraulic simulation model from the Inundation and Drainage Study of the lower LNFG watershed (downstream portion, map 2 of 4).

1/10/2021

366,100

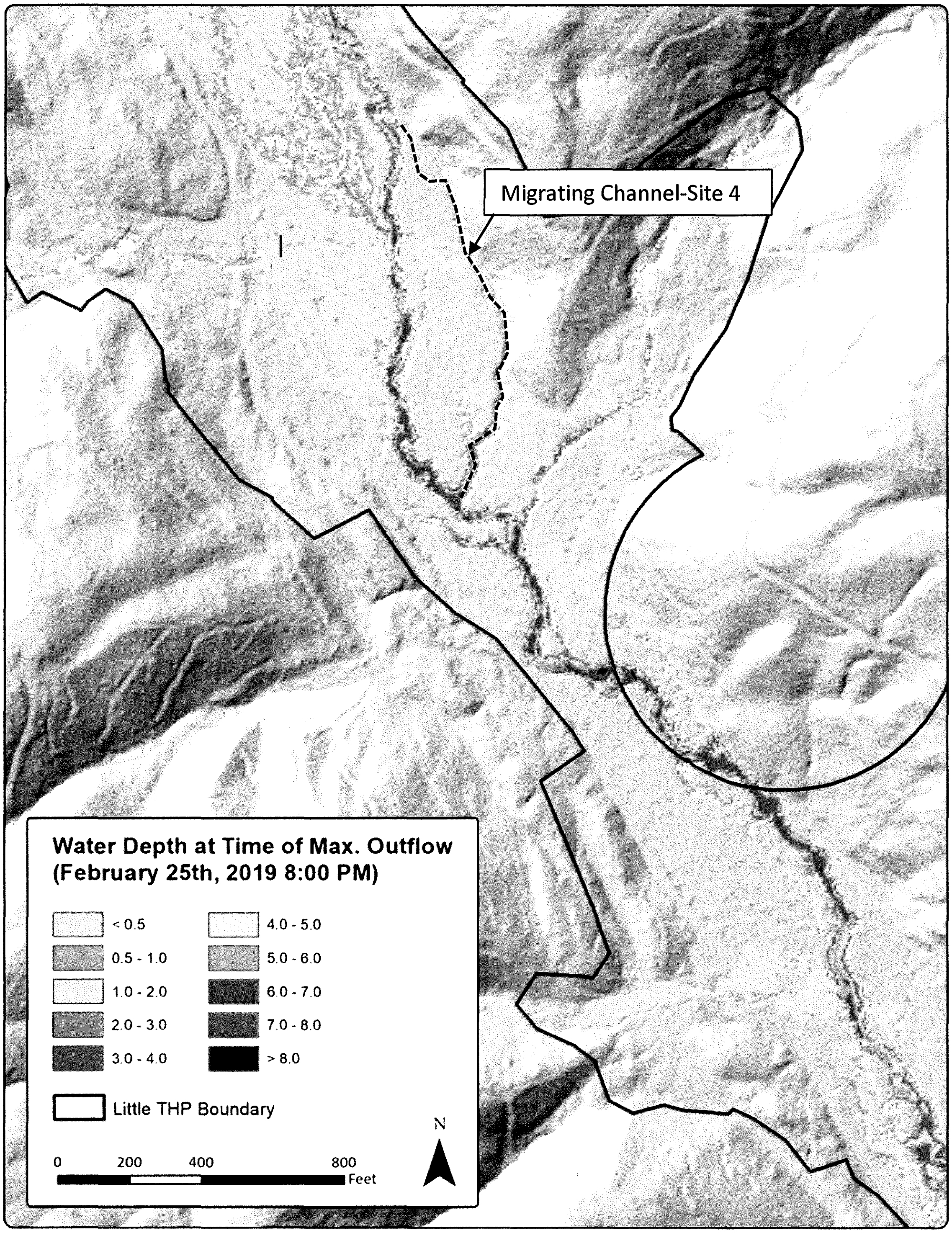


Figure 6c. Maximum extent and depth of February 25-27, 2019 flood from hydraulic simulation model from the Inundation and Drainage Study of the lower LNFG watershed (middle portion, map 3 of 4).

PART OF PLAN

1/10/2021

366.101

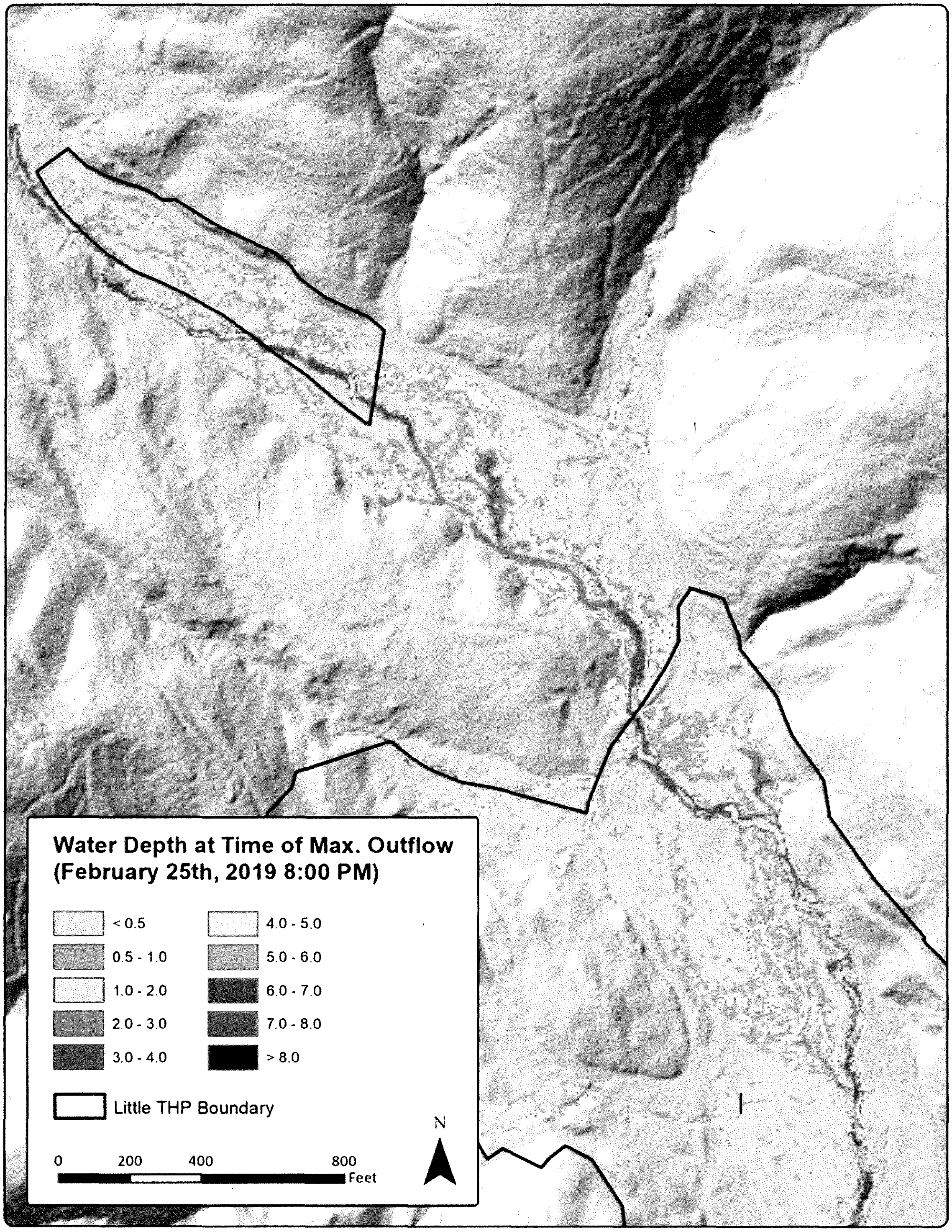


Figure 6d. Maximum extent and depth of February 25-27, 2019 flood from hydraulic simulation model from the Inundation and Drainage Study of the lower LNFG watershed (upstream portion, map 4 of 4).

1/10/2021

366.102

Table 2. Observed conditions per field evaluation form

Site	Valley Confinement	Lateral Activity	Vegetation	Secondary Channels
1 (includes CDFW 1)	C2-valley width > 2x bankfull width	L2-obvious lateral movement-existing secondary channel at island	V3-no vegetative evidence of channel migration	S3-existing secondary channel at island
2 (includes CDFW 2)	C2-valley width > 2x bankfull width	L3-no obvious constraint on lateral movement nor obvious lateral movement	V3-no vegetative evidence of channel migration	S3-existing secondary channel at island (upstream on opposite bank from CDFW 2)
3	C2-valley width > 2x bankfull width	L2-obvious lateral movement-existing secondary channel at island	V3-no vegetative evidence of channel migration	S3-existing secondary channel at island
4	C2-valley width > 2x bankfull width	L3-no obvious constraint on lateral movement nor obvious lateral movement	V3-no vegetative evidence of channel migration	S3-existing floodplain flow feature at east edge of valley floor
5	C2-valley width > 2x bankfull width	L3-no obvious constraint on lateral movement nor obvious lateral movement	V3-no vegetative evidence of channel migration	S1-no existing secondary channels
6	C2-valley width > 2x bankfull width	L3-no obvious constraint on lateral movement nor obvious lateral movement	V3-no vegetative evidence of channel migration	S1-no existing secondary channels

Site 1

This field site includes the floodplain flow feature identified as CDFW 1; the specific floodplain flow feature is also identified on a larger-scale map (Figure 5). This portion of the LNFG lies within the upstream edge of backwater flooding caused when the North Fork Gualala (NFG) is at flood stage. Consequently, overbank flows are more likely to occur than in areas farther upstream and unaffected by the NFG backwater and, when they do occur, overbank flow moving down stream will frequently encounter ponded flood water of the NFG within about 500 ft or less. The CDFW 1 floodplain flow feature may be considered a "distributary" channel in that is does not rejoin the main channel as a discrete channel; the overbank flood flows transported via this distributary channel spread and mix with numerous other floodplain flow features and do not have a discrete reconnection point with the primary channel. In addition, this site is located near the confluence with another body of water (the NFG) that creates a base level affecting geomorphology of the channel of the LNFG.

CDFW 1 is a location where flow escapes the channel of the LNFG over the low bank on the outside bend of a secondary channel as it curves back to rejoin the main channel of the LNFG less than 100 ft away. The secondary channel, separated from the primary channel of the LNFG by an island about 200 ft long and 50 ft wide, is itself characteristic of the style and scale of channel migration that appears to occur on the LNFG. The secondary channel has a depth (~3 to 4 ft) that is about half that of the primary channel (~4 to 7 ft), and it carries bedload sediment of the same caliber as that of the primary channel. The secondary channel is clearly a channel in that is does not contain terrestrial soil, vegetation or forest litter. Small islands of terrestrial vegetation are formed where small-scale, local channel migration occured in this area and secondary channels forming these islands should be considered Class I channels subject to ASP regulations; these channels are delineated in Figure 6a.

Secondary channels appear to result from a combination of

- large standing redwood trees and stumps that obstruct either the channel or floodplain flow,
- LWD accumulation (often captured by trees or stumps), and
- local accumulations of sediment related to LWD.

These flow obstacles occupy channel volume, increase local flow resistance, and divert flow; the diverted flow is believed to eventually form the secondary channel. Based on field observations in the LNFG, this process appears to be gradual. Accumulation of LWD and sediment gradually sets the stage for avulsion, presumably triggered by a flood event that adds new LWD and sediment and creates localized flow depth and/or velocity that exceeds an erosion threshold to form a secondary channel. Observations of several islands and the channel patterns evident from hydraulic modeling indicate that these avulsions create short secondary channels that rejoin the existing primary channel within 200 ft or less. This likely occurs because the floodplain is already occupied by overbank flow, so that water escaping the channel immediately encounters a local backwater that dissipates flow momentum, and because slope gradient of the floodplain is comparable to the channel gradient and the main channel is already following the steepest down-valley gradient. It has been observed that substantial avulsion channels form when the local floodplain slope is greater than the local channel slope (Jones and Schumm 1999, Bridge 2003, as cited in the WFPB guidance document-page M2-28).

The recent overbank flow of the LNFG during the ~20-year flood event in February 2019 at CDFW 1 carried bedload sediment (gravel) out of the secondary channel and onto the floodplain at the head of the floodplain flow feature. The gravel was deposited within about 20 feet of the beginning of the floodplain flow feature beyond which deposits of sand and silt were observed broadly across the floodplain. Although there was a discernable channel or swale in which flow was concentrated to depth of about 1

1/10/2021

366,104

to 2 ft, the flow that escaped the side channel of the LNFG did not have erosive power to create an alternative channel comparable to either the secondary channel or main channel of the LNFG. Forest vegetation and litter, now covered in a fresh layer of silt and sand deposits, characterize the floodplain surface where this shallow floodplain flow feature occurs.

The overbank flow in the floodplain flow feature identified as CDFW 1 does not constitute channel migration. A migrating channel must be capable of eroding a new channel to a depth comparable to that of the existing principal or secondary channel and be capable of transporting the bedload of the primary channel. That condition is necessary in order that a migrating channel be capable of disturbing forest vegetation on the floodplain that would distinguish it from a floodplain flow feature (here defined as concentrated flow following a linear or curvilinear swale carrying overbank flows).

Site 2

This field site includes the floodplain flow feature identified as CDFW 2; the specific floodplain flow feature is also identified on a larger-scale map (Figure 5). The CDFW 2 floodplain flow feature may be considered a "distributary" channel in that is does not rejoin the main channel as a discrete channel; the flood flows transported spread and mix with numerous other floodplain flow features.

A substantial floodplain flow feature lies just upstream on the opposite bank and rejoins the primary channel just downstream of the floodplain flow feature identified as CDFW 2. This floodplain flow feature is separated from the primary channel of the LNFG by a small island and has a depth (~2 to 3 ft) that is less than half that of the primary channel (~5 to 7 ft). This feature does not carry bedload sediment (gravel) and is mantled by shrubs. Overbank flows in this feature are evidently recurrent, and the shrub and grass community grow in mesic soil that appear to be sand and silt deposits. Abundant LWD is accumulated in complex jams distributed over about 200 ft upstream of this feature. It is not a migrating channel but has the potential to become a secondary channel.

CDFW 2 is a location where flow escapes the LNFG to the south over the low bank on the outside bend of the primary channel. The overbank flow through this floodplain flow feature is not more than 2 ft deep where it escapes from the primary channel. Overbank flow at CDFW 2 is likely moderated by the aforementioned floodplain flow feature just upstream on the opposite bank. There was clear evidence of flow in this linear feature with depths ranging from about 0.5 to 3.0 ft that extends about 400 ft down valley to the south where the flow it carries apparently dissipates broadly across the floodplain. CDFW 2 possibly originated as a road or skid trail. CDFW 2 is not a migrating channel; it does not carry the bedload of the LNFG and it flows across a vegetated surface in a swale otherwise characteristic of the forest floor.

Site 3

This site was selected for reconnaissance owing to the presence of potential secondary channels indicated by the hydraulic model and the presence of a series of islands with secondary channels similar to those observed at and described in relation to Site 1. LWD accumulations were found jammed at the upstream edge of some islands and in either the secondary or primary channel. Some island features did not have LWD accumulations present; it appears that there are shifting accumulations of LWD driven by peak flows. The recent flood flows of February 2019 appeared to have re-arranged LWD and caused deposition of silt and sand in some of the deeper (~2 ft) overbank floodplain flow features.

Overbank flow in this area is limited and found in floodplain flow features along the right (west) bank of the LNFG. Consequently, overbank flow tends to concentrate in overbank flow features that do not

1/10/2021

366,105

uniformly meet the criteria adopted for a secondary channel (depth of channel at least half of primary channel transporting primary channel bedload sediment and the absence of terrestrial vegetation). The deeper floodplain flow features (~2-3 ft) lying nearest the existing primary channel (depths ~4-7 ft) along the right bank are secondary channels (delineated in Figure 6b); as at Site 1, these secondary channels are readily defined by associated islands of terrestrial vegetation and should be considered Class I channels subject to ASP regulations.

Site 4

This site was selected for reconnaissance owing to the presence of a floodplain flow feature along the east edge of the LNFG valley that deepens downstream; this flow feature carried a small amount of flow in the simulation model developed in the Floodplain Study but not in the simulation model developed in the Inundation Duration Study. Field verification of the Floodplain Study found evidence that a small amount of overbank flow did reach this channel in the February 2019 flood. Both models show the lower end of this floodplain channel, which rejoins the LNFG about 1,000 ft downstream of its origin, fills with water to depths as great a 5 ft, primarily from backwater of the LNFG.

This floodplain channel at its upper end lies at an elevation that is near the threshold of overbank flow at a point where the primary channel of the LNFG is very narrow and confined on the east bank by the valley wall and turns at a near right angle to the west, immediately encountering a large LWD accumulation. The floodplain channel is 1-2 ft deep in the first ~200 ft before it begins to gradually deepen and widen until a gully-head channel form is reached and the channel significantly enlarges to a cross-section ~4 ft deep or greater and ~10-15 ft wide. Field and aerial photo observations suggest that this floodplain channel is located on--and was formed because of--a road grade that existed in this alignment. This relatively large channel does not appear to normally carry significant flow or sediment.

The valley floor lying between this floodplain channel and the LNFG is 200 to 300 ft wide. The hydraulic models indicate that most of this surface is not inundated in the simulated 20-year flood flow except for a relatively small area on its west edge with water depths of < 0.5 ft. Surprisingly, this surface contains numerous and widely distributed large conifer snags and a seral stand of alder that was first observed in the 1988 aerial photos. The prior set of aerial photos from 1973 do not show this vegetation pattern. The disturbance that produced this vegetation pattern is not understood; however, Gualala River Timber personnel believed that a retired forester who worked in the watershed had reported that a landslide disturbance affected this area. An episode of sedimentation could have conceivably produced this surface; this could possibly explain the conifer snags (killed by burial of the root collar), the seral stand of alder, and the apparent elevation of this area above the level of the 20-year flood. It should be noted that the seral stand in this area is uniform in character and does not express linear or curvilinear vegetation patterns that may be interpreted as evidence of channel migration.

The floodplain channel lying near the boundary of the valley floor and the eastern valley wall has a high potential for being enlarged by an avulsion of the LNFG which could partially or completely occupy this location. At its downstream end, this channel reaches depths comparable to the main channel of the LNFG. The potential avulsion channel subject to ASP CMZ rules is delineated in Figure 6c.

Site 5

This site was selected for reconnaissance owing to the presence of the floodplain flow feature identified as Site 4. This area lies at the mouth of a Class II S tributary on the east side of the LNFG valley; it was hypothesized that this tributary valley may be the source of a landslide hypothesized to have produced

1/10/2021

366,106

downstream sedimentation in the area of disturbed vegetation. The reconnaissance was therefore focused more on assessment of the area between the tributary and the LNFG for evidence of sedimentation associated with a hypothesized landslide.

The area at the mouth of the Class II S tributary does have the characteristic geometry of an alluvial fan, possibly consistent with a landslide but also consistent with an alluvial fan absent a significant landslide. The LNFG in this part of the valley emerges from the narrowest portion of the valley where a bridge with a substantial causeway approach from both banks forces the LNFG channel to pass nearer the west edge of the valley. After passing under the bridge, the LNFG curves to the east until it intersects the east edge of the valley about 1,000 ft downstream of the bridge. This portion of the channel appears somewhat steeper and shallower than areas downstream, potentially consistent with the effect of landslide sedimentation, but this could also be caused by the effect of the flow obstruction effect of the road/bridge causeway just upstream.

The west bank and western portion of the LNFG valley floor is unusually wet with large areas of perennial saturation. This area is not considered a channel migration area, but it is subject to extensive overbank flow that is drained by a swale system up to 3 ft deep but occupied by terrestrial and forest vegetation.

The overall interpretation of this area is that it may be locus of sedimentation originating from the Class II S tributary, but the magnitude of the sedimentation (putatively from a landslide) does not appear to be great enough to relate obviously to the conditions observed at Site 4. <u>There is no CMZ at Site 5</u>.

Site 6

This site was selected for reconnaissance owing to the presence of potential secondary channels indicated by the hydraulic model along the left (east) bank of the LNFG in the "middle compartment" of the Little THP. The LNFG channel flows along the west edge of the valley outside the THP boundary except for a 400 ft segment of the channel that flows in the center of the valley floor after the channel departs the west edge of the valley.

A small slump that occurred on the right (west) edge of the valley wall, apparently during the February 2019 flood, and impinged on the LNFG channel. The landslide deposit is comprised mainly of a large multi-stem redwood clump that partially obstructed the channel. This type of mass wasting is believed potentially capable of initiating channel avulsion. Although overbank flood flows occurred in this area, this landslide did not cause a channel avulsion.

The east (left) side of the valley floor lies in the 20-year floodplain and has flow depths on the floodplain mostly 1-2 ft with small areas over 2 ft deep. The LNFG primary channel is ~4-7 ft where the overbank flows originate. This area is occupied by forest vegetation and does not transport bedload sediment and is therefore considered a floodplain flow path and not a secondary channel. Despite the landslide that impinged on the LNFG and that tended to divert additional flow to the eastern floodplain, no avulsion occurred. <u>The floodplain in this area is not considered a channel migration zone</u>.

PART OF PLAN

366.107

1/10/2021

Summary

1. This investigation followed procedures recommended by the Board of Forestry to identify channel migration as required by ASP provisions of the Forest Practice Rules; the technical reference for identification of channel migration is the Washington Forest Practices Board's Standard Methods for Identifying Bankfull Channel Features and Channel Migration Zones (WFPB 2004).
2. Aerial photographs covering the period 1953-2010 did not reveal channel migration processes in the LNFG. This is a significant finding in that channel migration processes, where present, are typically evident in historic aerial imagery, and because the ASP regulations apply to channel migration that occurs within the time frame required for the affected area to grow mature conifers. The absence of observable channel migration over a ~60-year period strongly suggests that channel migration processes subject to the ASP regulations do not occur in the LNFG.
3. Field evidence and hydraulic simulations from two modeling studies of the LNFG prepared by OEI (the "Floodplain Study" and the "Inundation Duration Study") revealed that:
    a. Small-scale channel migration with lateral channel movement comparable to bankfull width (about 50 ft or less) of the LNFG channel occurs and is caused primarily by large woody debris accumulations associated with redwood trees on stream banks that drive development of short lengths (about 200 ft or less) of secondary channel characterized by widths and depths of about half that of the primary channel (e.g. Sites 1 and 3).
    b. One instance (Site 4) where potential exists for a significant channel avulsion that could laterally shift the primary channel of the LNFG 200 to 300 ft over a distance of about 1,000 ft.
    c. Overbank flow on the floodplain of the LNFG is relatively widespread with many dispersed connections where flow between the primary channel and the floodplain is exchanged; this broad dispersal of floodplain flow is believed to limit the energy of flow entering and departing the floodplain such that overbank flows are not generally capable of eroding secondary/migrating channels.
    d. The topography of the floodplain is relatively flat with gentle slope gradients that are comparable to the gradient of the LNFG primary channel; consequently, overbank flows do not tend to cause development of migrating channels by avulsion. Overbank flows are typically distributed in a network of shallow swales steered by topographic mounds associated with mature redwood trees and old growth stumps.
    e. Although the extent of floodplain inundation is substantial, the duration of inundation does not generally extend much longer than the period when stream stage exceeds bankfull depth except in the lower LNFG where backwater inundation caused by flood peaks on the larger NFG watershed occurs.
    f. Landslide deposits that impinge on stream channels are known to cause channel avulsion under some circumstances; field observations of a suspected landslide deposit from a Class II tributary (Site 5) and from a recent slump that directly entered the LNFG (Site 6) did not cause channel avulsions.

366,108

1/10/2021

PART OF PLAN

1/10/2021

366.109

September 6, 2019

TO:
John Bennett, Forest Manager
Gualala Redwood Timber, LLC
PO Box 197, 39951 Old Stage Road
Gualala, CA 95445

M.D. O'Connor
No. 2449

FROM:
Matt
Matthew O'Connor, PhD, CEG #2449 (Exp. 10-31-19)
President and Principal Geomorphologist/Hydrologist

PART OF PLAN

SUBJECT:
Supplemental Information Pertaining to Floodprone Area Identification and Channel Migration Processes, Focused PHI for THP 1-18-095, August 29, 2019

INTRODUCTION

This memorandum was prepared for Gualala Redwood Timber, LLC by O'Connor Environmental, Inc. (OEI) to provide supplemental information relevant to the Focused Pre-harvest Inspection (PHI) for Timber Harvest Plan (THP) 1-18-095 MEN, the so-named "Little" THP. The Focused PHI was primarily a review of classification of the Flood Prone Area (FPA) and Channel Migration Zones (CMZ) in the THP.

Hydrologic, hydraulic and geomorphic analyses of the Little North Fork of the Gualala River (Little North Fork) conducted by OEI for Gualala Redwood Timber LLC and submitted to the THP file provide the technical basis for identification and delineation of the FPA and CMZ. Three separate documents prepared by OEI summarize analyses conducted in spring and summer 2019 that, respectively, delineate the 20-year recurrence interval floodplain, characterize the duration of floodplain inundation, and evaluate channel migration processes.

The Focused PHI toured six separate portions of the THP identified and described in the CMZ evaluation by OEI during which field evidence and interpretation of its significance was discussed. The FPA delineation based on the 20-year floodplain surface determined using hydrologic and hydraulic modeling was also a matter of discussion. Field evidence of overbank flow, sedimentation, and erosion resulting from a significant flood event in late-February 2019 was abundant. OEI's analysis indicates that this flood event corresponds to the estimated magnitude of the 20-year recurrence interval flood. Field evidence immediately after the flood and at the Focused PHI was quite consistent with model predictions of the extent and depth of overbank flow throughout the THP.

This memorandum provides supplemental data and analyses relating to (1) identification of the floodprone area of the Little North Fork in the THP area and (2) evaluation of channel migration processes as required under the California Forest Practice Rules (FPR) pertaining to Anadromous Salmonid Protection (ASP rules) which are applicable in this watershed.

RECEIVED
MAR 16 2021
COAST AREA OFFICE
RESOURCE MANAGEMENT

1/10/2021

366.110

FLOOD PRONE AREAS ANALYSIS

Methods and Approach. During the Focused PHI, there was considerable discussion regarding methods to determine the extent of the FPA in the THP. Identification of the FPA is an aspect of the ASP rules that applies to unconfined channels in the Coastal Anadromy Zone[1]. Where present, the FPA demarcates the outer edge of Inner Zone B. In this designated zone, timber harvest is restricted to retain 50% of overstory canopy cover and the 13 largest trees per acre; there are also silvicultural and operational requirements that apply in Inner Zone B. Definitions in the FPR's relevant to identification and delineation of the FPA are provided in Attachment A. I also referred to a guidance document by CALFIRE and California Department of Fish and Wildlife (CDFW) regarding implementation of the ASP rules[2] wherein an answer to the question "How will the FPA be determined in the field?" is answered (see Attachment A). Background information regarding the genesis of FPA definitions from an interagency white paper supports the use of the 20-year flood to represent the FPA as emphasized in the document: **"[i]n the North and Central Coast regions, the biologically critical area is generally considered by riparian ecologists to be that area inundated at less than or equal to every 20 years, based on coho salmon life cycle requirements."**[3]

We chose to identify the FPA in the THP area by estimating the spatial extent of the 20-year floodplain of the Little North Fork. A hydrologic and hydraulic modeling approach was used primarily because a recent LiDAR-derived Digital Elevation Model (DEM) available from the United States Geological Survey (USGS) provides a high-resolution topographic map for the area; absent the LIDAR DEM, the modeling approach would not be feasible. Furthermore, OEI is experienced with this type of hydrologic and hydraulic analysis and has prepared several such modeling studies over the past 10 years. These hydrologic and hydraulic analyses were conducted for a variety of public-sector and private-sector projects; the objectives included flood hazard analysis and mitigation, aquatic habitat restoration, and evaluation of project impacts.

At the time OEI initiated its analysis in early February 2019, field indicators did not provide a clear and consistent representation of the FPA and the modeling approach to determine the extent of the 20-year floodplain surface was expected to objectively and accurately delineate the FPA. This approach conforms with the FPA definition (Attachment A) specifying that "…where the outer boundary of the flood prone area cannot be clearly determined using the field indicators…it shall be determined based on the area inundated by a 20-year recurrence interval flood flow event, or the elevation equivalent to twice the distance between a thalweg riffle crest and the depth of the channel at Bankfull stage."

Subsequent to completion of our initial modeling work to delineate the 20-year floodplain, the late-February flood occurred. This provided the opportunity to compare model predictions to field evidence and so validate the results of the hydraulic model. It happened that the modeled flood was very closely correlated with the late-February flood. During the PHI on May 14, 2019, the FPA derived from the modeling analysis was reviewed, and questions arose regarding the duration of overbank flow in the FPA and potential channel migration processes. To address these questions, a second hydrologic and

PART OF PLAN

---

[1] 2019 FPR, p. 90.

[2] California Dept. of Forestry and Fire Protection and California Department of Fish and Wildlife (2014) Anadromous Salmonid Protection Rules: Revised Interpretive Questions and Answers for RPF's and Landowners.

[3] State of California Riparian Protection Committee (2005) Flood Prone Area Considerations in the Coast Redwood Zone, p. 7.

1/10/2021

366.111

hydraulic analysis was developed to simulate the flood event in late-February and a separate evaluation of channel migration processes was conducted according to CAL FIRE guidance.

Alternative Representation of the FPA. A principal objective of this memorandum is to provide an alternative representation of the FPA based on the floodplain area that would be inundated at two times bankfull flow. Per the definition of bankfull stage (Attachment A), the elevation of the surface at two times the bankfull flow has been estimated based on the height of the two-year recurrence interval flow. This elevation typically lies about 1 to 3 feet below the elevation at which overbank flooding occurs. Following is a description of the analysis used to determine this alternative representation of the FPA.

Previous modeling by OEI estimated streamflow of the Little North Fork based on drainage area-normalized discharges from the USGS gage on the Navarro River near Navarro (HUC 11468000). This decision was driven by the paucity of reliable long-term stream and precipitation gaging data near the project area. Using the USGS's PeakFQ software to implement a flood frequency analysis, the two-year peak discharge for the Navarro River at the USGS gage was estimated to be 18,300 cfs. Normalized to the 303 mi^2 watershed above the gage, the two-year peak discharge is 60 cfs/mi^2. Scaled to the 7.3 mi^2 Little North Fork watershed, this is equivalent to 441 cfs (Table 1). For a further discussion of the methodology used, refer to the Floodplain Study for the Little North Fork Gualala River, prepared by OEI and dated March 21, 2019.

The foregoing estimate, based on data from a substantially larger nearby watershed, is comparable to other estimates of the two-year peak discharge from regionally available sources. Using the USGS's Stream Stats web tool, which incorporates regional flood frequency regressions (Gotvald et al., 2012), the two-year peak discharge was estimated to be 478 cfs. These regressions also give a 90% confidence interval of 196 to 1,160 cfs, with the 441 cfs estimate from the Navarro gage falling substantially less than one standard deviation from the mean. Streamflow records are also available for four small tributaries to the South Fork Gualala River obtained from previous hydrographic work by OEI. The nearest of these is Francini Creek (drainage area 1.8 mi^2), a tributary of Buckeye Creek, for which peak daily and annual streamflow data is available for Water Years 2007 – 2012 (Figure 1). While this period of record is insufficient to apply the methodology of Bulletin 17B, a simple flood frequency analysis using the Weibull plotting position could be applied. This yielded an area-normalized two-year peak discharge of 72 cfs/mi^2 or an estimated two-year peak discharge of 526 cfs when scaled to the Little North Fork watershed. Since these estimates of the two-year flood are reasonably consistent and subject to uncertainty regarding their accuracy, we chose the estimate of 441 cfs consistent with our prior analysis and derived from the lengthiest stream flow record in the area.

Table 1: Estimates of two-year peak discharge (Q2) for the Little North Fork watershed from regionally available sources.

Source	Area Normalized Q_2 (cfs/mi^2)	Q_2 for Little North Fork (cfs)
Navarro River nr Navarro	60	441
Stream Stats for Little North Fork	65	478
Francini Creek	72	526

PART OF PLAN

1/10/2021

366.112

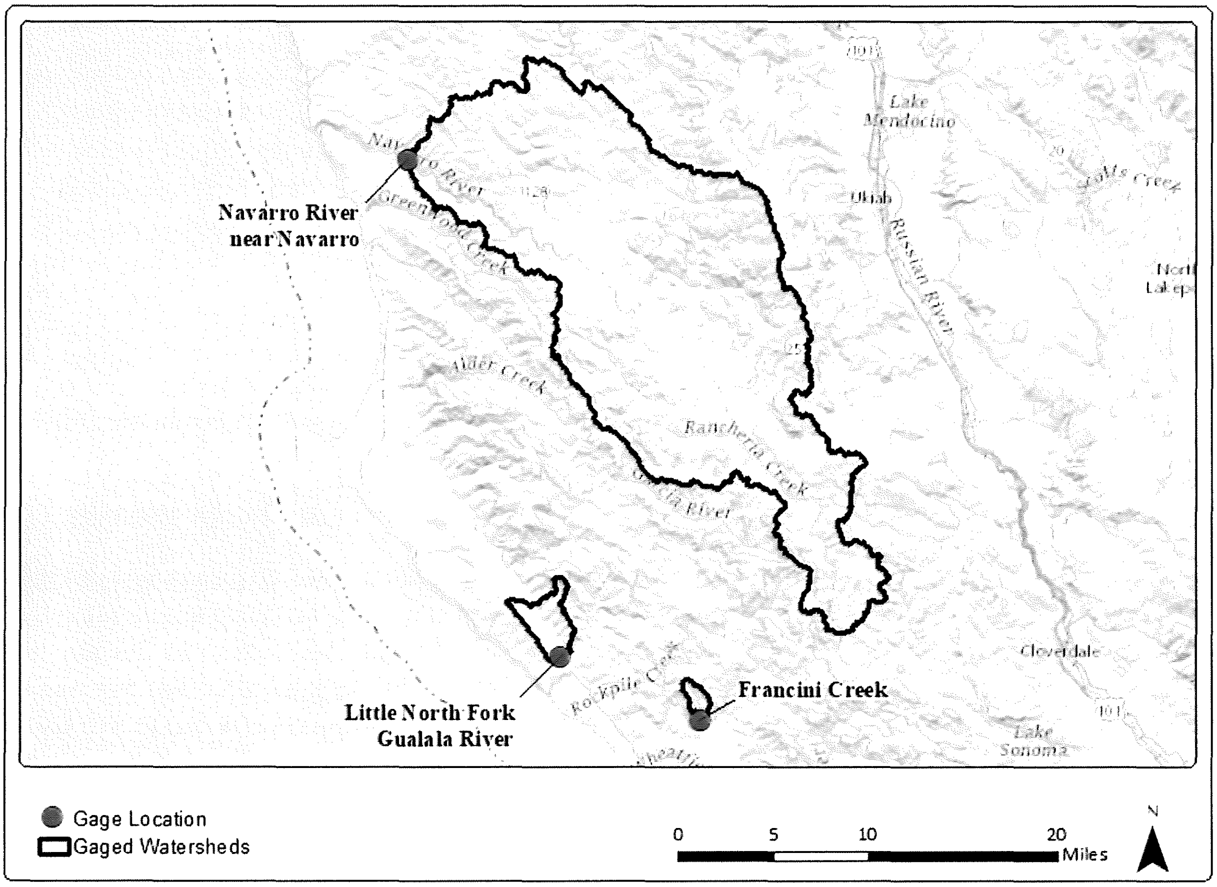


Figure 1: Location of gages used in hydrologic analysis.

An existing hydraulic model of the Little North Fork was used to determine the depth of flow at the two-year peak discharge. This hydraulic model was previously prepared by OEI and is documented in a report titled Floodplain Inundation Duration Study for the Little North Fork Gualala River, dated July 10, 2019. It was used to simulate flows during the February 26th and 27th, 2019 storm event and simulated flow depth at a variety of discharges ranging as high as to 1,263 cfs. At several timesteps during the simulation period, including at 1:00 PM on February 25th, watershed outflows were equal to the two-year peak flow of 441 cfs. Water depths at this timestep were used as an estimate of water depth at the two-year peak discharge.

Results at this timestep were queried in the ESRI ArcGIS platform for cross-sections at 500-foot intervals along the mainstem of the Little North Fork. Along each cross-section, the height of twice the maximum depth of the was added to the thalweg elevation which was extracted from the one-meter grid resolution LiDAR-derived DEM of coastal Mendocino County. This resulted in closely spaced estimates of the two-times bankfull water surface elevation. From estimates along these cross-sections, water surface elevations were linearly interpolated along the entire valley bottom. Areas were considered inundated where estimated water surface elevations exceeded the ground surface elevations from the LiDAR-derived DEM.

1/10/2021

366,113

This analysis showed that most, but not all, of the valley bottom is inundated at two times bankfull flow (Figure 2). In the lower and upper portions of the model domain, the area inundated at two times bankfull flow is comparable to the area inundated during the 20-year flood. In the middle portion of the model domain, the area inundated at two times bankfull flow is slightly wider than the area inundated during the 20-year flood. However, throughout this middle section, the inundated area does not include the entire valley floor.

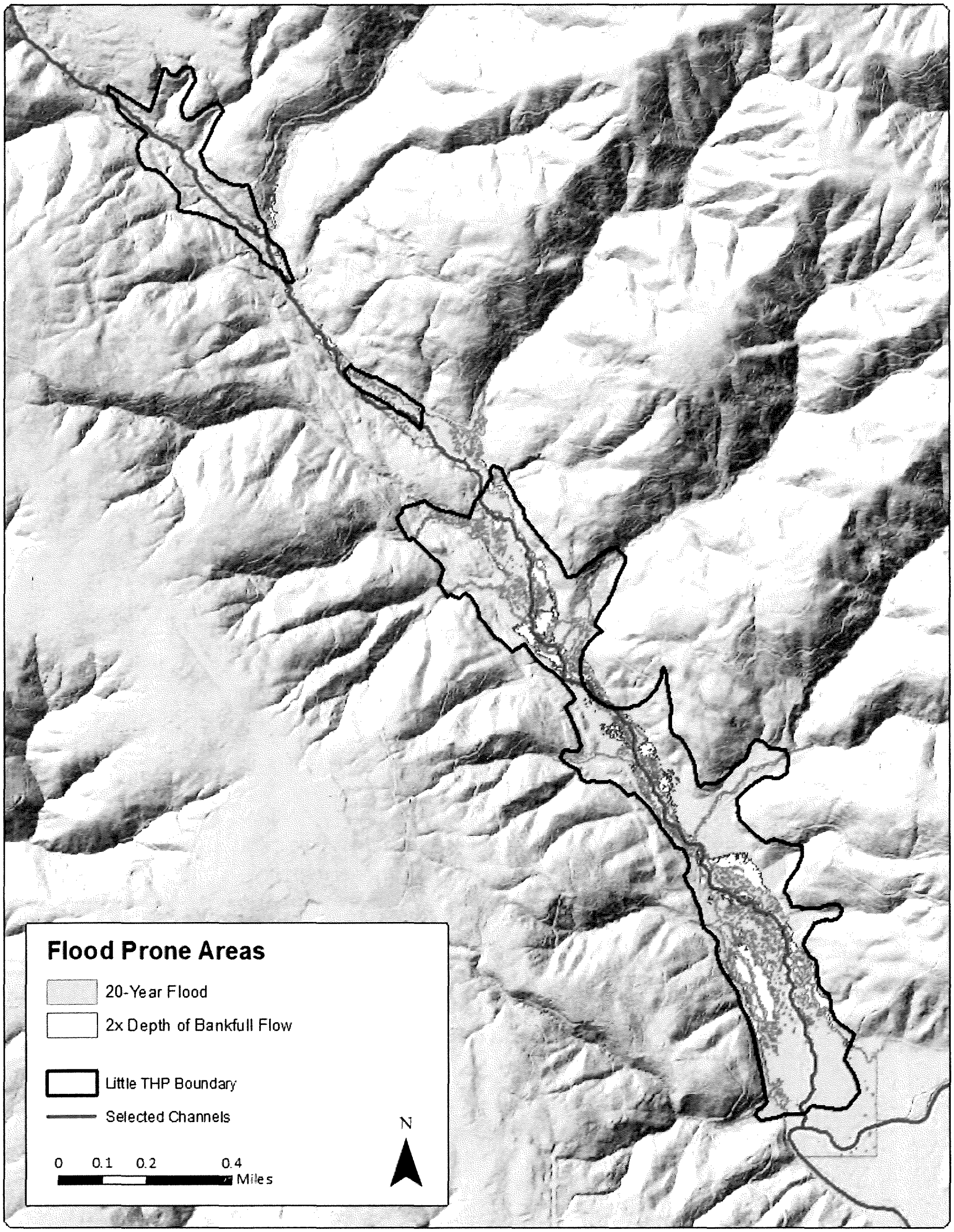


Figure 2: Flood prone areas in the Little North Fork watershed estimated from the 20-year extent of inundation and from two times the bankfull depth.

1/10/2021

366.115

PART OF PLAN

Fluvial Geomorphology and Channel Migration Processes

The second principal objective of this memorandum is to provide additional perspective regarding fluvial geomorphology of the Little North Fork, particularly as it pertains to channel migration processes. During the Focused PHI, CAL FIRE staff brought to our attention potentially applicable research by National Marine Fisheries Service scientists from the western Cascades in Washington[4] that might prove helpful in evaluating the susceptibility of the Little North Fork to channel migration processes. The Washington study assessed channel morphology for six large watersheds in the Puget Sound region of Washington state and established thresholds for channel slope, bankfull width, and other readily-observed or estimated parameters to classify channel planform and stability. The thresholds derived provide a general understanding of channel dynamics in forested mountain watersheds, and can be expected to be generally applicable to the Little North Fork. Nevertheless, caution should be exercised when extrapolating their findings owing to regional differences in geology, sediment supply, hydrologic regime and forest stand characteristics. As described below, we analyzed fluvial geomorphic characteristics of the Little North Fork for comparison to channel migration thresholds established for watersheds in western Washington.

Channel geometry (bankfull width and longitudinal slope) were calculated for the mainstem of the Little North Fork at 100-foot intervals using the ArcGIS platform. All geometries were calculated from the one-meter LiDAR-derived DEM of coastal Mendocino County. Longitudinal slope was calculated over 100-foot segments based on the difference between thalweg elevation at upstream and downstream ends of each segment. Bankfull width was calculated as the horizontal distance between the top-of-bank on opposite sides of the channel, consistent with the definition used in Beechie et al, 2006. Where there were secondary channels with thalweg elevations similar to the main channel, the bankfull width of secondary channels was included in measured width. The width of forested islands separating these channels from the main channel were not included in the bankfull width.

Bankfull width and longitudinal slope have been summarized by dividing the mainstem of the Little North Fork into five reaches. Reaches 1-4 are unconfined reaches; Reach 5 is a confined reach that was included for comparison to unconfined reaches. Reach breaks were determined based on evident differences in valley floor width and floodplain extent. Maps summarizing bankfull width and channel slope in the Little North Fork are presented in Figures 3 and 4. Reach 1 consists of the lower 4,000 feet of the Little North Fork and is typified by extensive overbank flows and floodplain connectivity during the 20-year flood. Within this reach, longitudinal slope averages 0.9% and the average bankfull width is 18.1 meters (Table 1). Reach 2 consists of an approximately 3,500-foot section of the channel with limited overbank flows during the 20-year flood. Bankfull widths are wider and more variable than anywhere else in the watershed, averaging 21.8 meters. This correlates with the presence of secondary channels and island complexes adjacent to the main channel. Reaches 3 and 4 consist of an approximately one-mile long section of the channel with relatively high slopes (1.3 – 1.4%) and extensive overbank flows during the 20-year flood. Bankfull widths in Reaches 3 and 4 (13.0 – 15.0 meters) are substantially lower than in Reaches 1 and 2 (18.1 to 21. 8 meters). In Reach 5, the valley floor narrows and the channel becomes confined; bankfull width and slope in Reach 5 are generally comparable to Reaches 3 and 4. The mean bankfull width for Reaches 1-4 aggregated is 17.4 meters.

---

[4] Beechie, T.J. et. al. (2006) Channel pattern and river-floodplain dynamics in forested mountain river systems. Geomorphology 78:124-141.

366, 116

1/10/2021

Table 2: Channel geometries summarized by reach. Bankfull widths were measured at 100-foot intervals from top of bank to top of bank and are reported in units of meters for comparison to Washington data.

Reach	Length (ft)	Mean Slope (%)	95% Confidence Interval of Mean Slope (%)	Sinuosity	Mean Bankfull Width (m)	95% Confidence Interval of Mean Bankfull Width (%)
1	3,970	0.9	0.6-1.2	1.18	18.1	16.7-19.5
2	3,490	1.0	0.8-1.2	1.11	21.8	19.6-24.0
3	2,630	1.4	1.1-1.7	1.18	15.0	13.7-16.3
4	2,710	1.3	0.9-1.5	1.09	13.0	11.4-14.6
5	2,730	1.5	1.1-1.7	1.12	13.2	11.3-15.1
1-4 Combined	**12,800**	**1.1**	**1.0-1.3**	**1.14**	**17.4**	**16.4-18.4**

1/10/2021

366.117

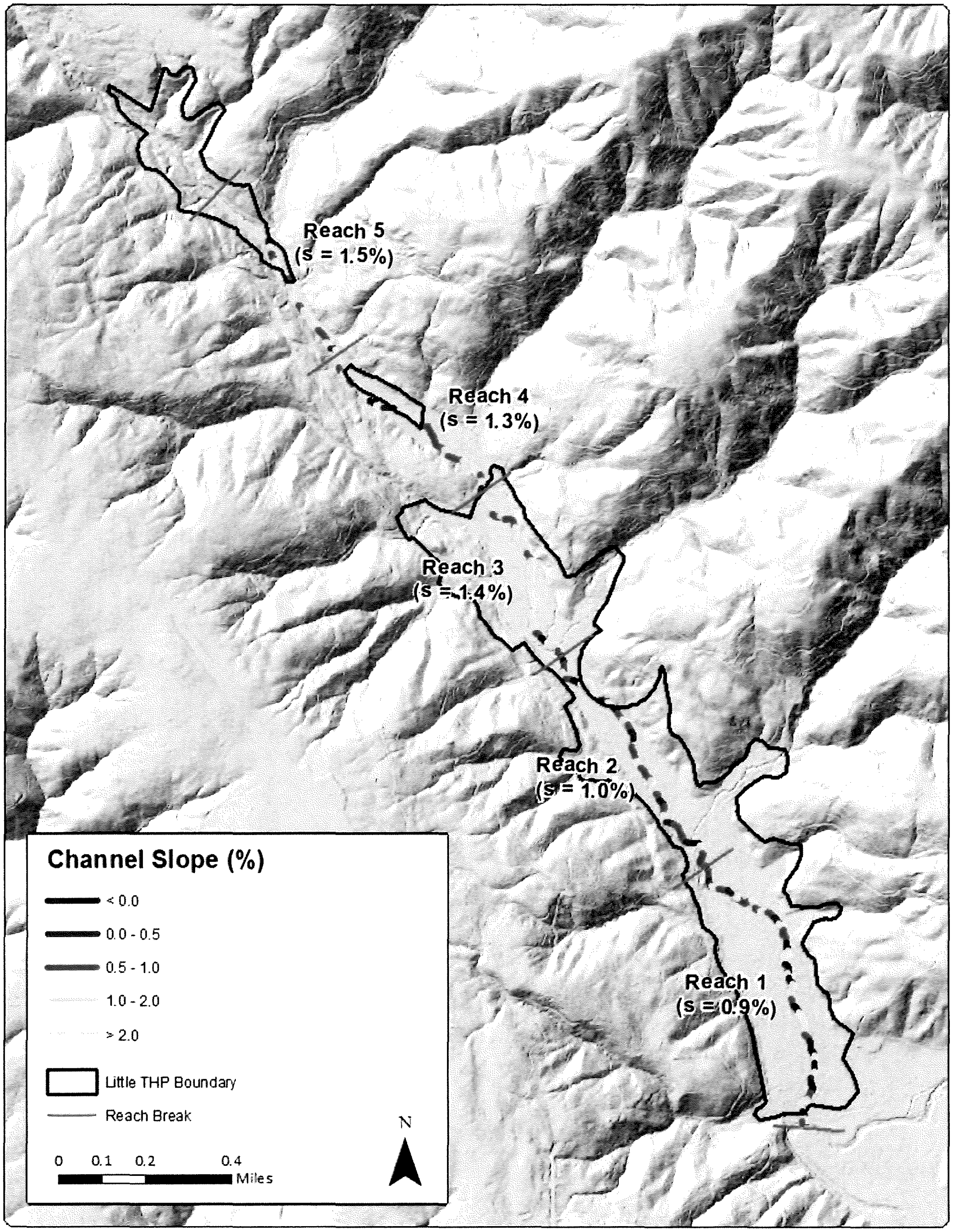


Figure 3: Channel slopes for each 100-foot channel segment.

O E I

366.118

1/10/2021

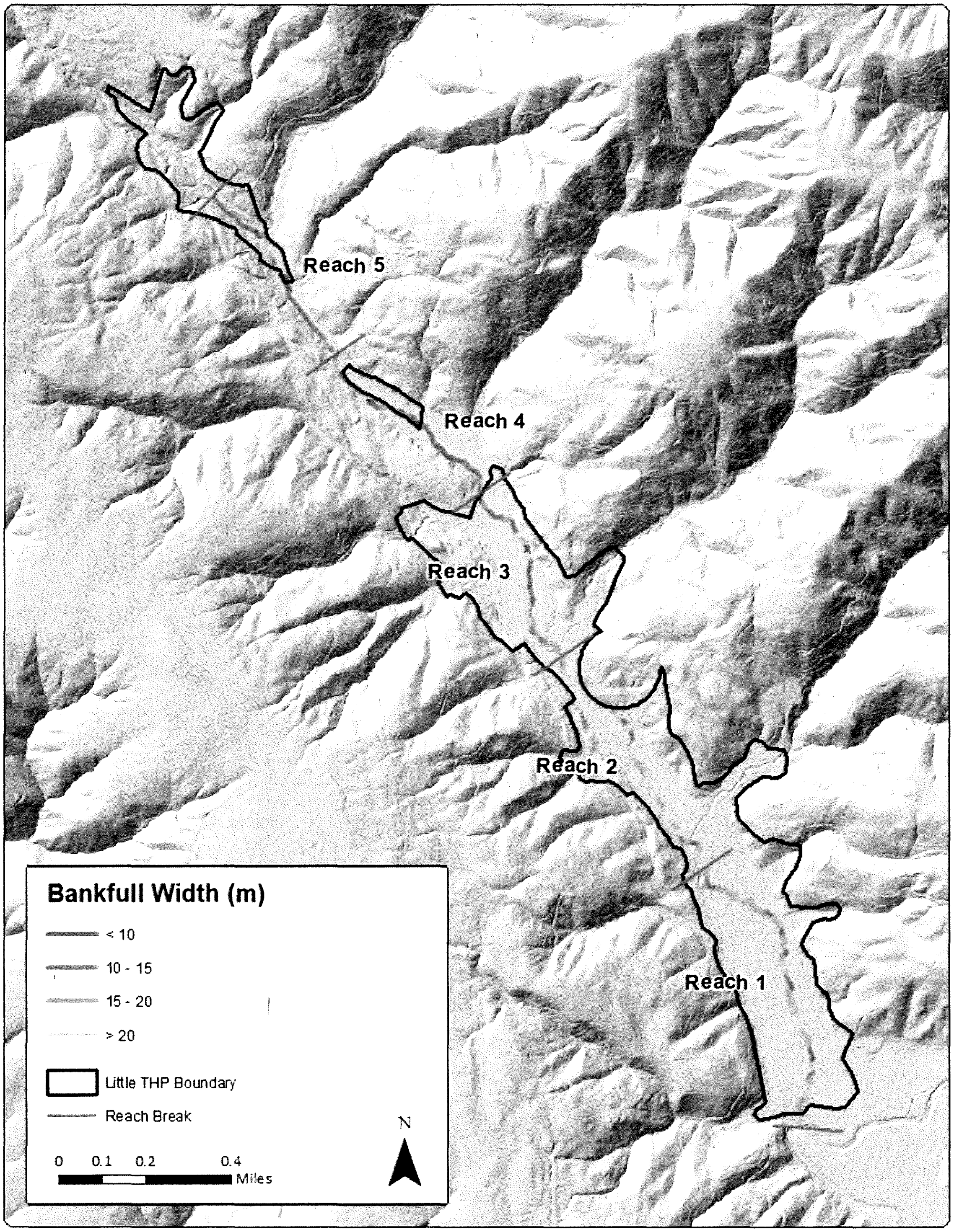


Figure 4: Bankfull width measured from top of bank to top of bank for each 100-foot channel segment.

PART OF PLAN

1/10/2021

OEI

366,119

Beechie et al. provides a simplified classification of channel planform for laterally unconfined channels. Channels are classified as either straight, meandering, island-braided, or braided. Based on channel sinuosity and a visual comparison of channel planform to examples provided in the text, the Little North Fork most closely resembles a straight or meandering channel planform. Although in several locations forested islands separate side channels from the main channel in Reaches 1 and 2, their spatial extent is limited and appears to be consistent with the interpretation that Little North Fork is predominantly a non-migrating channel (Figure 5).

Beechie et al. also establishes distinct combinations of bankfull depth and longitudinal slope associated with each type of planform. The combination of slope of slope and discharge along the mainstem of the Little North Fork most closely match those of other straight channels. All reaches, including Reaches 1 and 2, plot outside the domains associated with either braiding or island-braiding channels. It may be inferred that these channel planforms are typically associated with greater discharges and or slopes. While the mainstem of the Little North Fork plots near the domain associated with meandering channels, slope in the Little North Fork is substantially greater and field observations do not reflect a meandering channel.

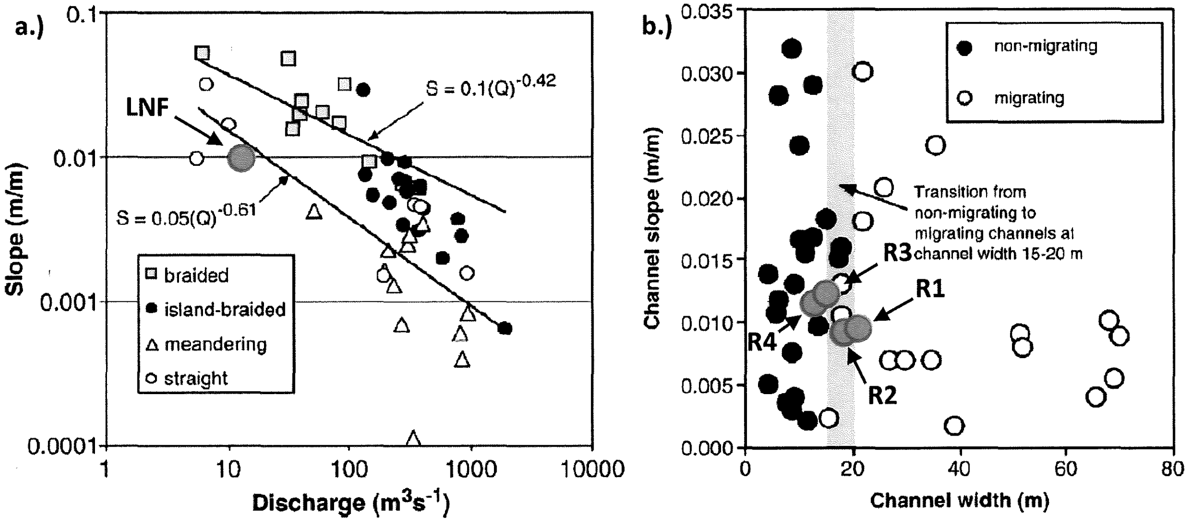


Figure 5: Figures reproduced from Beechie et al., 2006 for a.) slope-discharge thresholds separating channel domains and b.) bankfull channel width thresholds for channel migration. Figures are annotated to show geometries from the Little North Fork watershed plotted in orange.

Drawing in part on the work of Nanson and Hickin (1986)[5] which found bankfull width to be the strongest indicator of a channel's potential for lateral migration, Beechie et al established a threshold width above which channels were observed to laterally migrate. At widths below 15 meters, channels were observed to be non-migrating. At widths above 20 meters, channels were observed to be migrating. Between 15 and 20 meters, a transition zone was observed where channels were either migrating or non-migrating.

---

[5] Nanson, G.C and Hickin, E.J. (1986) A statistical analysis of bank erosion and channel migration in western Canada. GSA Bullletin 97:497-504.

1/10/2021

366,120

Summary Interpretation. The channel characteristics of Little North Fork place it generally in the transition zone between migrating and non-migrating channel types. The presence of limited island-braided plan form may be interpreted to represent the limited susceptibility of the Little North Fork to channel migration. This is generally consistent with the prior evaluation of channel migration prepared by OEI. Field evidence suggests that interactions between large woody debris accumulations, mature redwood trees on islands or at the channel margins, and peak stream flows are the primary cause of channel migration in the Little North Fork. Secondary channels and narrow islands found locally in the Little North Fork appear to typify the the primary channel migration process.

PART OF PLAN

1/10/2021

366,121

ATTACHMENT A

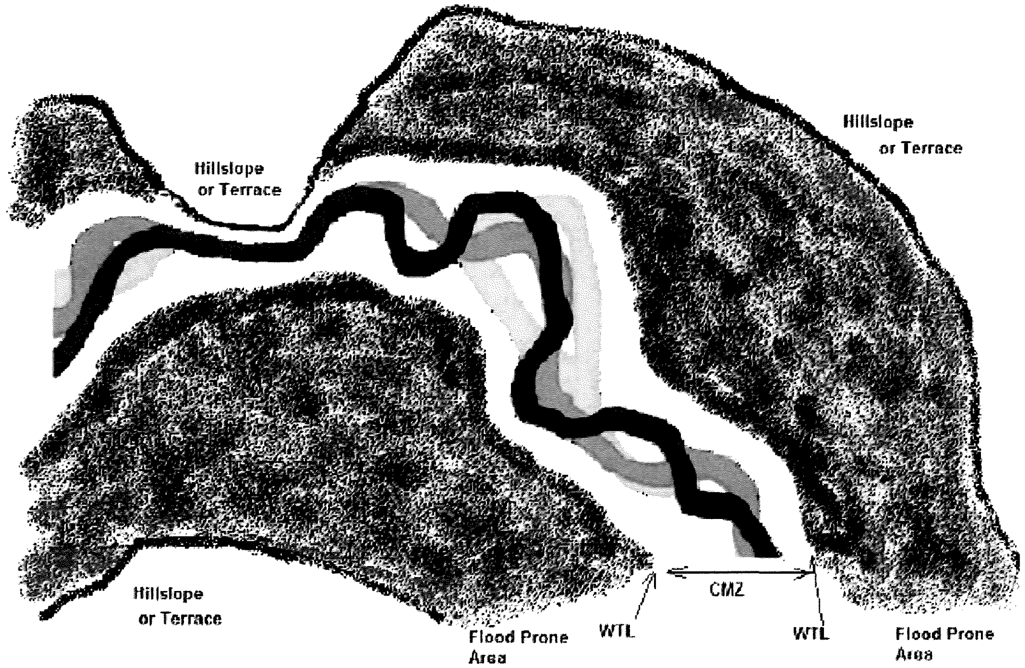
PART OF PLAN

Relevant FPR Section 895.1 Definitions:

Bankfull stage means the stage that occurs when discharge fills the entire channel cross section without significant inundation of the adjacent floodplain, and has a recurrence interval of 1.5 to 2.0 years.

Channel Migration Zone means the area where the main channel of a Watercourse can reasonably be expected to shift position on its floodplain laterally through avulsion or lateral erosion during the period of time required to grow forest trees from the surrounding area to a mature size, except as modified by a permanent levee or dike. The result may be the loss of beneficial functions of the Riparian zone or Riparian habitat (see Figure 1).

Figure 1. Plan view diagram of a simple Channel Migration Zone designation.



Flood Prone Area means an area contiguous to a Watercourse Channel Zone that is periodically flooded by overbank flow. Indicators of flood prone areas may include diverse fluvial landforms, such as overflow side channels or oxbow lakes, hydric vegetation, and deposits of fine-grained sediment between duff layers or on the bark of hardwoods and conifers. The outer boundary of the flood prone area may be determined by field indicators such as the location where valley slope begins (i.e., where there is a substantial percent change in slope, including terraces, the toes of the alluvial fan, etc.), a distinct change in soil/plant characteristics, and the absence of silt lines on trees and residual evidence of floatable debris caught in brush or trees. Along laterally stable Watercourses lacking a Channel Migration Zone where the outer boundary of the flood prone area cannot be clearly determined using the field indicators above, it shall be determined based on the area inundated by a 20-year recurrence interval flood flow event, or the elevation equivalent to twice the distance between a thalweg riffle crest

1/10/2021

366,122

and the depth of the channel at Bankfull stage. When both a Channel Migration Zone and flood prone area are present, the boundaries established by the Channel Migration Zone supersede the establishment of a flood prone area.

Relevant Questions and Answers from: California Dept. of Forestry and Fire Protection and California Department of Fish and Wildlife (2014) Anadromous Salmonid Protection Rules: Revised Interpretive Questions and Answers for RPF's and Landowners.

30. How will the FPA be determined in the field?

RPFs should refer to indicators described in the ASP rule FPA definition, as well as the document titled Flood Prone Area Considerations in the Coast Redwood Zone (Cafferata et al. 2005). Other helpful tools for determining the extent of flood prone areas are USGS topographic maps; LIDAR (Light Detection and Ranging) data, which provides high resolution topography; and individual county 100-year flood hazard maps, which depict with reasonable accuracy the extent of relatively flat, floodplains adjacent to streams.

Evidence for a flood prone area includes, but is not limited to: (1) flotsam (i.e., material floating on water) hanging in the brush and log jams on top of the surface, (2) fine sediments found in the tree moss and bark, (3) silt, sand, or gravel found immediately under the leaf layer, (4) alluvial materials consisting of silt, sand and gravel that are uncompacted and unconsolidated, (5) a wetter understory plant community with facultative wet and/or wetland obligate species present, (6) disturbance species such as willow, cottonwood and alder present in the overstory canopy, (7) evidence of flowing water, such as scour features, flattened grass or secondary channels formed by scour action of the modern river channel, and (8) the elevation of the surface lies near the elevation of the highest channel features (e.g., log jams and gravel bar surfaces). If some period of time has lapsed since a large flood event, evidence that relates directly to flooding of a surface may be muted (WFPB 2004).

RPFs are encouraged to consult with DFW, CAL FIRE, the California Geological Survey (CGS), the Regional Water Quality Control Boards (RWQCBs), and others prior to laying out a project in an area suspected to be prone to flooding. Agency staff can help foresters determine if flood prone areas are present and answer questions about the ASP rules and agency expectations.

PART OF PLAN

366,123

1/10/2021

November 11, 2019

TO: John Bennett, Forest Manager
Gualala Redwood Timber, LLC
PO Box 197, 39951 Old Stage Road
Gualala, CA 95445

FROM: Matthew O'Connor, PhD, CEG #2449 (Exp. 10-31-21)
President and Principal Geomorphologist/Hydrologist

Jeremy Kobor, MS, PG #9501
Senior Hydrologist

M.D. O'Connor
No. 2449
CERTIFIED ENGINEERING GEOLOGIST

PART OF PLAN

SUBJECT: Response to '*Review of OEI Reports for the Little North Fork Gualala River, Timber Harvest Plan (THP) 1-18-095 MEN*' by Kamman Hydrology & Engineering, dated October 2, 2019

Overview

Kamman Hydrology & Engineering's (Kamman's) primary review comment is as follows: "*many of the findings presented in these reports are inaccurate due to the significant underestimation of the flow magnitude for the 20-year recurrence interval event on the Little North Fork Gualala River.*" We have carefully reviewed the discussion and data analysis presented by Kamman and have also reviewed our original analysis and completed some limited additional data analysis. We remain confident in the validity of our estimate of the magnitude (instantaneous discharge) of the 20-yr recurrence interval flood as presented in our March 21, 2019 "Floodplain Study for the Little North Fork Gualala River" (Floodplain Study). We acknowledge that there is uncertainty associated with estimating flow magnitudes and the associated floodplain inundation in any ungauged watershed.

Estimating floodplain inundation in the Little North Fork Gualala is further complicated by the effect of flood elevations of the North Fork Gualala on flow dynamics of the Little North Fork. Flood waters of the North Fork determine the hydraulic base elevation of the Little North Fork in a manner akin to the effect of ocean tides on estuary water levels that create a backwater zone. When the tide is high, incoming flows from a river encounter the ocean elevation farther upstream, and during periods of flood, the effect of backwater is to redistribute incoming river water laterally, vertically, and upstream depending on the river discharge, channel slope and channel geometry. Likewise, the fluctuating elevation of the North Fork Gualala River creates backwater that affects the depth and extent of inundation on the Little North Fork floodplain. Our prior analyses used the hydraulic base elevation in the North Fork Gualala associated with the recent flood event of February 2019; in hindsight, we recognized that the February 2019 flood was probably less than that of the 20-yr flood. Consequently, we have updated the simulation described in the Floodplain Study by adopting a more conservative backwater elevation for the North Fork Gualala from historic silt deposits on redwood trees that is 1.7 ft higher than the February 2019 flood. The result of the supplemental hydraulic simulation shows that the extent of increased inundation of the floodplain

1/10/2021

361,124

is quite limited (Figure 4). This strongly suggests that the extent of flooding in the Little North Fork is not very sensitive to the backwater elevation of the North Fork for floods with recurrence intervals between 5 and 35 years.

The following response to Kamman's comments is organized based on Kamman's subject headers.

Floodplain Study-Similarity of Flow Magnitudes between Navarro and Gualala River

Kamman states that *"They do not include the area-normalized runoff rate for the North Fork Gualala River gauge, stating it was not operated from 2000-2006".* We did not state that this gauge was not operated, on the contrary we stated on page 5 of the Floodplain Study that *"The North Fork Gualala gage not included in the analysis was operated from 2000-2006"* and that *"Stage data is available for this gage, however high flow discharge data is not available for hydrologic analysis due to a lack of flow measurements and rating curve development during high flow conditions."*

It is our practice to review the field measurements of streamflow that provide the basis for developing rating curves and calculating discharges to evaluate their accuracy and understand the expected uncertainty associated with the discharge data prior to working with stream gauge data for analyses such as this. As part of our original analysis we considered using the discharges from the North Fork Gualala gauge; however, we found that the highest measured discharge used in the rating curve for the gage was only 1,410 cfs, which is grossly insufficient for calculating streamflow of 13,600 cfs such as was reported for the December 2005 flood.

Additionally, it is readily apparent from Figure 1 of Kamman's review that the annual peak discharges for this site (particularly the 2003 peak) are unrealistically high compared to those from the Navarro River and South Fork Gualala gauges. To further illustrate this point, we have compiled peak discharges at four nearby gauges with available data for the three water years with published annual peak discharges at the North Fork Gualala gauge which demonstrates that the peak flows at the North Fork gauge are unrealistically high, ranging from 136% to 800% of those reported at regional stations (Table 1). Based on the limited extent of high flow measurements used to construct the rating curve for the North Fork Gualala gauge and the anomalously high annual peak discharges, we concluded that the discharge data for this site was unreliable and therefore we did not use it in our analysis. It is also worth noting that the USGS stopped publishing high flow discharge data after water year 2006, presumably because of the lack of high flow discharge measurements available to constrain the rating curve.

Table 1: Comparison of area normalized annual peak discharges in units of cfs/mi² between the North Fork Gualala River gauge and four nearby gauges.

Gauge Location	North Fork Gualala River	Noyo River	Navarro River	Wheatfield Fork Gualala River	South Fork Gualala Above Wheatfield
USGS Station ID	11467553	11468500	11468000	11467485	11467295
Water Year 2003	488	61	100		
Water Year 2005	190	30	25	95	160
Water Year 2006	289	129	205	195	212

PART OF PLAN

1/10/2021

366,125

Floodplain Study-Flood Frequency Analysis of South Fork Gualala River

Kamman's principal assertion under this heading is that the South Fork Gualala gauge record provides a more accurate means of estimating flood flows in the Little North Fork Gualala. We concur that USGS's Bulletin 17B protocols suggest a minimum length of annual peak flow records of 10 years. However, when shorter periods of record are used to perform flood frequency analyses, the uncertainty and error associated with those estimates may be quite high, and the accuracy of the estimates is expected to increase in relation to the length of record (e.g. Feaster, 2010). We considered performing a flood frequency analysis on the 12 years of data from the South Fork Gualala River near Sea Ranch gauge. A review of the field measurements for this site suggests that the rating curve is well-constrained at higher flows. However, field measurements are not available for the South Fork Gualala River near Annapolis gauge making it difficult to verify the completeness of the rating curve and thus the 21 years of annual peak flow data. We were reluctant to use these data without being able to verify the quality of the underlying rating curve, particularly considering the potentially erroneous discharges published at the nearby North Fork gauge as discussed above. If, despite the foregoing concerns, the data were to be used in combination with the 'Near Sea Ranch' data as Kamman has presented, the 33 year record would have greater uncertainty than the 69 year record from the Navarro River gauge that we chose to utilize for our analysis.

In addition to the issue of the duration of hydrologic records and associated uncertainty, there are other watershed factors to consider when evaluating alternative watershed hydrologic records for purposes of estimating flows in an ungauged watershed. Kamman presents no evidence that the South Fork Gualala watershed is more representative of the Little North Fork Watershed than the Navarro River watershed. In reviewing our selection of the Navarro River hydrologic data as the basis for estimating peak flows in the Little North Fork, we conducted some additional investigation of watershed hydrologic factors comparing the Navarro, the South Fork Gualala, and the Little North Fork Gualala. Our investigation suggests that the characteristics of the Navarro watershed more closely match those of the Little North Fork Gualala than do those of the South Fork Gualala. To help illustrate this point, we compared proximity, precipitation and soil conditions between the three watersheds. In terms of distance, both gauged watersheds are located a similar distance from the Little North Fork watershed. However, the centroid of the Little North Fork is slightly closer to the centroid of the Navarro than it is to the centroid of the South Fork (Figure 1, Table 2).

Table 2: Comparison of proximity, precipitation, and soil properties between the Little North Fork Gualala River, the Navarro River, and South Fork Gualala River watersheds; mean annual precipitation from Flint & Flint (2014), 25-yr, 24-hour storm depth from NOAA Atlas 14, and saturated hydraulic conductivity from USDA (2007). All values are watershed averages from spatially distributed data.

	Distance to Centroid of Little North Fork Watershed (miles)	Mean Annual Precipitation (in)	25-yr 24-hr Precipitation (in)	Mean Soil Saturated Hydraulic Conductivity (micro m/s)
Little North Fork Gualala River		49.8	8.3	23.8
Navarro River	17.8	46.6	7.3	16.7
South Fork Gualala River	18.4	57.0	9.9	8.1

PART OF PLAN

1/10/2021

366,126

The South Fork experiences significantly more precipitation than the Little North Fork and most other watersheds in the region. Based on mean annual precipitation data from the regional rainfall-runoff simulation Basin Characterization Model (Flint & Flint, 2014), the South Fork receives approximately 14% more precipitation on an annual basis than the Little North Fork (Figure 1). Based on the NOAA Atlas 14 dataset, the South Fork also receives 19% more precipitation than the Little North Fork during the 25-year, 24-hour storm (Figure 2, Table 2). In comparison, the Navarro is somewhat drier than the Little North Fork receiving approximately 7% less precipitation on an annual basis and 12% less during a 25-yr 24-hr storm.

Aside from precipitation, another critical factor controlling peak discharges is the capacity of the soil to infiltrate water. A commonly used measure of this capacity is the soil saturated hydraulic conductivity (K-sat). We compiled K-sat data for the three watersheds from the Soil Survey Geographic Database (USDA, 2007) and found that the average K-sat for the South Fork is only 34% of the value for the Little North Fork, whereas the average value for the Navarro is 70% (Figure 3, Table 2). The lower K-sat values in the gauged watersheds would be expected to result in higher runoff rates relative to the Little North Fork; however, the average soil infiltration capacity in the Navarro is more representative of the Little North Fork than that of the South Fork. The low K-sat values in the South Fork suggest that this watershed would generate relatively high rates of runoff per unit of precipitation during high-magnitude, low-frequency storm events compared to the Little North Fork.

In summary, it is our opinion that estimated peak flows in the Little North Fork watershed based on flood frequency analysis for the Navarro River are reasonable. We believe that estimating peak flows for the Little North Fork based on flood frequency analysis for the South Fork Gualala would overestimate peak flows in the Little North Fork. The longer period of record and verifiable rating curve for the Navarro reduces uncertainty in the estimates relative to uncertainty associated with estimates that could be made from the South Fork hydrographic data. More importantly, precipitation and soil characteristics believed to strongly influence peak flow magnitudes of the Navarro are more representative of the Little North Fork than those of the South Fork.

1/10/2021

366,127

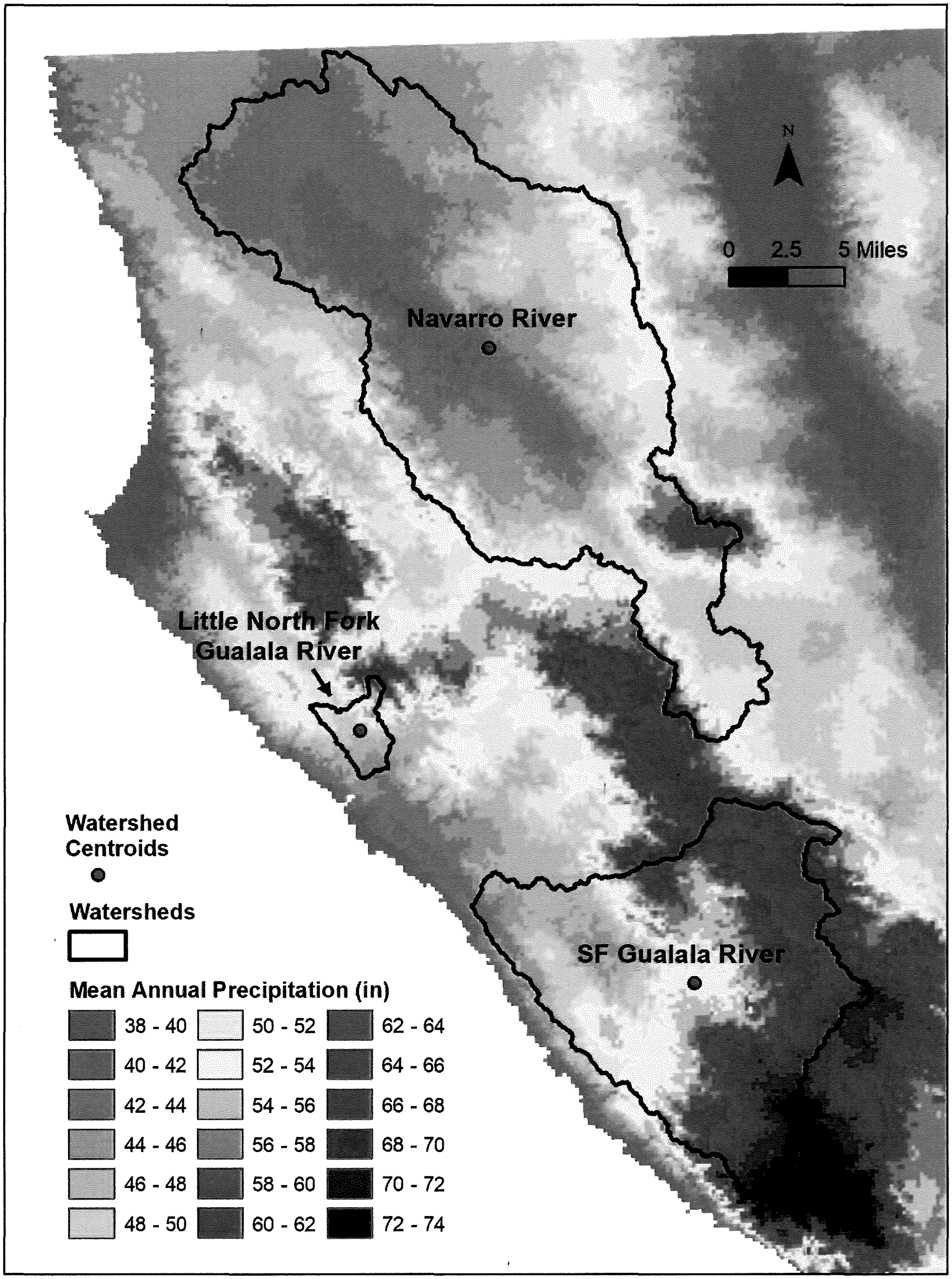


Figure 1: Mean annual precipitation from 1981-2010 (Flint & Flint, 2014) in the Little North Fork Gualala River, Navarro River, and South Fork Gualala River watersheds.

1/10/2021

366,128

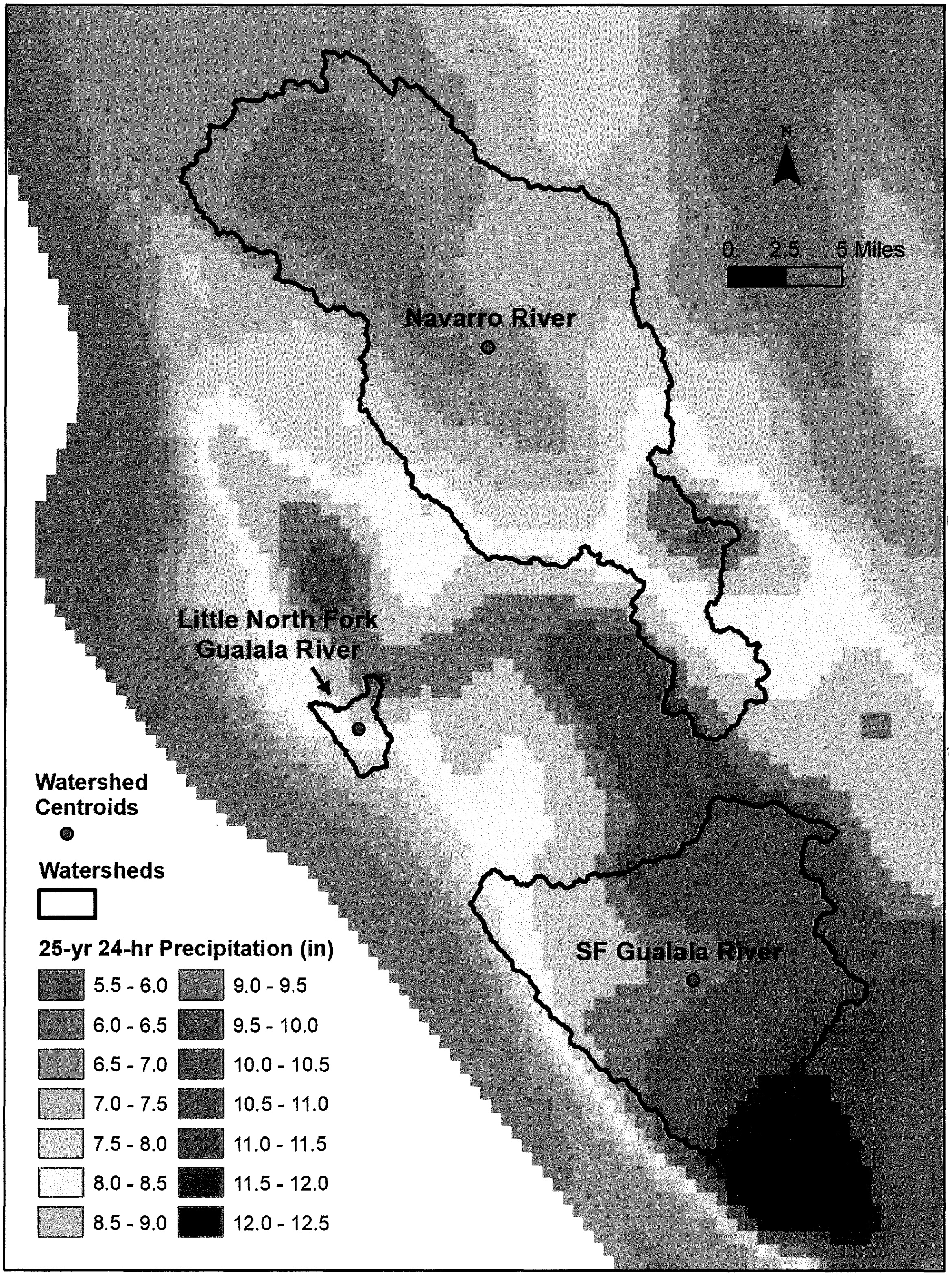


Figure 2: NOAA Atlas 14 25-yr 24-yr total precipitation in the Little North Fork Gualala River, Navarro River, and South Fork Gualala River watersheds.

PART OF PLAN

1/10/2021

366,129

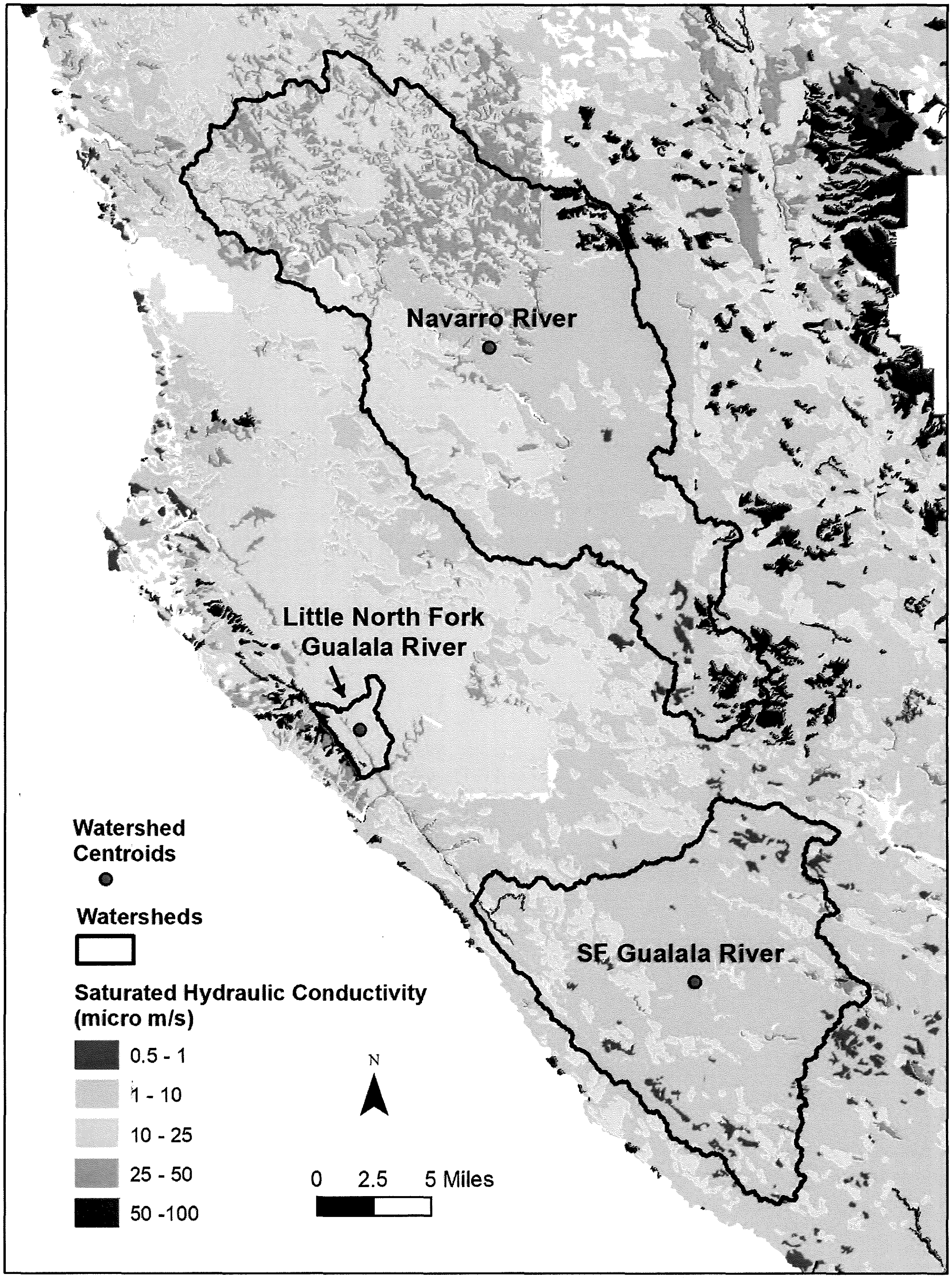


Figure 3: Soil saturated hydraulic conductivities (Ksat) in the Little North Fork Gualala River, Navarro River, and South Fork Gualala River watersheds (USDA, 2007).

OEI

1/10/2021

366,130

Comments on Floodplain Inundation Duration Study Report

Kamman's comments pertaining to OEI's July 10, 2019 report "Floodplain Inundation Duration Study for the Little North Fork Gualala River" (Inundation Duration Study) suggest that (1) the area and duration of inundation are inaccurate because the 20-yr flood magnitude has been under-estimated (as discussed above), and (2) OEI also utilized incorrect (lower) flood elevations of the North Fork Gualala for the downstream boundary condition used in the Inundation Duration Study. With regard to the first component of Kamman's comment, we believe that our estimates of the flood magnitude (instantaneous discharge) for the Little North Fork based on the Navarro River hydrologic record are the best available (as described above).

The second component of Kamman's comment suggests that the model significantly under-estimated downstream water surface elevations based on a reproduction of OEI's Figure 4 from the July 10, 2019 report in which Kamman superimposed the stage data from the North Fork Gualala USGS gauge. The data plotted as North Fork stage on Figure 4 is the same measured data from the North Fork gauge and represents the boundary condition imposed on the model rather than elevations simulated by the model. Unfortunately, OEI's Figure 4 contained a mislabeled secondary y-axis on that plot which should read "water surface elevation (meters)". The time series was generated directly from the USGS stage data, which is not explicitly tied to an elevation (i.e. the published stage data reference a local datum). In order to utilize the USGS stage data, we conducted a local topographic survey so that we could convert the reported stage data to an elevation based on the LiDAR-determined elevation of the ground surface near the USGS gauge. We then converted the gauge elevation to units of meters to conform to the operational units system of the model. Consequently, the maximum stage at the gauge of approximately 19-ft is equivalent to a maximum water surface elevation of 14-meters as shown on Figure 4. Since we directly used the USGS North Fork stage data to derive our downstream water level boundary, the model conforms directly to the gauge data.

Setting aside the misunderstanding regarding the downstream water level boundary condition used for modeling in the Inundation Duration Study, Kamman suggests that the water level used in the model from the North Fork gauge during the February 2019 event was significantly less than a 20-yr water level. As discussed in our reports, we considered various options for estimating the downstream water level and elected to use the peak stage from the February 2019 flood event. Estimating the recurrence interval associated with a given water level in the North Fork (for a steady-state model) is inherently difficult because of the limited period of record and lack of high flow gauging for the North Fork gauge. Compounding the difficulty further, the site is subject to backwater flooding from the South Fork so the stage/discharge relationship may be complex and depend in part on the relative timing of peak precipitation intensities and durations associated with the a given storm event affecting the North and South Forks of the Gualala. Unfortunately, it is not possible to use water levels from the North Fork gauge for the 2005 event because the gauge was since moved from that location and the USGS only georeferenced the gauge elevation to the nearest 10-ft contour (USGS, personal communication). We were fortunate to have a significant flood event that could be directly observed coincident with our analyses and to have had the water level recorded at the North Fork gauge. Without this data, the only means of estimating an appropriate time-varying downstream water level suitable for inundation duration analysis (i.e. for a simulation of unsteady flow) would be developing and calibrating a combined hydrologic and hydraulic model of both the North and South Forks, an effort which would present a host of technical issues and was judged to be far beyond the scope of the analyses we intended.

1/10/2021

366,131

In our review of Kamman's comments, we recognized that there is evidence that the February 2019 flood was less than a 20-yr event as we implicitly assumed in our original simulation described in the Floodplain Study. The recurrence interval of the February 2019 flood on the Navarro was less than 10 years, and, assuming the shorter data record for that gauge produces reliable flood frequency estimates, Kamman is correct that the discharge on the South Fork for the February 2019 event represents approximately a 5-yr flood on that river. Notwithstanding the aforementioned difficulties of determining the most appropriate water level in the North Fork for use in hydraulic models of the Little North Fork, we have elected to re-run the steady-state model described in the Floodplain Study using a more conservative (higher) downstream water level boundary condition as discussed below.

During development of the steady-state model for the Floodplain Study, we surveyed observable high-water marks in the form of a set of historic silt lines on mature redwood trees as shown in Figure 6 of the Floodplain Study. These high-water marks extend about 0.25 miles upstream from the confluence of the Little North Fork and North Fork and were found to be about 1.7 ft higher (47.5 ft NAVD88) than the February 2019 flood event as recorded at the North Fork gauge (45.8 ft NAVD88). The particular flood event associated with these high-water marks is unknown; however, the most recent flood larger than the 2019 event for which hydrographic data are available was the December 2005 flood, which was approximately a 35-yr flood on the Navarro based on our flood frequency analysis. The South Fork Gualala gauge was not in operation at that time. We used the water elevation represented by these high-water marks to provide a more conservative model simulation of the extent of floodplain inundation in the Little North Fork.

As shown in Figure 4, the difference in the extent of inundation resulting from the more conservative boundary condition is small. This suggests that the lateral extent of flooding in the Little North Fork is not very sensitive to the backwater elevation of the North Fork for floods with recurrence intervals between about 5 years (estimated recurrence interval of the 2019 flood on the South Fork Gualala per Kamman) and about 35 years (estimated recurrence interval of 2005 flood on the Navarro River presumed to be associated with high water marks).

Comments on Channel Migration Zone Evaluation Report

Kamman's comments are general in character and presented in two bullet-point paragraphs. In the first paragraph, Kamman offers several general statements regarding the relationship between overbank flow, floodplain features, and channel migration processes. He states that it "would be helpful to know" how a range of flood flows interact with floodplain channels, that "channel avulsion may be a long-term process and dependent on flow magnitudes", and that "channel avulsion may be an episodic process triggered by flows with recurrence intervals greater than the 20-year recurrence". He asserts that the absence of evidence of channel migration is inconclusive, and that historic and/or future channel migration may occur. This set of statements is not so much a critique of the OEI report as it is a statement of an initial set of questions that would likely occur to a researcher setting out to better understand channel migration phenomena. The OEI report performed the CMZ evaluation per guidance set forth by the State of California and identified and discussed evidence of contemporary and potential future channel migration observed in the field.

Kamman's second bullet-point paragraph suggests that the CMZ evaluation did not consider the possibility that secondary or floodplain channels might represent filled-in channels and could provide evidence of past channel migration. That possibility was considered, but despite observations of numerous floodplain

1/10/2021

366.132

flow features (sometimes classified as Class III channels by the RPF), we did not observe compelling evidence indicating that these were filled/abandoned channels. If such were the case, we would have expected to observe vegetative evidence in the form of linear/arcuate stands of seral vegetation (typically trees) in the 60-year aerial photo history of the area. We concluded that there was evidence of channel migration manifested by relatively short secondary channels associated with islands along a narrow strip associated with the existing primary channel.

1/10/2021

366,133

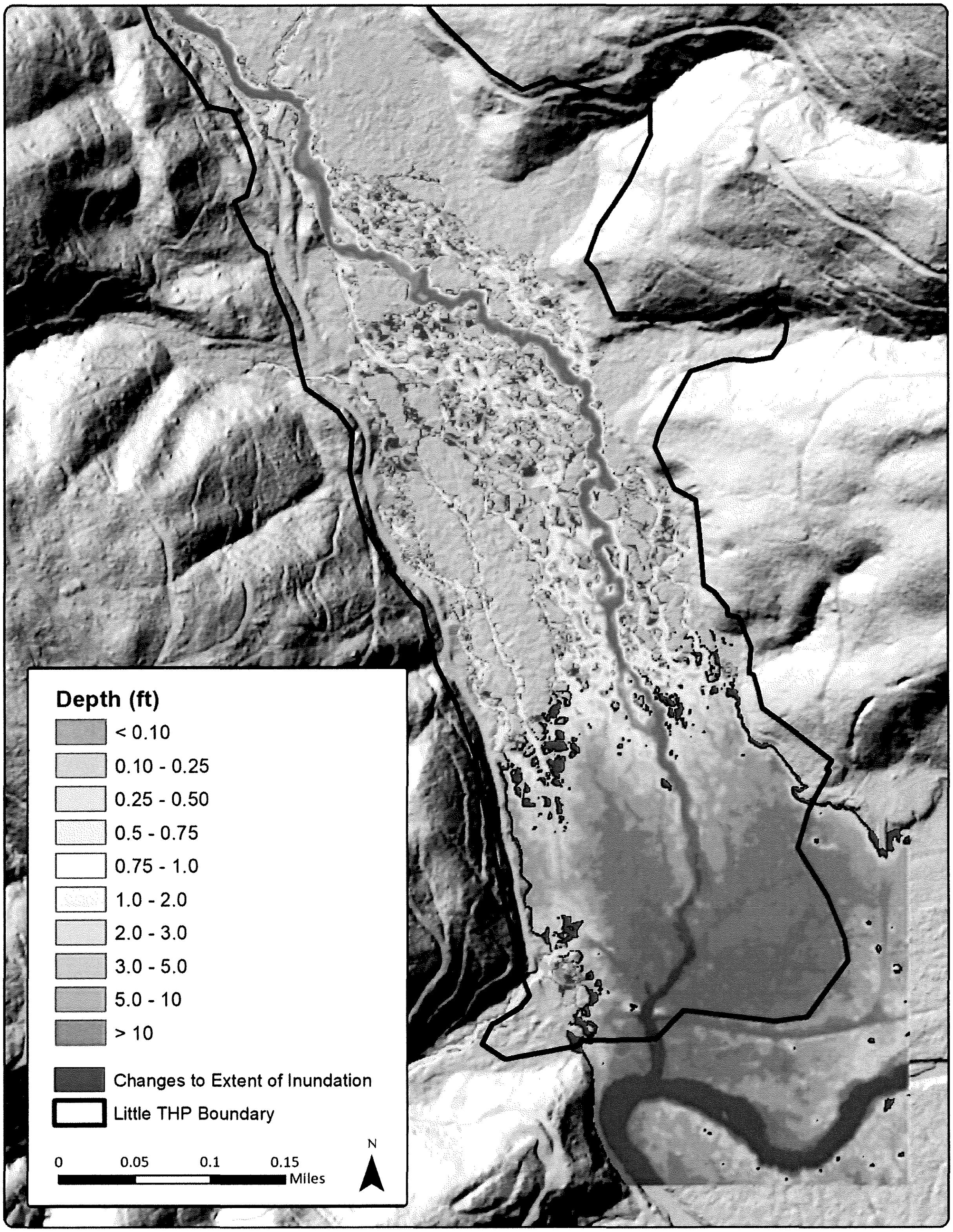


Figure 4: Revised extent and depth of inundation of the estimated 20-year flood in the Little North Fork Gualala River emphasizing areas of change in comparison with the Floodplain Study (March 21, 2019).

1/10/2021

366,134

References Cited

Feaster, T.D., 2010. Importance of Record Length with Respect to Estimating the 1-Percent Chance Flood, Proceedings of the 2010 South Carolina Water Resources Conference, held October 13-14, 2010 at the Columbia Metropolitan Convention Center.

Flint, L.E. and Flint, A.L., 2014, California Basin Characterization Model: A Dataset of Historical and Future Hydrologic Response to Climate Change, (ver. 1.1, May 2017): U.S. Geological Survey Data Release, https://doi.org/10.5066/F76T0JPB.

Perica, S. et al., 2011, NOAA Atlas 14, Precipitation-Frequency Atlas of the United States, Vol. 6 Version 2.3: California. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Silver Spring, MD. Revised 2014

United States Department of Agriculture (USDA), 2007. Natural Resource Conservation Service, Soil Survey Geographic Database (SSURGO) for Sonoma County and Mendocino County, California, Washington DC, http://soildatamart.nrcs.usda.gov.

1/10/2021

366.135

UNIT, RPF, PLANSUB, CalT, ARV

PART OF PLAN

State of California **Natural Resources Agency**

Memorandum

To: Dr. Helge Eng, Deputy Director
California Department of Forestry and
Fire Protection, Sacramento Headquarters

Date: November 4, 2019

Telephone: (916) 653-9455

Website: www.fire.ca.gov

Attention: Mr. Dominik Schwab, Forester III
Forest Practice Manager; North Coast Region

From: Pete Cafferata, Watershed Protection Program Manager Peter H Cafferata
PH No. 1676, RPF No. 2184, CPESC No. 417
Drew Coe, Forest Practice Monitoring Program Coordinator Drew Coe
RPF No. 2981
Stacy Stanish, Forest Practice Biologist Stacy Stanish
RPF No. 3000
California Department of Forestry and Fire Protection (CAL FIRE)
Sacramento Headquarters

Subject: **Hydrologic and Biologic Review of THP 1-18-095 MEN**

This memorandum reports the results of a focused Pre-Harvest Inspection (PHI) for the Little THP (1-18-095 MEN). Field inspection participants for the PHI held on August 29, 2019 included the following individuals:

John Bennett	Gualala Redwood Timber Forest Manager
Gabriel Ghrirann	Gualala Redwood Timber Forestry Technician
Nick Kent	Redwood Empire Sawmills Resource Manager
Jesse Weaver	Redwood Empire Sawmills Registered Professional Forester
George Gentry	California Forestry Association Senior Vice President/RPF
Dr. Matt O'Connor	O'Connor Environmental Principal Geomorphologist
Will Creed	O'Connor Environmental Hydrologist
Kevin Doherty	CGS Engineering Geologist
Nick Simpson	CDFW Senior Environmental Scientist (Specialist)
Jon Hendrix	CDFW Senior Environmental Scientist (Supervisor)
Mark Smelser	CDFW Regional Engineering Geologist
Danielle Castle	CDFW Environmental Scientist
Jim Burke	NCRWQCB Senior Engineering Geologist
Justin Fitt	NCRWQCB Environmental Scientist
Dan Wilson	NMFS Fisheries Biologist
Ken Margiott	CAL FIRE Forester I
Jeff Longcrier	CAL FIRE Forester II
Stacy Stanish	CAL FIRE Senior Environmental Scientist (Specialist)
Drew Coe	CAL FIRE Forester II
Pete Cafferata	CAL FIRE Forester III

"The Department of Forestry and Fire Protection serves and safeguards the people and protects the property and resources of California."

1/10/2021

366.136

The purpose of this focused PHI and field review was to assess whether the 2019 California Forest Practice Rules (FPRs) are accurately being followed for the Little THP regarding (1) channel migration zone (CMZ) determination, (2) flood prone area determination and protection measures, and (3) potential anadromous fisheries impacts for unconfined reaches of the Little North Fork of the Gualala River.

I. Introduction

The need for the additional focused PHI for the Little THP stems from a difference in interpretation by the Review Team agencies regarding the FPR definitions related to the Anadromous Salmonid Protection (ASP) rules and rule application of the channel migration zone and flood prone area concepts. The definition and rule application of channel migration zones and flood prone areas are linked within the FPRs such that the delineation of the channel migration zone is sometimes necessary before the extent of the flood prone area can be determined. This is the case for the Little THP. As such, the 2019 FPR rule definitions are as follows:

Channel Migration Zone means the area where the main channel of a Watercourse can reasonably be expected to shift position on its floodplain laterally through avulsion or lateral erosion during the period of time required to grow forest trees from the surrounding area to a mature size, except as modified by a permanent levee or dike. The result may be the loss of beneficial functions of the Riparian zone or Riparian habitat.

Flood Prone Area means an area contiguous to a Watercourse Channel Zone that is periodically flooded by overbank flow. Indicators of flood prone areas may include diverse fluvial landforms, such as overflow side channels or oxbow lakes, hydric vegetation, and deposits of fine-grained sediment between duff layers or on the bark of hardwoods and conifers. The outer boundary of the flood prone area may be determined by field indicators such as the location where valley slope begins (i.e., where there is a substantial percent change in slope, including terraces, the toes of the alluvial fan, etc.), a distinct change in soil/plant characteristics, and the absence of silt lines on trees and residual evidence of floatable debris caught in brush or trees. Along laterally stable Watercourses lacking a Channel Migration Zone where the outer boundary of the flood prone area cannot be clearly determined using the field indicators above, it shall be determined based on the area inundated by a 20-year recurrence interval flood flow event, or the elevation equivalent to twice the distance between a thalweg riffle crest and the depth of the channel at Bankfull stage. When both a Channel Migration Zone and flood prone area are present, the boundaries established by the Channel Migration Zone supersede the establishment of a flood prone area.

The FPRs illustrate the close spatial arrangement of the channel migration zone and flood prone area (see CCR § 895.1; page 7, Figure 1 of the 2019 FPRs). Channel migration zones are best viewed as zones of historic and potential channel erosion where the channel is likely to move through lateral erosion (e.g., meandering) or sudden shifting (i.e., avulsion) during a specified time frame (e.g., <70 years for high site coast redwood). Conversely, flood prone areas are areas of deposition and overbank

1/10/2021

366,137

flooding. Generally, channel migration zones are afforded the same protection as watercourses, whereas flood prone areas are allowed to have more intensive timber operations. As mentioned previously, a key step before determining the spatial extent of the flood prone area is to determine the presence and spatial extent of the channel migration zone.

In this focused PHI report, we provide (1) a brief historical perspective on these topics from past THP reviews and information provided in a 2005 Riparian Protection Committee final report, (2) a detailed channel migration zone evaluation, (3) a flood prone area determination for this THP, (4) a brief anadromous fisheries impact assessment, and (5) conclusions for the Little THP.

II. THP Setting and Historical Perspective

THP Setting

The Little THP is within the Doty Creek CalWater 2.2.1 Planning Watershed located at the southern extent of Mendocino County. Winter-run steelhead trout (*Oncorhynchus mykiss*) from U.S. Fish and Wildlife Service Northern California Distinct Population Segment (DPS) and coho salmon (*Oncorhynchus kisutch*) have current and/or historic populations that extend into the watershed. The Northern California steelhead DPS is listed as threatened under the federal Endangered Species Act (ESA) and coho salmon are listed as threatened under the federal ESA and endangered under the California Endangered Species Act. As a result of their presence and listing status, the Doty Creek planning watershed is identified as an Anadromous Salmonid Protection watershed and subject to the provisions of 14 CCR § 916.9.

Cassidy and Lily THPs

A historical perspective for the Little THP area is provided by PHI reports written for THPs 1-00-101 MEN (Cassidy THP) and 1-04-032 MEN (Lily THP), located in the Main Fork, the North Fork, and the lower part of the Little North Fork of the Gualala River.[1] The area included in the 032 plan was similar to what was proposed in the 101 plan. Spittler (2004a,b) reported that "Inspections of aerial photographs taken in 1936, 1984, and 2000 reveal that the channel of the North Fork Gualala River has meandered within a narrow zone between the redwood floodplains (see figure below), which has remained remarkably stable for over 60 years. The 1984 photos document a widening of the channel compared with 1936, but much of this had recovered by 2000."

Spittler (2004b) also states "Literature on avulsion (Ashworth and others, 2004); Berendsen and Stouthamer, 2002; Bryant and others, 1995, Committee on Alluvial Fan Flooding, Natural Resource Council, 1996; Kelberer and others, 2002; Kellerhals and Church, 1989; King County Department of Natural Resources and Parks, Department of Development and Environmental Services, Department of Transportation, 2004; Mount, 1995; Pittman and others, 2003; Slingerland and Smith, undated; Washington

---

[1] The portion of these plans in the Little North Fork watershed was never harvested. The last entry was between 1987 and 1992.

1/10/2021

366.138

Environmental Council, 2002), document that avulsion occurs where the elevation of an active channel is above adjacent lands. This may occur on alluvial fans, in distributary deltaic systems, along low-gradient streams with well-defined meanders next to low-lying floodplains, and adjacent to areas with abrupt channel gradient flattening. As observed in the field, the existing channels of the Main Fork, the North Fork, and the Little North Fork of the Gualala River are all lower than the adjacent floodplains. In these areas the floodplains are well vegetated with redwood and other trees. When the roughness effects of vegetation are included in the avulsion assessment, stream flow velocity exhibited as basal shear of the existing channels is substantially greater than potential flow velocities elsewhere on the floodplain...No evidence of past avulsion in the THP area was observed in the field or on the aerial photographs. While there remains a remote possibility that a major river-damming landslide could occur near the THP area, the potential for the proposed harvesting to exacerbate the avulsion potential appears to be negligible."

Cafferata (2004), in a PHI report for 1-04-032 MEN, evaluated Unit 15, which was located at the lower end of the Little North Fork watershed and encompasses the widest part of the floodplain currently included in the Little THP. It was determined that this unit was located on a more active floodplain than the other proposed logging units, based on characteristics provided in Benda (2004). It was concluded that Unit 15 was sensitive to timber harvest and should be given additional mitigation measures. These included (1) flagging all skid trails in the unit, (2) requiring all ground skidding equipment to remain on designated skid trails, and (3) requiring all side channels to remain open and free to flow water.

It is our opinion that the observations and recommendations from CGS and CAL FIRE written for the 101 and 032 plans remain relevant and should be considered during the review of the current subject THP.

Riparian Protection Committee's Flood Prone Area Considerations Report

Flood prone area determination has been heavily debated for over two decades by landowners and the Review Team agencies in California. The primary issues relate to identifying flood prone areas and determining the types and intensities of timber harvesting activities that will not adversely impact both the ecological characteristics of the floodplain and the ability of the floodplain to influence its adjacent channel (Benda, 2004). In response to these disagreements, the interagency Riparian Protection Committee was formed by CAL FIRE in 2005 to allow the state agencies to work collaboratively to reach common understandings on riparian issues related to harvesting operations on coast redwood-dominated floodplains and flood prone areas (Cafferata et al., 2005). Issues raised for THPs in the Gualala River and Big River watersheds in the early 2000's were reviewed by the Riparian Protection Committee to develop a better understanding of how to address related areas of concern in future plans.

The Riparian Protection Committee's final report describes a mutually agreeable process for flood prone area protection and restoration. The primary steps are to (1) inventory flood prone areas for all of the hydrologic, geomorphic, and biological

1/10/2021

366.139

functions present that may be affected by proposed timber operations; (2) determine the category of inundation of the flood prone area proposed for management (i.e., very frequent, frequent, moderately frequent, or infrequent), and (3) conduct an appropriate analysis for the functions present in light of possible significant adverse impacts from management.

The report also states that "disclosure and analysis requirements will increase with increased risk associated with the proposed level of activity, and with increased frequency of inundation of the flood prone area. In particular, management proposed within the 20-year recurrence interval floodplain in a watershed with anadromous fish habitat (particularly coho salmon habitat or restorable habitat) requires detailed analysis...If a flood prone area has an active channel migration zone, where a stream is prone to movement with near-term loss of riparian function and associated habitat adjacent to the stream, proposed practices will require more detailed analyses and additional mitigation than required for those channels that have remained laterally stable over many decades and can reasonably be expected to continue to exhibit stability in the future."

Floodplain sensitivity to timber harvest activities is determined by the frequency of overtopping flows, impacts of harvesting on ecological characteristics of the floodplain, and impacts of harvesting on the ability of the floodplain to influence its adjacent channel. The Riparian Protection Committee's final report documents that the area inundated at less than or equal to every 20 years is the most biologically critical area based on coho salmon life cycle requirements. Flood prone area frequency of inundations was defined as "frequent" for the 5-20 year recurrence interval.

Information from the Riparian Protection Committee's final report was used when developing the Anadromous Salmonid Protection rule package that was adopted by the State Board of Forestry and Fire Protection (BOF) in October 2009 and implemented on the ground in January 2010 (e.g., CCR § 916.9 [936.9, 956.9](v)(5)—Section V site-specific riparian management).

III. Channel Migration Zone Determination

The primary goal of a channel migration zone evaluation is to predict floodplain, terrace, and hillslope areas at risk for channel erosion due to fluvial processes. This allows for the proper design and placement of watercourse and lake protection zones (WLPZs) so that riparian function (e.g., stream shading, large wood recruitment) can be protected and maintained, rather than degraded by channel erosion.

The plan proponent hired O'Connor Environmental, Inc. (OCE) to evaluate and delineate the channel migration zone for the Little THP. It is beyond the scope of this report to recreate the same analyses performed by Dr. Matthew O'Connor and his staff. Rather, the goal was to determine if Dr. O'Connor's analysis was logical, reasonable based on the best available science, and supported by field evidence. To do so, CAL FIRE's Watershed Protection Program (WPP) staff utilized a combination of (1) geospatial analysis of high quality digital elevation models (DEMs) available for the

1/10/2021

366.140

project area, (2) field observations made during the focused PHI, and (3) knowledge of relevant literature regarding channel migration processes and delineation.

Dr. O'Connor (Ph.D., CEG) and his staff performed the channel migration zone evaluation using the framework proposed within the Washington State Forest Practices Board (WFPB) Manual Section 2: Standard Methods for Identifying Bankfull Channel Features and Channel Migration Zones (WFPB, 2004). In turn, the WFPB (2004) Board Manual relies heavily on the method developed by Rapp and Abbe (2003) for delineating channel migration zones.

Rapp and Abbe (2003) delineate the channel migration zone based on a collection of identifiable components which include (Figure 1):

- The Historical Migration Zone (HMZ) – the collective area the channel occupied in the historical record. This is usually done through an analysis of aerial photos and satellite imagery.
- The Avulsion Hazard Zone (AHZ) – the area not included in the Historical Migration Zone that is at risk of channel avulsion over the timeline of the channel migration zone.
- The Erosion Hazard Area (EHA) – the area not included in the Historical Migration Zone or the Avulsion Hazard Zone that is at risk of bank erosion from stream flow or mass wasting over the timeline of the channel migration zone.
- The Disconnected Migration Area (DMA) – the portion of the channel migration zone where man-made structures physically eliminate channel migration.

Given these definitions, the channel migration zone can be defined by the following equation:

(1) Channel Migration Zone = HMZ + AHZ + EHA - DMA

Channel migration zone evaluations rely heavily on historical analysis and field assessments to solve Equation 1 and determine the spatial extent of the CMZ.

1/10/2021

366,141

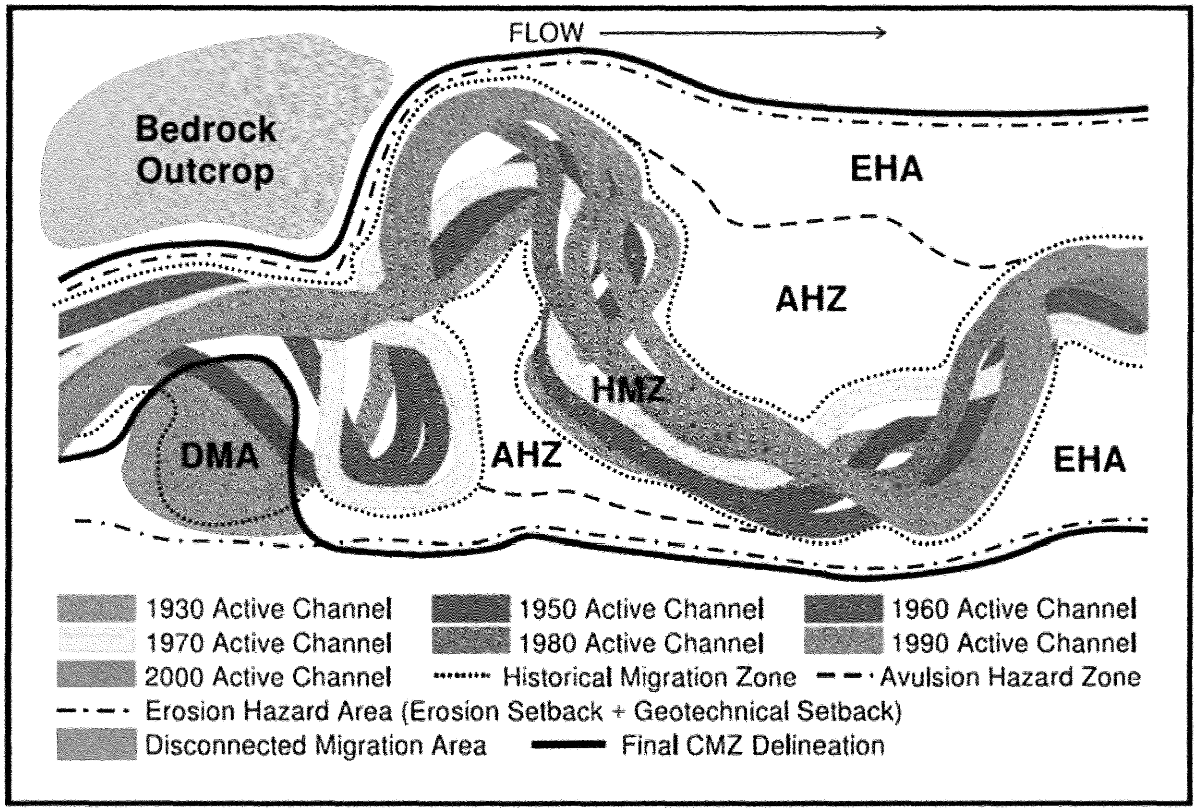


Figure 1. An example of the channel migration zone as a combination of the Historical Migration Zone, Avulsion Hazard Zone, Erosion Hazard Area, and Disconnected Migration Area based on historical and field analysis/interpretation (from Rapp and Abbe, 2003).

At the minimum, all migrating watercourses have Historical Migration Zones, but not necessarily an Avulsion Hazard Zone, Erosion Hazard Area, and/or Disconnected Migration Area. In the case of the Little THP, there is no Disconnected Migration Area, due to the lack of flood control infrastructure within the Little North Fork of the Gualala River floodplain. As such, Dr. O'Connor's analysis focuses on characterizing the spatial extent of the Historical Migration Zone, Avulsion Hazard Zone, and/or Erosion Hazard Area.

Dr. O'Connor's channel migration zone report (OCE, 2019a) first evaluated the extent of the Historical Migration Zone by using 14 series of aerial photographs taken over a 58-year period (1952 to 2010). Dr. O'Connor did not observe evidence of significant channel migration between photo series, but also noted that it was difficult to see the channel due to canopy. However, he did note that if channel migration occurred during this period, it would have left evidence of vegetative disturbance and/or multiple age classes of vegetation. Dr. O'Connor (OCE, 2019a) summarized his evaluation of the available aerial photography with the following statement:

> "The absence of the characteristic signature of channel migration in historic aerial photography is a significant finding. Significant channel migration by gradual

1/10/2021

366,142

> bank erosion or by avulsion erodes the floodplain or terrace to a depth comparable to the existing channel; this erosion would undermine existing forest vegetation leaving linear or curvilinear gaps in the forest canopy that are readily apparent in aerial photography. If channel migration processes are present, there is typically evidence of past channel migration in the form of distinctive patterns of vegetation corresponding to seral stage of forest vegetation associated with disturbance. In my professional and academic experience, significant channel migration on a valley floodplain of this size would be evident in this aerial photo record, particularly considering the large number of photo sets (14), their frequency (the longest gap was only 15 years from 1973-1988), and quality (photo sets complete with stereo pairs in good condition)."

This clearly indicates that Dr. O'Connor found very little evidence of historic channel migration in the photo record.

Despite the photo record showing no indication of previous channel migration, it was still necessary to perform field assessments to determine whether an Avulsion Hazard Zone and/or Erosion Hazard Area were present on the floodplain. Dr. O'Connor used results from hydrologic and hydraulic modeling (OCE, 2019b), high quality topographic data, and field locations identified from previous site visits to guide in the field assessment.

CAL FIRE WPP staff used remotely sensed data to determine if the field sites investigated were appropriate and/or comprehensive enough to allow for reasonable channel migration zone delineation. The availability of 1-meter LiDAR digital elevation models (DEMs), flown in 2017 for Mendocino County, allowed for processing of the topographic data to further aid in the evaluation of the channel migration zone. The generation of shaded relief (i.e., hillshade) and a relative elevation model (REM) provide a visualization of the subtle landforms on floodplains and valley bottoms necessary for channel migration zone delineation (Olson et al., 2014).

CAL FIRE WPP staff generated multiple relative elevation model maps on a reach scale (five reaches in total) using methods contained within the Washington State Department of Ecology document titled "A Methodology for Delineating Planning-Level Channel Migration Zones" (Olson et al., 2014) to determine whether the field sites assessed during the channel migration zone evaluation were reasonable to allow for CMZ delineation (see Appendix A). These relative elevation models represent floodplain elevations relative to the stream centerline, thereby detrending changes in elevation in the downstream direction. Reaches were delineated based on changes in flow due to significant tributary influx. The modeled areas of the floodplain are shown in Figure 2.

In the following sections, the relative elevation model reach maps are used in conjunction with CAL FIRE WPP field observations to confirm or dispute the analysis performed by Dr. O'Connor.

1/10/2021

366,143

PART OF PLAN

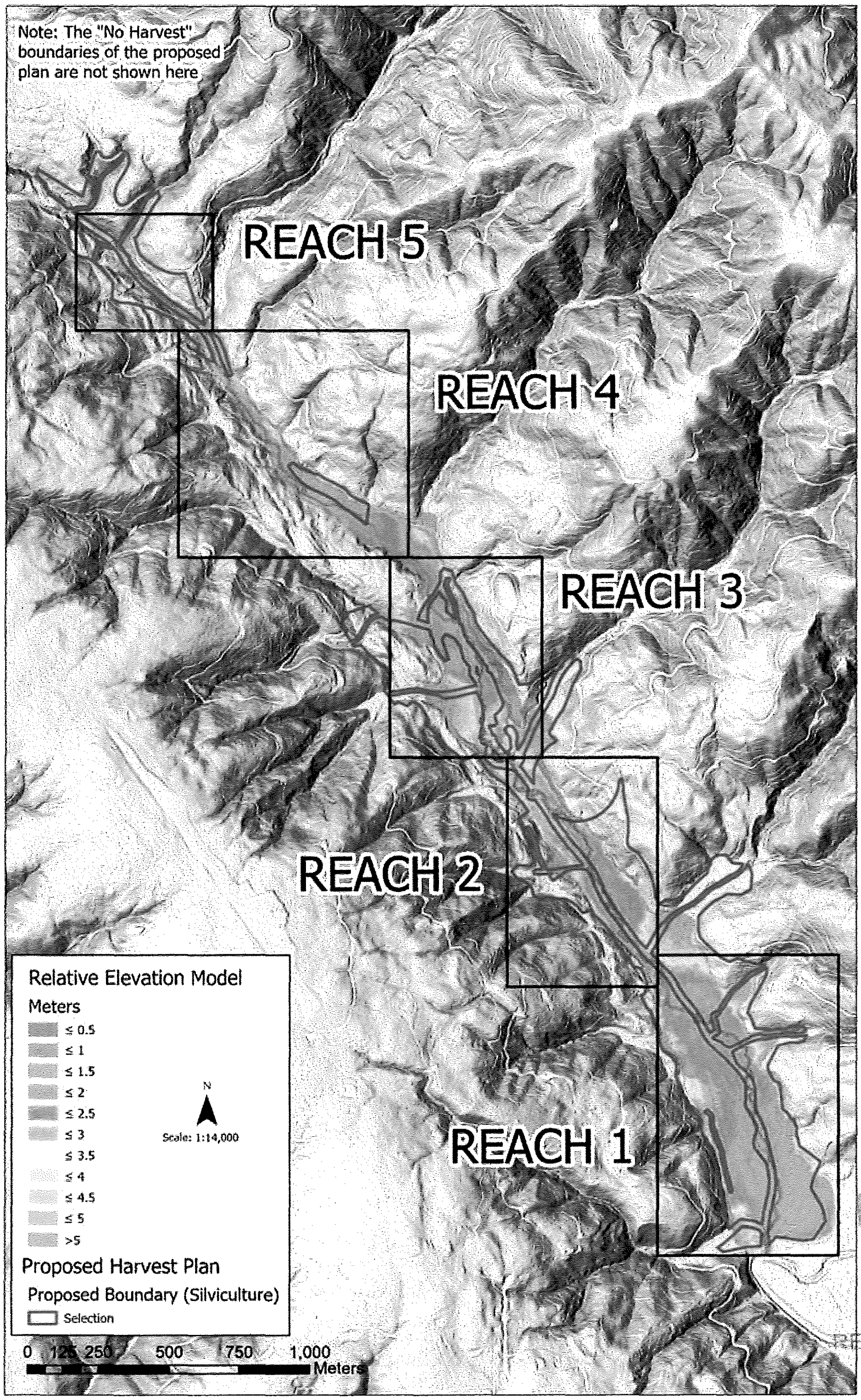


Figure 2. A relative elevation model produced by CAL FIRE WPP staff to help verify the channel migration zone evaluation provided by the plan proponent. The five relative elevation model reaches are displayed, as well as the THP unit boundaries.

1/10/2021

366.144

Site 1

Site 1 is within Reach 1 at the lower end of the Little North Fork of the Gualala River and is shown in Figure 3. Dr. O'Connor identified and evaluated Site 1 based on concerns by CDFW that the area was subject to potential avulsion from the Little North Fork of the Gualala River. The relative elevation model confirms the presence of potential overbank flooding in the vicinity. However, the relative elevation model indicates that this flooding is generally dispersed rather than concentrated into channelized flowpaths.

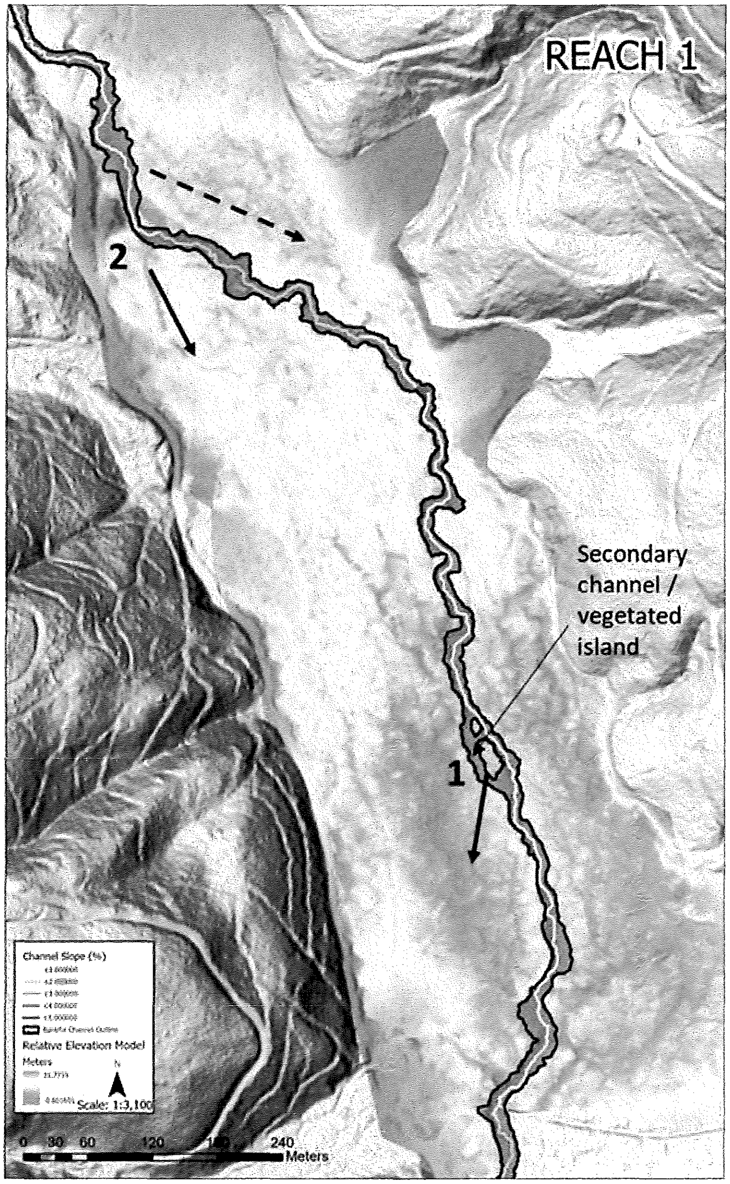


Figure 3. Relative elevation map of Reach 1 of the Little North Fork of the Gualala River. Numbers refer to sites assessed in the O'Connor channel migration zone evaluation (OCE, 2019a). Arrows represent potential flowpaths evaluated in the field.

1/10/2021

366.145

Dr. O'Connor noted the presence of secondary channels that create small vegetated islands upstream of Site 1, and noted it as a form of small scale channel migration that is characteristic throughout the Little North Fork Gualala River. He also suggested that the secondary channel be given Class I watercourse protection. Dr. O'Connor noted that a right-bank[2] linear to curvilinear swale was present down gradient of the secondary channel (Figure 4), but stated that the flowpath was distributary in nature and did not reconnect with the primary channel. He concluded that the swale did not have the erosive power to create a new primary/secondary channel. CAL FIRE WPP staff observations were consistent with those noted by Dr. O'Connor. Avulsion potential is greatly increased when the floodplain flowpath gradient is 3-5 times greater than that of the primary/secondary channel (WFPB, 2004). Staff measured the slope of the secondary channel and swale feature and found them to be approximately equal (≈1%), indicating a relatively low potential for avulsion.

Figure 4. The secondary channel and broadly convergent right-bank floodplain surface at Site 1.

---

[2] Right- or left-bank refers to the location of a feature relative to the bank of the primary channel when looking in the downstream direction.

1/10/2021 366,146

Site 2

Site 2 is within Reach 1 and is shown in Figure 3. Dr. O'Connor identified and evaluated Site 2 based on concerns by CDFW that the area was subject to potential avulsion from the primary channel of the Little North Fork of the Gualala River. The relative elevation model confirms the presence of a curvilinear feature in the vicinity that could act as a potential flowpath. The relative elevation model indicates that this feature is disconnected from the main channel in downstream direction, and is generally narrower than the active channel.

Dr. O'Connor characterized Site 2 as a right-bank floodplain feature that acted as a distributary flowpath and did not rejoin the primary channel of the Little North Fork of the Gualala River. Dr. O'Connor suggested that the feature may be an old skid trail or road. Overall, he determined the avulsion potential as being low because: water was dissipated across the floodplain in the downslope direction; the floodplain feature lacked bedload and was comprised of silt and sand deposits; and the fact that a large left-bank overflow floodplain feature (see dashed arrow on Figure 3) would moderate the amount of flow that could travel down the right-bank floodplain feature.

The observations and rationale provided by Dr. O'Connor were confirmed by CAL FIRE WPP staff. Staff determined the water surface elevation would have to rise by 5-6 feet (Figure 5) before it would access the right-bank floodplain feature. The 20-year recurrence interval storm is predicted to overtop this feature (OCE, 2019a), but did not show signs of recent overtopping. The slope of the floodplain feature was approximately three times greater than that of the primary channel (1.5% vs. 6%). However, the steeper surface only persisted for approximately 100 feet before flattening to a gentler slope. The feature does have characteristics that indicate it might have been a skid trail at one time, as the soil appeared compacted and had the same approximate width of a skid trail. The relative elevation model shows strong evidence that the feature acts more as a flooding and depositional flowpath rather than as a potential avulsion pathway. Staff also noted the presence of the left-bank overflow floodplain feature noted in Dr. O'Connor's report, and this is expected to convey most of the overbank flow, rather than the right-bank feature, during a storm event.

1/10/2021

Figure 5. A view of the potential flowpath at Site 2. The water surface elevation would have to rise 5 to 6 feet to reach the elevation of this floodplain surface.

Site 3

Site 3 is within Reach 2 and is shown in Figure 6. Dr. O'Connor identified and evaluated Site 3 based on the presence of secondary channels and a series of islands similar to those at Site 1. The relative elevation model confirms the presence of split flowpaths in the vicinity of Site 3, including some upstream of the area evaluated by Dr. O'Connor.

1/10/2021

366,148

Dr. O'Connor characterized Site 3 as primary and secondary channels separated by vegetated islands. He further stated that the secondary channels should receive Class I protection (Figure 7). CAL FIRE WPP staff confirmed these observations and agree with the recommendation to treat the secondary channels as a Class I watercourse.

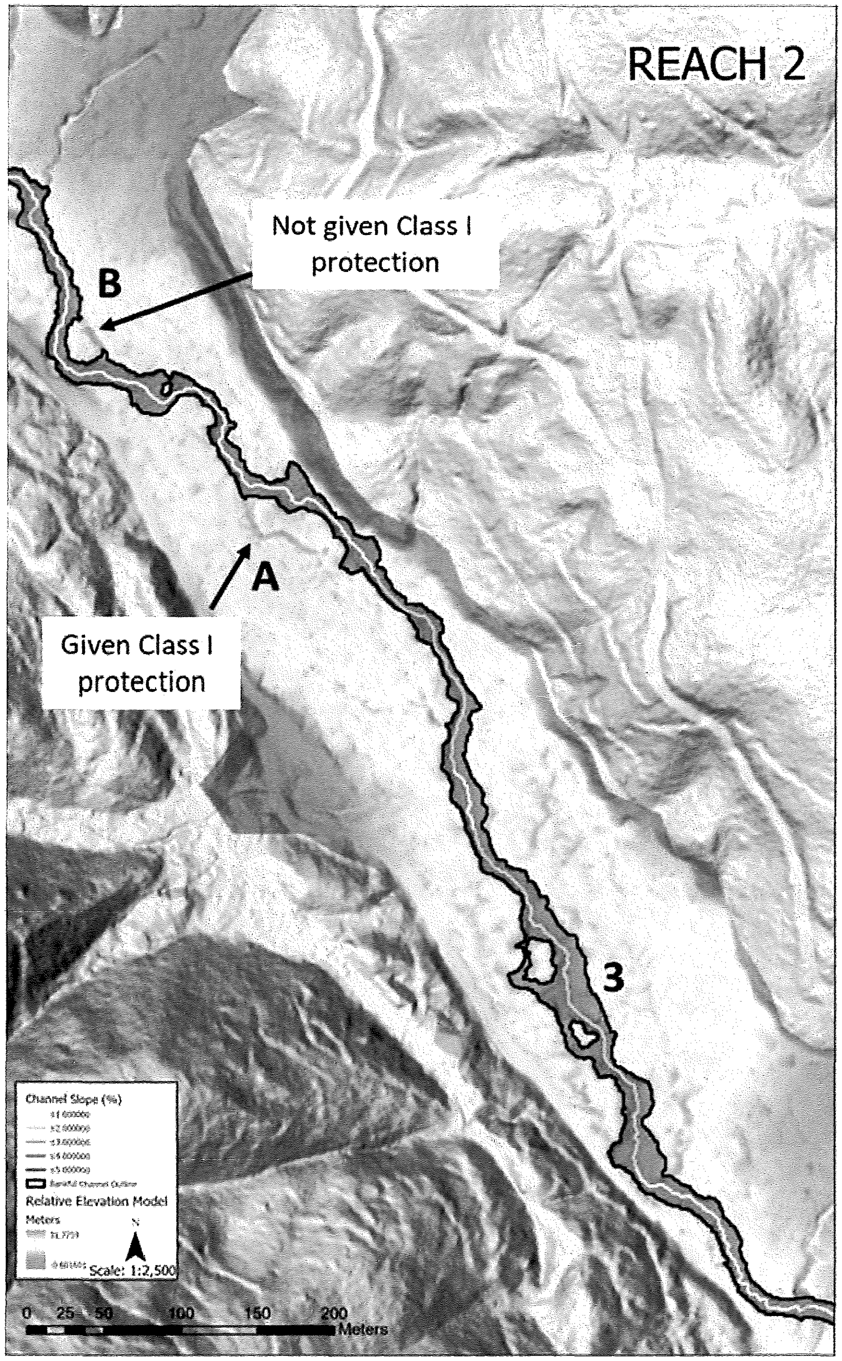


Figure 6. Relative elevation model of Reach 2 of the Little North Fork of the Gualala River. Numbers refer to sites assessed in the O'Connor channel migration zone evaluation. Alphabetical designations represent areas with secondary channel or potential secondary channels.

1/10/2021

366,149

The relative elevation model indicates two locations upstream of Site 3 that showed similar signs of secondary channel development. Site A (Figure 6) indicates the presence of a possible secondary channel. Revised silviculture maps submitted by the plan proponent indicate this feature has proposed Class I watercourse protection. Site B (Figure 6) shows another location along the Little North Fork of the Gualala River where a secondary channel may also be present. The revised silviculture maps indicate that this potential secondary channel has not been given Class I watercourse protection. It was also not evaluated by Dr. O'Connor in his report. As a result, we suggest that this area be evaluated for the presence of a secondary channel, and the need for Class I watercourse protection (**Recommendation 1**).

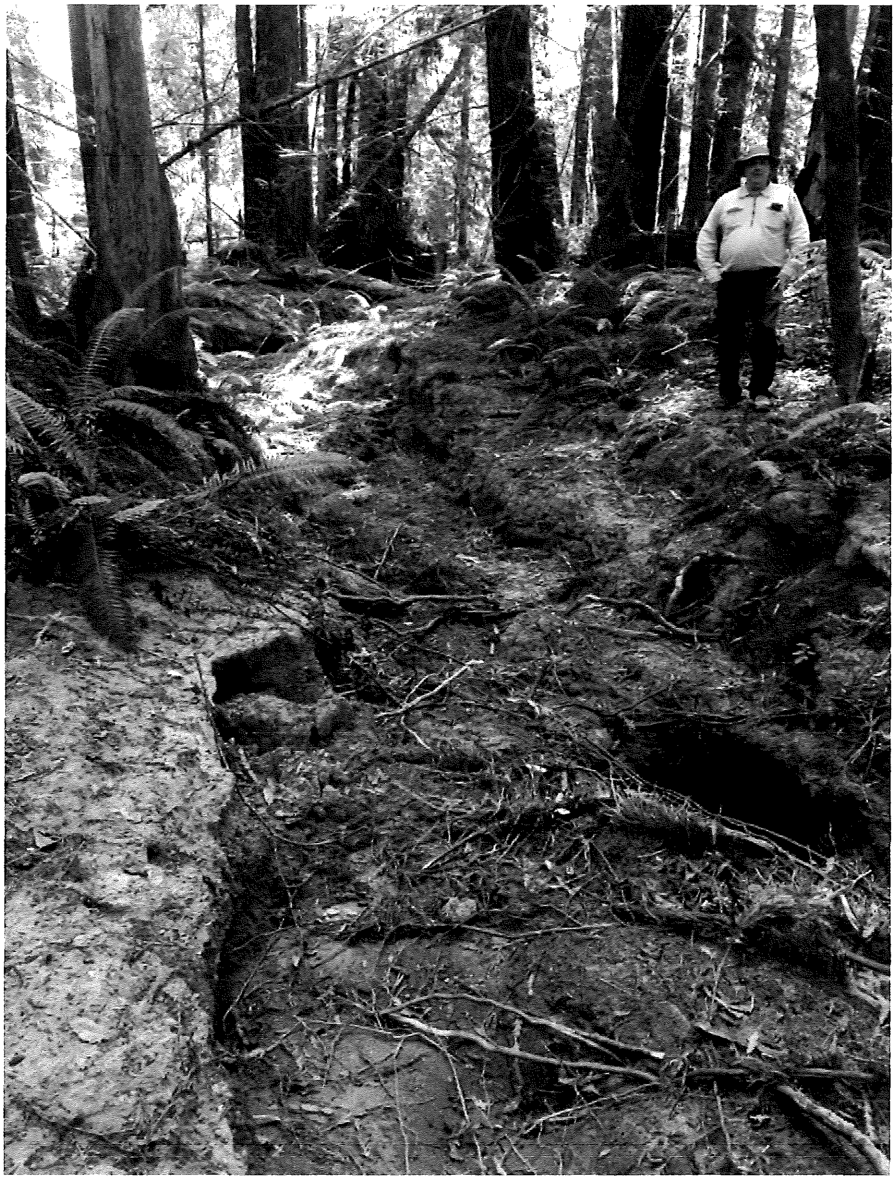


Figure 7. A secondary channel at Site 3. This channel received Class I watercourse protection.

1/10/2021

366,150

Site 4

Site 4 is within Reach 3 and is shown in Figure 8. Dr. O'Connor identified and evaluated Site 4 because it is a left-bank flowpath that was predicted to have flow with the hydraulic modeling study (OCE, 2019b). The relative elevation model shows clear evidence of a defined flowpath on the left bank that has potential upstream and downstream connectivity with the primary channel. Dr. O'Connor identified this area as possibly being influenced by an old road with a high likelihood of avulsion, and identified the area as channel migration zone for approximately 1000 feet. Additionally, red alder stands were evident in this area using the 1988 aerial photos. The area between the left-bank flowpath and the primary channel fits the criteria of an Avulsion Hazard Zone.

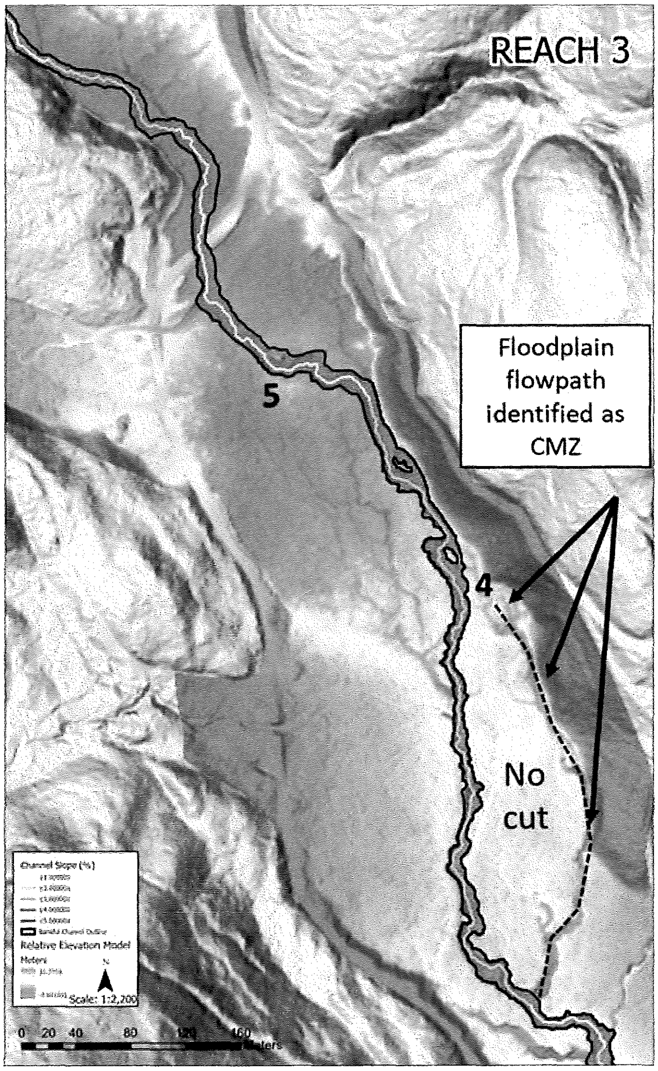


Figure 8. The relative elevation model map for Reach 3. Numbers refer to sites assessed in the O'Connor channel migration zone evaluation (Sites 4 and 5). Site 4 refers to the entire flowpath defined by the dashed line. The area between the dashed line and the primary channel, labeled as "no cut", and can be considered an Avulsion Hazard Zone.

1/10/2021

366,151

CAL FIRE WPP staff agree with this assessment. Staff noted that the upstream end of this flowpath is approximately three feet higher than the existing channel, and is located within a bend in the channel with a large woody debris jam directly downstream. Form roughness in combination with in-channel large woody debris roughness (Figure 9) has the potential to cause a rise in water surface elevation which could shift the main flow to this left-bank flowpath.

Figure 9. The upstream end of the Site 4 flowpath. Note the large woody debris jam in the background.

Site 5

Site 5 is within Reach 3 and is shown in Figure 8. Dr. O'Connor identified and evaluated Site 5 due to its potential as a source of landslide and/or alluvial fan sediments that may affect the downstream avulsion potential at Site 4. The relative elevation model indicates that much of the floodplain is likely inundated during flood events, and there is clear evidence of an alluvial fan from a left-bank tributary upstream from Site 5. Dr. O'Connor stated that the area was subject to extensive overbank flooding but should not be considered a channel migration zone.

CAL FIRE WPP staff agree with the assessment provided by Dr. O'Connor. Evidence of abrasion on the base of snags showed that floodplain depths can reach two feet above the bankfull elevation (Figure 10). There was no evidence of abandoned channels that could act as potential avulsion flowpaths.

1/10/2021

366,152

Figure 10. Evidence of abrasion on the base of a snag illustrating floodplain depths can reach two feet above the bankfull elevation (red line).

Site 6

Site 6 was investigated by Dr. O'Connor due to the potential presence of secondary channels as indicated by the hydraulic model simulation (OCE, 2019b). The relative elevation model (Figure 11) indicates the potential for extensive overbank flooding near Site 6. In his report, Dr. O'Connor mentioned the presence of a landslide that impinged on the Little North Fork of the Gualala River, with the potential to cause the channel to shift its position (OCE, 2019a). However, he concluded that the landslide did not trigger an avulsion of the Little North Fork of the Gualala River. Dr. O'Connor concluded that the area is not a channel migration zone.

CAL FIRE WPP staff agree with the Dr. O'Connor's assessment. Staff noted silt lines of approximately 1.7 feet on the floodplain. However, there were no signs of abandoned channels in this area. Staff noted an area of bank erosion at a small bend in the Little North Fork of the Gualala River, but it appears relatively stable as the relative elevation model shows no signs of lateral erosion (e.g., meander scrolls) nearby. A clump of large redwood trees tipped into the channel during the winter of 2018-2019 here but has not caused channel movement (Figure 12).

1/10/2021

366,153

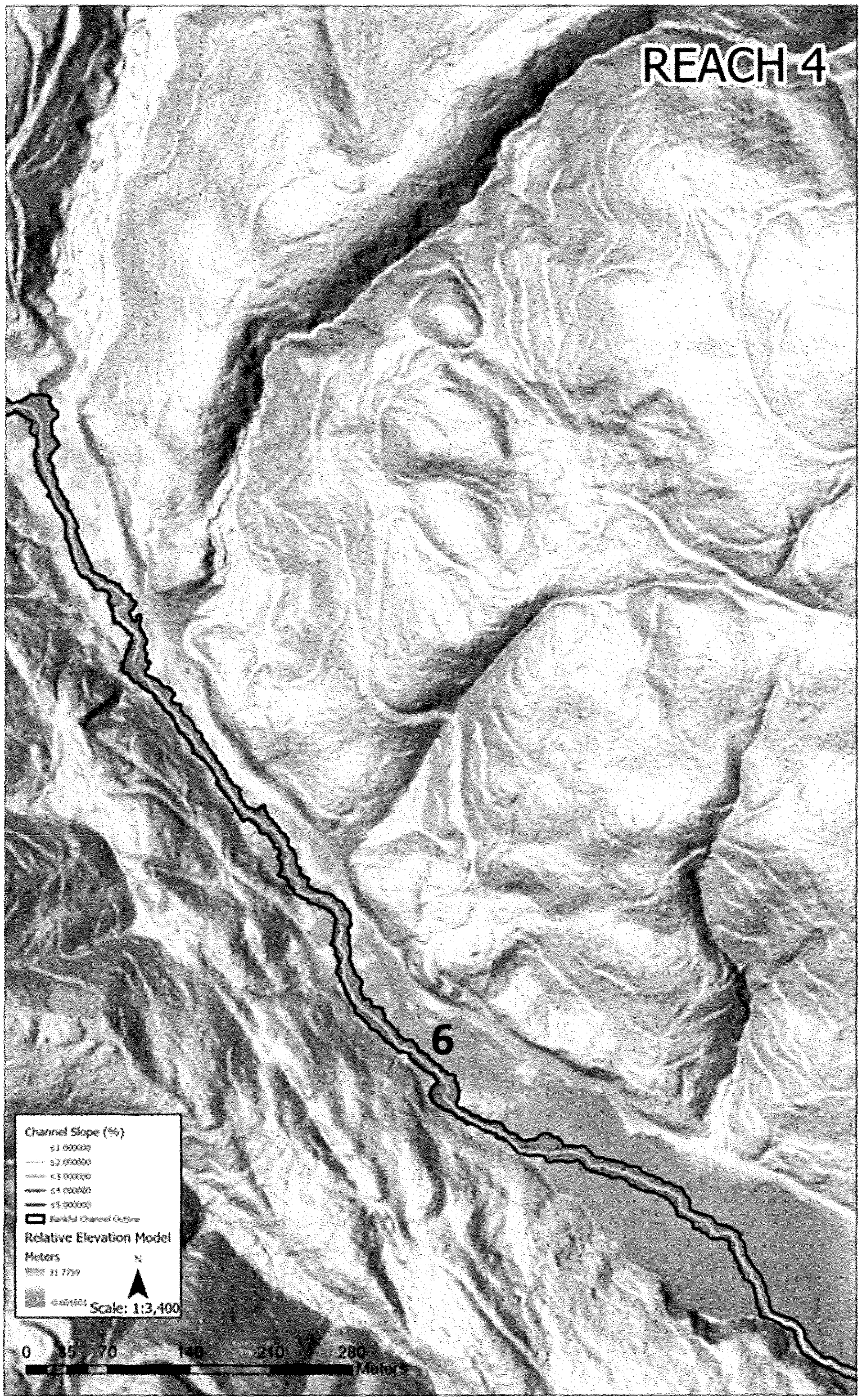


Figure 11. The relative elevation model for Reach 4. The number refers to the site assessed in the O'Connor channel migration zone evaluation (Site 6).

1/10/2021

366,154

Figure 12. Coast redwood trees that recently entered the Little North Fork of the Gualala River channel at Site 6.

Channel Migration Zone Determination for the Little North Fork of the Gualala River

In his summary statement, Dr. O'Connor stated that within the Little North Fork of the Gualala River floodplain there is a lack of visible channel migration processes in the aerial photo record (OCE, 2019a). This indicates that the Historical Migration Zone is very limited in its spatial extent. A combination of field evaluation and hydraulic model simulations suggest that the spatial extent of channel migration is limited to a narrow band around the primary channel where woody debris can split flow and cause the development of secondary channels. Most of the secondary channels have been given Class I watercourse protection apart from area B identified within Reach 2 (Figure 6). The exception is the avulsion pathway identified at Site 4, which shows a clear abandoned flowpath with upstream and downstream connectivity. Dr. O'Connor concludes that despite the extensive evidence of overbank flow, flood flows are generally dispersed and have insufficient energy to erode channels that would trigger channel avulsion.

Data from the relative elevation model and field observations made by CAL FIRE WPP staff confirm those reported by Dr. O'Connor. Particularly, the relative elevation model

1/10/2021

366.155

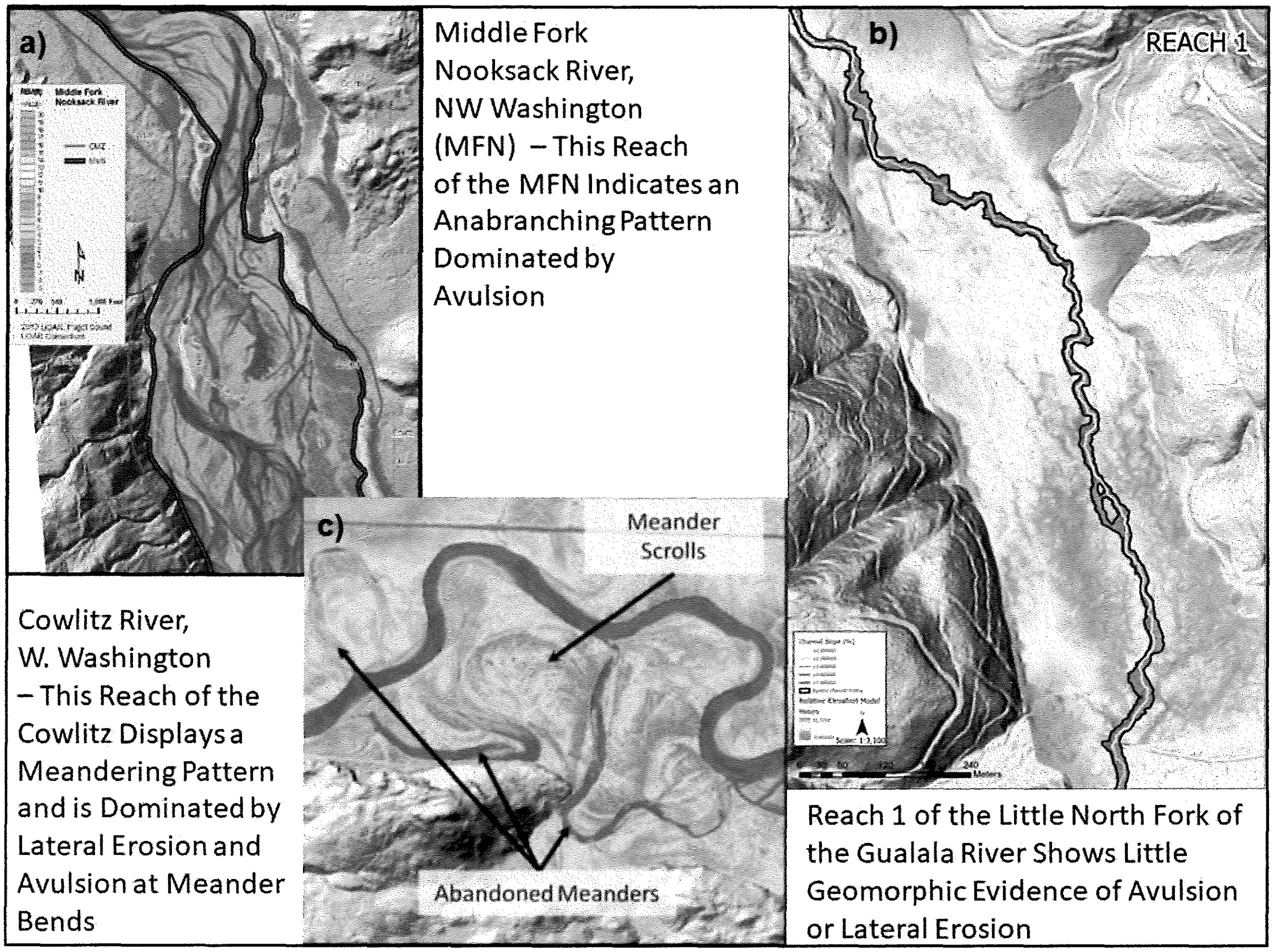
supports the assertion that the floodplain is dominated by dispersed overbank flows rather than channel erosion and migration. This is evident when comparing the relative elevation model of the Little North Fork of the Gualala River to relative elevation models of rivers that migrate through a variety of avulsion processes (Figure 13). Altogether, there is lack of topographic evidence indicating active channel migration processes for the majority of the Little North Fork of the Gualala River, with the exception of Site 4.

It is important to reconsider Equation 1 in the beginning of this section, as it presents a process-based approach for determining the channel migration zone. The photo record shows a very constrained Historical Migration Zone, which indicates the Little North Fork of the Gualala River is generally stable. Furthermore, the historical photo record shows no evidence of channel migration through lateral erosion processes. Since the determination of the Erosion Hazard Area requires an analysis of the areal extent of fluvial features over time (Rapp and Abbe, 2003), and the historical record shows no clear evidence of lateral erosion, there is no clear basis to delineate an Erosion Hazard Area for the Little North Fork of the Gualala River. The analysis of Dr. O'Connor does identify an Avulsion Hazard Zone associated with Site 4.

Other lines of evidence support the conclusion that the Little North Fork of the Gualala River is generally laterally stable and limited in its ability to migrate across its floodplain. For instance, Beechie et al. (2006) classified forested channels by their planform pattern, each with a characteristic rate of channel migration (Figure 14). In general, the authors found that straight channels (i.e., primarily single thread channel, sinuosity <1.5) had the lowest rate of lateral migration, and braided channels had the highest rate of migration. Analysis of the Little North Fork of the Gualala River using LiDAR data indicate that the Little North Fork of the Gualala River fits the definition of a straight channel as defined by Beechie et al. (2016) (Table 1), and therefore likely has a relatively low migration rate.

1/10/2021

366,156



Middle Fork Nooksack River, NW Washington (MFN) – This Reach of the MFN Indicates an Anabranching Pattern Dominated by Avulsion

Cowlitz River, W. Washington – This Reach of the Cowlitz Displays a Meandering Pattern and is Dominated by Lateral Erosion and Avulsion at Meander Bends

Reach 1 of the Little North Fork of the Gualala River Shows Little Geomorphic Evidence of Avulsion or Lateral Erosion

Figure 13. Relative elevation models for (a) the Middle Fork Nooksack River (MFNR) in northwest Washington; (b) the Little North Fork of the Gualala River; and (c) the Cowlitz River in western Washington. The MFNR and Cowlitz River show ample topographic evidence of channel migration processes, whereas the Little North Fork of the Gualala River shows limited evidence of channel migration.

Table 1. Channel metrics derived from analysis of the 1-m LiDAR digital elevation model data (BFW = bankfull channel width).

Full Watercourse	Mean BFW	Median BFW	Transects ≥ 15-m	Mean Slope	Median Slope	Sinuosity
	13.5 m	12.2 m	256/986	1.2%	1.1%	1.24
By Reach						
Reach 1	15.7	13.5	97/250	1.2%	-	1.27
Reach 2	15.6	12.8	70/194	0.7%	-	1.23
Reach 3	11.6	11.2	31/191	1.1%	-	1.28
Reach 4	12.5	12.1	40/227	1.2%	-	1.20
Reach 5	10.8	9.6	18/124	2.6%	-	1.18

1/10/2021

366,157

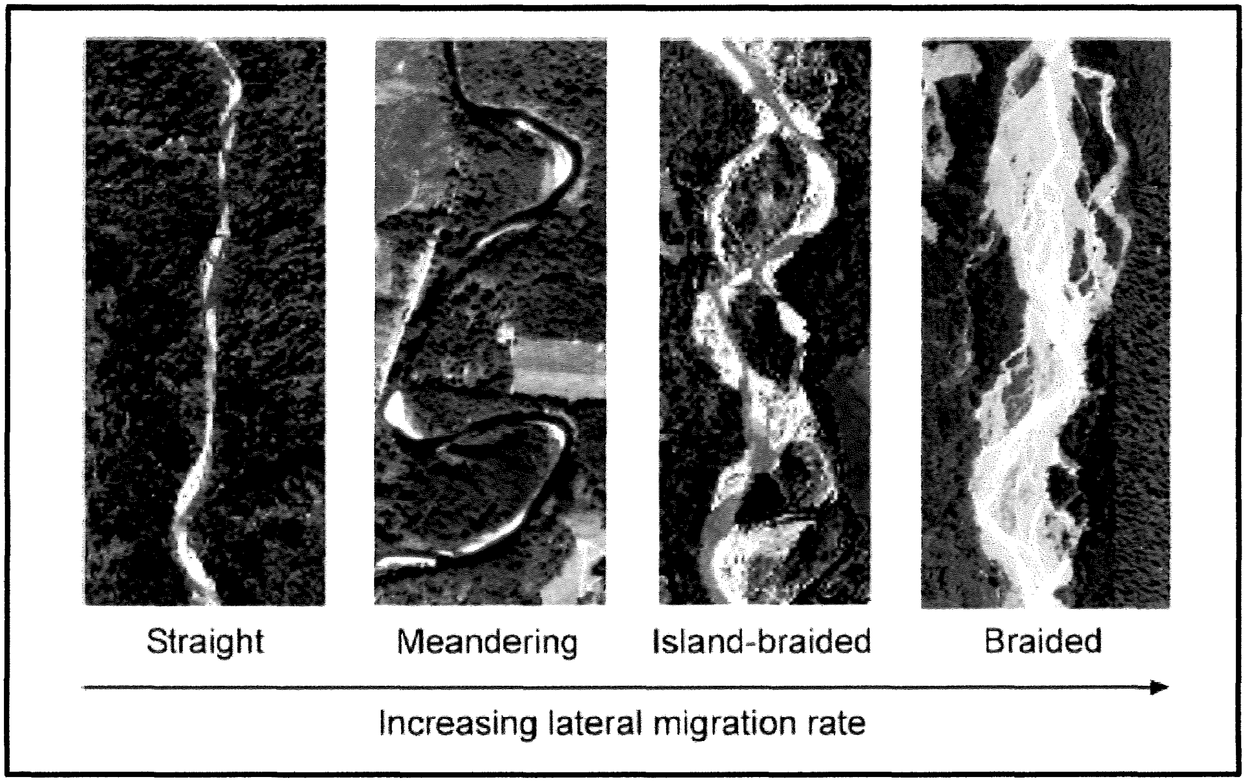


Figure 14. Illustration of the four channel patterns, indicating relative rates of lateral migration of the channel (i.e., migration that erodes floodplain surfaces). The Little North Fork of the Gualala River most resembles the straight channel pattern. Taken from Beechie et al. (2006).

Beechie et al. (2006) found a bankfull channel width threshold for channel migration across forested floodplains in western Washington for channels between 15 and 20-m bankfull width. They speculated that the bankfull width threshold was related to the water depth necessary to erode the banks beneath the roots of riparian tree species, and that channel migration became an active process once channels were able to erode beneath the rooting zone of the bank trees. We did not see evidence of extensive bank erosion and/or recruitment of trees via bank erosion in the Little North Fork of the Gualala River. The analysis of the LiDAR digital elevation model (DEM) also indicated that the Little North Fork of the Gualala River was generally below the 15 to 20-m bankfull width threshold documented for western Washington (Table 1; Figure 15). Average bankfull width for reaches 1 and 2 fell within the documented threshold for transition from non-migrating to migrating channels, but did not fall within the range of "clearly" migrating channels.

Additionally, Beechie et al. (2006) reported on areas in the Pacific Northwest with non-sprouting conifer species (e.g., red cedar, Sitka spruce, western hemlock), while the Little North Fork of the Gualala River floodplain is primarily covered with 90-100 year old coast redwood, which exhibits prolific stump sprouting. Following removal of timber from

1/10/2021

366.158

a site, the roots of non-sprouting species totally decay. While long-term studies on second-growth coast redwood root decay have yet to be completed, retrospective research on redwood root decay has shown that root biomass drops approximately 40% in 11 years, and thereafter increases (Ziemer and Lewis 1984). Live root biomass declines but does not drop to zero after logging, as coast redwood roots come into equilibrium with reduced above ground biomass. Coast redwood tree sprouting may, therefore, allow for rapid recovery of rooting strength, which may limit the potential for channel migration following disturbance compared to non-sprouting species in the Pacific Northwest.

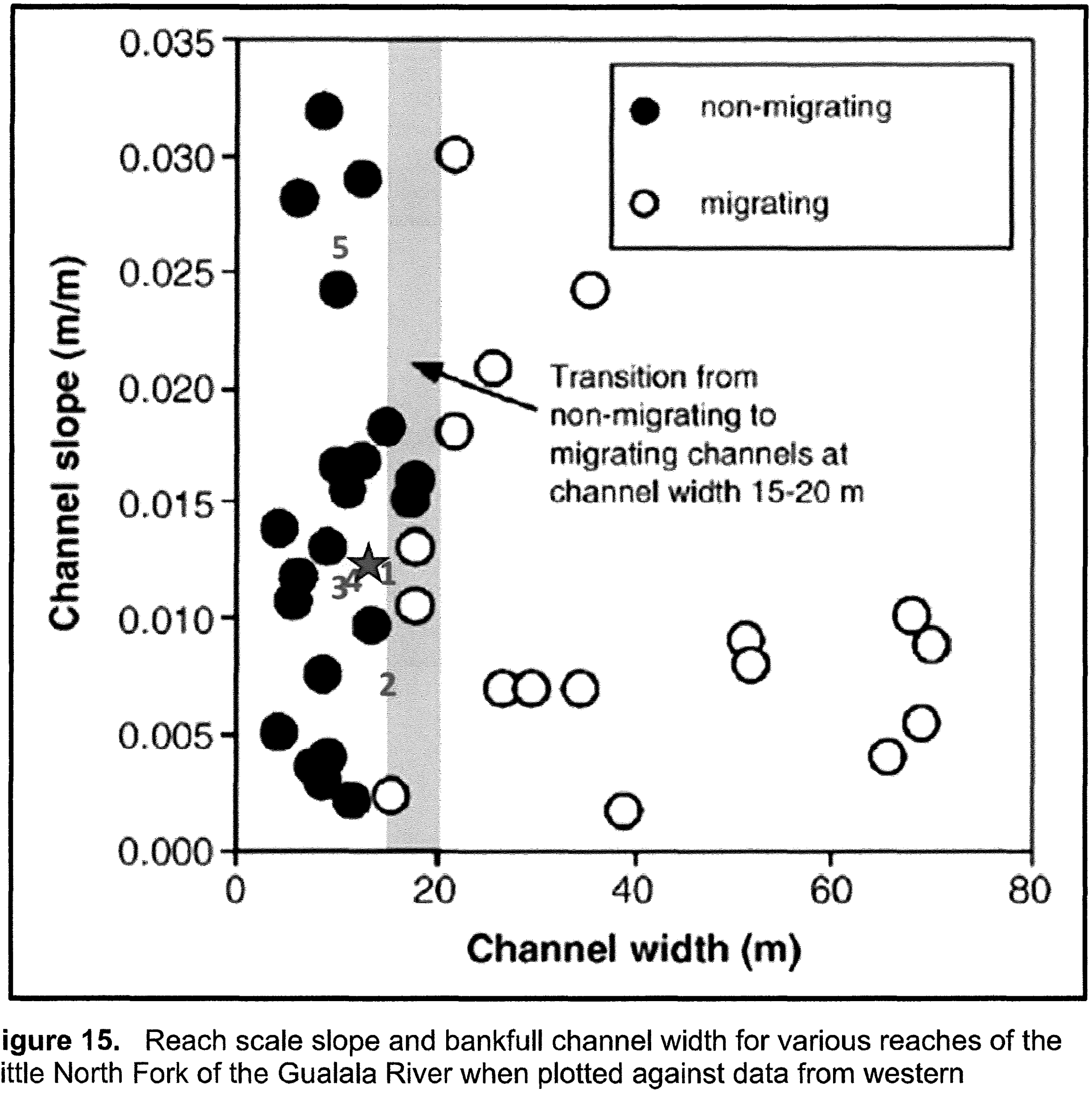


Figure 15. Reach scale slope and bankfull channel width for various reaches of the Little North Fork of the Gualala River when plotted against data from western Washington. Red numbers represent specific reaches of the Little North Fork of the Gualala River, whereas the red star represents the average for all reaches. Figure modified from Beechie et al. (2006).

1/10/2021

366,159

Another conclusion of the Beechie et al. (2006) paper was that relatively stable channels were dominated by older and larger trees, whereas less stable channels were a mosaic of different age classes or dominated by younger age classes of vegetation. Section III of the THP states that the riparian stand is approximately 90-100 years old, and we infer this to mean that the stand is even-aged (i.e., a single age class of trees). This conforms with our observations in the field, where the floodplain stand appeared to be even-aged in composition, heavily dominated by coast redwood.

In summary, we conclude that the O'Connor channel migration zone report (OCE, 2019a) provides a logical and reasonable evaluation of the channel migration zone for the Little North Fork of the Gualala River. Dr. O'Connor's conclusions are supported by CAL FIRE WPP field staff observations, the general lack of topographic signatures indicating channel migration processes by the relative elevation model, as well as alternate lines of evidence suggested by relevant published literature.

IV. Flood Prone Area Determination for the Little THP

The 2019 California Forest Practice Rules definition for a **flood prone area** is provided in Section I of this report. The WLPZ Inner Zone B definition for flood prone areas is:

(D) Inner Zone B: The Inner Zone B is applicable when there are very wide flood prone areas. The Inner Zone B encompasses the portion of the flood prone area from the landward edge of the Inner Zone A (i.e., 150 feet from the WTL) to the landward edge of the flood prone area. The landward edge of the Inner Zone B (i.e., the landward perimeter of the flood prone area) shall be established in accordance with flood prone area definitions in 14 CCR § 895.1. Timber Operations are permitted in this zone when conducted to meet the goals of this section, including those for the Inner Zone in 14 CCR § 916.9 [936.9, 956.9], subsection (c)(2), 14 CCR § 916.9 [936.9, 956.9], subsection (e)(1)(A)-(F), or pursuant to 14 CCR § 916.9 [936.9, 956.9], subsection (v)...

CAL FIRE and CDFW provided guidance to RPFs for implementing the Anadromous Salmonid Protection rules in 2010, which was updated in 2014 (CAL FIRE and CDFW, 2014). In particular, Question and Answer No. 30 is relevant to review of the Little THP and observations made during the focused PHI.

> ***30. How will the Flood Prone Area be determined in the field?***
>
> *RPFs should refer to indicators described in the ASP rule flood prone area definition, as well as the document titled Flood Prone Area Considerations in the Coast Redwood Zone (Cafferata et al. 2005). Other helpful tools for determining the extent of flood prone areas are USGS topographic maps; LIDAR (Light Detection and Ranging) data, which provides high resolution topography; and individual county 100-year flood hazard maps, which depict with reasonable accuracy the extent of relatively flat, floodplains adjacent to streams.*

1/10/2021

366.160

> *Evidence for a flood prone area includes, but is not limited to: (1) flotsam (i.e., material floating on water) hanging in the brush and log jams on top of the surface, (2) fine sediments found in the tree moss and bark, (3) silt, sand, or gravel found immediately under the leaf layer, (4) alluvial materials consisting of silt, sand and gravel that are uncompacted and unconsolidated, (5) a wetter understory plant community with facultative wet and/or wetland obligate species present, (6) disturbance species such as willow, cottonwood and alder present in the overstory canopy, (7) evidence of flowing water, such as scour features, flattened grass or secondary channels formed by scour action of the modern river channel, and (8) the elevation of the surface lies near the elevation of the highest channel features (e.g., log jams and gravel bar surfaces). If some period of time has lapsed since a large flood event, evidence that relates directly to flooding of a surface may be muted (WFPB 2004).*
>
> *RPFs are encouraged to consult with DFW, CAL FIRE, the California Geological Survey (CGS), the Regional Water Quality Control Boards (RWQCBs), and others prior to laying out a project in an area suspected to be prone to flooding. Agency staff can help foresters determine if flood prone areas are present and answer questions about the ASP rules and agency expectations.*
>
> *It is most appropriate to determine if channel migration has historically occurred using a combination of office methods (e.g., a series of aerial photographs covering a wide time frame, topographic maps) and field inspection. CMZs are found in areas with unconfined channels (i.e., valley floor width is greater than two (2) times the bankfull channel width). Field inspections will reveal past lateral movement of the channel, often age-progressive bands of trees (e.g., red alder) on the floodplain, and at least one side channel on the floodplain at or below bankfull elevation of the main channel (WFPB 2004).*

During the focused PHI inspection held on August 29, 2019, the PHI participants observed (1) the six sites identified by CDFW as potential channel migration zone sites and discussed in detail in Section III of this report, (2) the flood prone area delineation in several locations, and (3) protection measures provided for the flood prone area and larger floodplain. Dr. O'Connor explained his findings for these sites, as documented in the O'Connor Environmental, Inc. reports prepared for this THP (OEC 2019a,b,c). We found that the area delineated as the landward edge of Inner Zone B corresponded to the mapped estimate of the 20-year flood prone area, which was based on Dr. O'Connor's detailed hydrologic and hydraulic (H&H) modeling (OCE, 2019b,c).

During the focused PHI, CAL FIRE WPP staff compared measured silt lines on trees to the water depth predicted by hydraulic model simulations using the Collector/Avenza applications on iPads. Due to accuracy of the iPad GPS under tree canopy, locations had potential errors ranging from approximately 15-40 feet. Because of this potential error, we averaged flow depths within a 20-foot radius of the measurement point. A linear regression between measured silt height and average modeled flow depth was

1/10/2021

366.161

not significant. However, the regression line is relatively close to a 1:1 relationship (Figure 16).

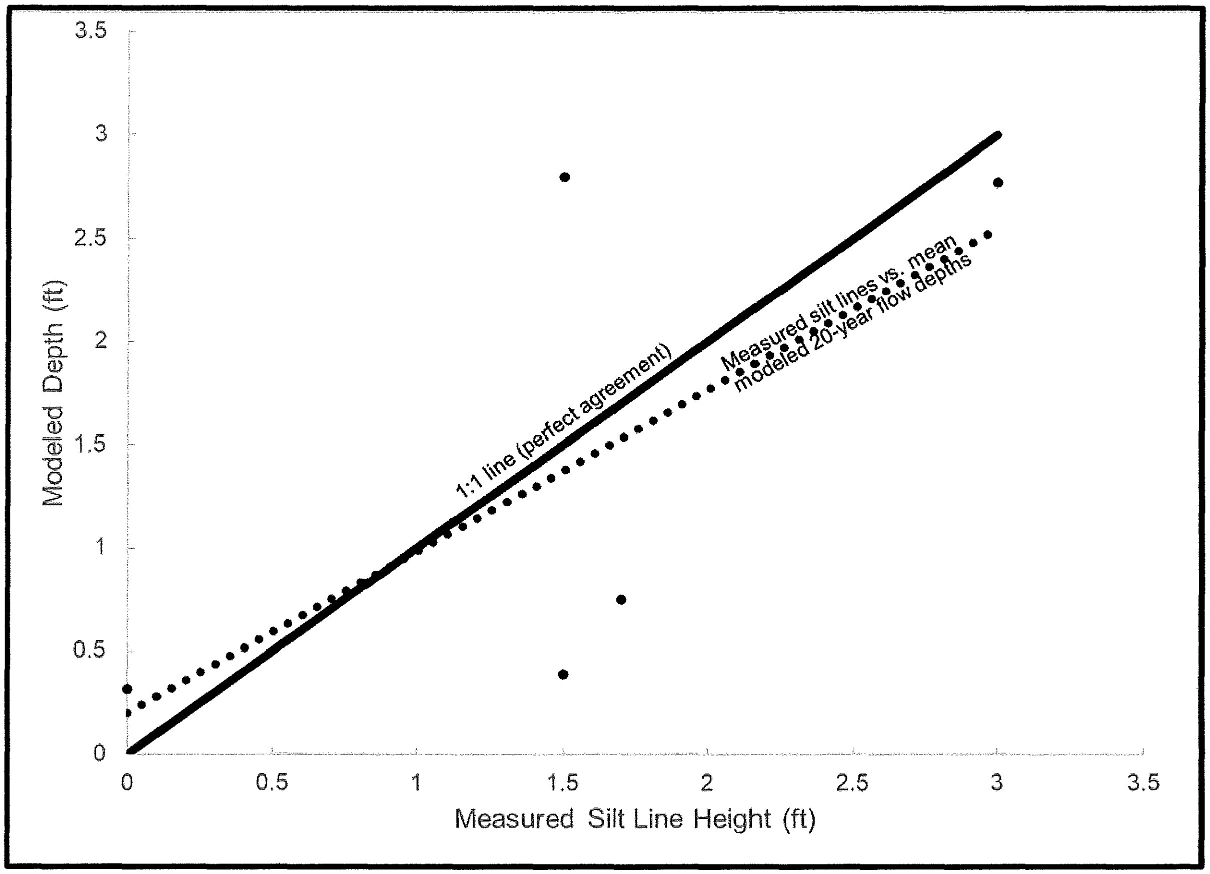


Figure 16. Relationship between measured silt line height and average modeled flow depth for five points along the Little North Fork of the Gualala River. The lack of significance is likely due to the inaccuracy of the iPad GPS and the limited degrees of freedom in the regression. Despite this, the regression line is relatively close to a 1:1 agreement.

The FPRs allow the plan proponent to use either (1) the area inundated by a 20-year recurrence interval flood flow event, or (2) the elevation equivalent to twice the distance between a thalweg riffle crest and the depth of the channel at bankfull stage (i.e., 2X bankfull stage method) to determine the edge of the flood prone area along laterally stable watercourses lacking a channel migration zone where the outer boundary of the flood prone area cannot be clearly determined using the listed field indicators.

As stated above, Dr. O'Connor and his staff have conducted detailed hydrologic and hydraulic modeling to delineate the 20-year recurrence interval flood event boundary (OCE, 2019b,c), which has been incorporated into the THP. Information provided in the

1/10/2021

366.162

CAL FIRE and CDFW guidance to RPFs for implementing the Anadromous Salmonid Protection rules (CAL FIRE and CDFW, 2014) indicates that the 2X bankfull stage methodology (Rosgen, 1996) equates to approximately a 40-50 year return period flood event in the California Coast Ranges (based on personal communication from Dr. William Trush). As indicated in the Riparian Protection Committee flood prone area report, the most biologically critical area for listed anadromous salmonids, including coho salmon life cycle requirements, is the area inundated at less than or equal to every 20 years (Cafferata et al., 2005). Therefore, CAL FIRE WPP staff find that Dr. O'Connor's hydrologic and hydraulic modeling results are acceptable for flood prone area delineation for the Little THP. Additionally, hydrologic and hydraulic modeling is required for the development of flood insurance rate maps (FIRMs) by the Federal Emergency Management Agency (FEMA), and is a federally recognized regulatory standard for predicting flood inundation. Hence, results from hydrologic and hydraulic modeling are much more accurate and defensible than results obtained using the 2X bankfull stage methodology.

It is our opinion that the plan proponent, Gualala Redwood Timber, Inc., has utilized the key components suggested by the Riparian Protection Committee's final report to determine the flood prone area for the Little THP. We find that the flood prone area delineations flagged on the ground and mapped as part of the Little THP follow the requirements of the California Forest Practice Rules for the following reasons:

(1) The Little North Fork Gualala River channel is laterally stable and generally lacking a channel migration zone, except for the 1000-foot stretch denoted as CDFW No. 4 in the O'Connor Environmental, Inc. channel migration zone report (OCE 2019a) [see Channel Migration Zone discussion above].

(2) The factors listed in the Forest Practice Rule flood prone area definition for determining the outer boundary are to be considered in totality; the BOF did not assign greater weight to any one factor over another.

(3) We observed in the field that there were:

   a. No silt lines on the coast redwood trees beyond at the currently flagged edge of the Inner Zone B in the lower Little THP unit, even though Dr. O'Connor (OCE 2019b) documented that approximately a 20-year recurrence interval flood flow event occurred in February 2019 in the Little North Fork of the Gualala River watershed.

   b. No fresh fine sediment or silt deposits on the floodplain beyond the designated Inner Zone B boundary in the lower unit.

   c. No evidence of floatable debris (flotsam) caught in brush or trees beyond the designated Inner Zone B boundary in the lower unit.

1/10/2021

366,163

d. No disturbance tree species in the overstory canopy (expect for the designed 1000-foot reach at CDFW Site No. 4).

e. No evidence that the elevation of the surface lies near the elevation of the highest channel features (e.g., log jams and gravel bar surfaces) (except for the designated 1000-foot reach at CDFW Site No. 4).

(4) Given that the vast majority of the Little North Fork can be considered a laterally stable watercourses lacking a Channel Migration Zone, as supported by the analysis in Section III of this report, and the outer boundary of the flood prone area cannot be <u>clearly determined</u> using the field indicators listed in the definition, as per the Forest Practice Rules, it is appropriate to determine the outer boundary of the flood prone area based on the area inundated by a 20-year recurrence interval flood flow event.

(5) The procedures described in the Riparian Protection Committee's final report have been followed and well documented in the three O'Connor Environmental, Inc. reports (OCE 2019a,b,c) written and submitted as part of this THP, as well as verbiage included in the plan by the RPF. The level of modeling and analysis completed is well beyond what is expected for a standard THP and meets the expectations for determining flood prone area delineation.

(6) The protection measures provided for the delineated flood prone area and larger floodplain area (with less frequent inundation recurrence intervals) were found to be appropriate and meeting the Anadromous Salmonid Protection rule requirements. In particular, these measures include (1) pre-flagging all skid trails in the units, (2) requiring ground skidding equipment to remain on designated skid trails, and (3) requiring all side channels to remain open and free to flow water. The plan proponent has flagged skid trails to utilize existing skid trails to the maximum extent possible. In flood prone areas, crawler tractors will be required to drive with their blade elevated except as needed to move debris, resulting in no new excavation except at watercourse crossings or to improve conditions at existing site-specific problem areas.

V. Brief Anadromous Fisheries Impact Assessment for the Little North Fork of the Gualala River

The plan area is located approximately seven miles upstream from where the mouth of Gualala River meets the Pacific Ocean. At the mouth of the Gualala River is a sandbar that is a seasonal barrier to upstream fish migration. During the focused PHI, the Gualala River Timber staff stated that coho have not been present in the river for the last seven years, largely driven by storm conditions not producing runoff events large enough to breach the sandbar in time, or at all, for coho migration.

1/10/2021

366.164

PART OF PLAN

The history of coho salmon population and abundance is not well documented in Gualala River. Visual encounter monitoring in the mid-1960s estimated populations of about 4,000 annually, however the data are not considered reliable by CDFW (LeDoux-Bloom, 2002). Stocking efforts to reestablish coho populations took place from 1969 to 1999, with approximately 350,000 coho planted over the three decades, including 45,000 from 1995-1997 in the Little North Fork of the Gualala River. By the early 2000s the Coho Salmon Status Review found there were no remaining viable populations of coho in the watershed (CDFG, 2002).[3] There is speculation that the robust population estimates earlier were due to fish stocking efforts (Higgins, 1997). Church (2012), citing information from NOAA and CDFW, states that only three planning watersheds in the Gualala River watershed still have habitat for California Central Coast (CCC) ESU coho—Doty and Robinson creeks in the North Fork, and Pepperwood Creek in the South Fork.

Similar to coho, winter-run steelhead populations were visually estimated in the mid-1960s to be about 16,000, although again the data are unreliable. Stocking with hatchery-raised steelhead was done to bolster populations, and steelhead continue to persist within the watershed (LeDoux-Bloom, 2002; Church, 2012).

Juvenile coho salmon spend up to a year instream before outmigrating to the ocean. They predominantly occupy pool habitat while steelhead of similar size will dominate riffle and run habitat (Moyle, 2002). Off-channel, cold-water refugia is important for juvenile coho rearing to avoid being swept downstream by high flows and chronic turbidity (CDFG, 2004). Off-channel refugia, particularly those areas that allow for over-wintering, are found adjacent to the main Little North Fork of the Gualala River channel, and contain large woody debris for cover. Small tributaries are the primary refugia for steelhead for over-wintering and this species may temporarily use off-channel habitat during periods of flooding (Bramblett et al., 2002).

Protection measures incorporated in the THP, including skid trail pre-flagging, requirements for all ground skidding equipment to remain on designated skid trails, and requirements for side channels to remain open and free to flow water, are anticipated to be protective for the listed salmonids found in the Little North Fork of the Gualala River watershed.

VI. Recommendation

For Reach 2-B identified in Figure 6, the RPF is to further evaluate the site for the presence of a secondary channel, and apply Class I watercourse protection standards if appropriate.

---

[3] Coho young-of-the-year were observed in tributaries of the North Fork subbasin in 2002, including the Little North Fork of the Gualala River (CDFG, 2002; Church, 2012). Juvenile coho were found in North Fork tributaries in 2003 and 2004 (CDFG, 2004; TCF, 2014).

1/10/2021

366,165

VII. Conclusions

With the possible exception of Reach 2-B (see recommendation above), the plan proponent has correctly followed the Forest Practice Rules in delineating the channel migration zone and flood prone areas for the Little THP, as well as providing the appropriate protection measures for the (1) channel migration zone and sensitive areas on the broader floodplain area, and (2) current and restorable anadromous salmonid fisheries resources.

References

Beechie, T.J., M. Liermann, M.M. Pollock, S. Baker, and J. Davies. 2006. Channel pattern and river-floodplain dynamics in forested mountain river systems. Geomorphology. 78: 124-141. https://www.researchgate.net/publication/251529648_Channel_Pattern_and_River_Floodplain_Dynamics_in_Forested_Mountain_River_Systems

Benda, L. 2004. Responses provided to Campbell Timberland Management for THP 1-04-049 MEN, 2LOG2 THP. Response submitted to the California Department of Forestry and Fire Protection for THP 1-04049 MEN dated May 12, 2004. Campbell Timberland Management, Fort Bragg, CA. 20 p.

Bramblett, R.G.; Bryant, M.D.; Wright, B.E.; White, R.G. 2002. Seasonal use of small tributary and main-stem habitats by juvenile steelhead, coho salmon, and Dolly Varden in a southeastern Alaska drainage basin. Transactions of the American Fisheries Society. 131: 498-506.

Cafferata, P.H. 2004. Hydrologic review for THP 1-04-032 MEN. Memorandum to Mr. Jim Wright, dated May 15, 2004. California Department of Forestry and Fire Protection, Santa Rosa, CA. 13 p.

Cafferata, P., M. Berbach, J. Burke, J. Hendrix, R. Klamt, R. Macedo, T. Spittler, K. Vyverberg, and C. Wright-Shacklett. 2005. Flood prone area considerations in the coast redwood zone. Final Report of the Riparian Protection Committee. California Department of Forestry and Fire Protection. Sacramento, CA. 67 p. https://www.researchgate.net/publication/272170568_Flood_Prone_Area_Considerations_in_the_Coast_Redwood_Zone

California Department of Fish and Game (CDFG). 2002. Status review of California coho salmon north of San Francisco. Report to the California Fish and Game Commission. Candidate Species Status Review Report 2002-3. Sacramento, CA. 231 p. plus appendices. file:///C:/Users/pcaffera/Downloads/SAL_Coho_StatusNorth_2002.pdf

California Department of Fish and Game (CDFG). 2004. Recovery strategy for California coho salmon. Report to the California Fish and Game Commission.

11/10/2021

366,166

Sacramento, CA. 594 p.
https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=99401&inline

CAL FIRE and CDFW. 2014. Anadromous salmonid protection rules: revised interpretive questions and answers for RPFs and landowners. California Department of Forestry and Fire Protection and California Department of Fish and Wildlife. Sacramento, CA. 54 p. https://www.fire.ca.gov/media/8277/asp-qa-doc-with-revised-language-06_16_14-final-revision.pdf

Church, T.S. 2012. Understanding wood-pool dynamics using long-term monitoring data from the Gualala River Watershed: What can we learn? UC Berkeley: Water Resources Collections and Archives. 76 p. https://escholarship.org/uc/item/4r6894pk

Higgins, P.T. 1997. Gualala River watershed literature search and assimilation. Funded by the Coastal Conservancy under contract to Redwood Coast Land Conservancy. Gualala, CA. 57 p.
http://www.krisweb.com/biblio/gualala_rclc_higgins_1997_litsearch.pdf

LeDoux-Bloom, C. M. 2002. Assessment of anadromous salmonids and stream habitat conditions of the Gualala River basin, Mendocino County, California. California Department of Fish and Game, North Coast Watershed Assessment Program. Sacramento, CA. 59 p. plus Attachments.
Moyle, P.B. 2002. Inland fishes of California: revised and expanded. Berkeley, California: University of California Press.

OCE (O'Connor Environmental, Inc.). 2019a. Channel migration zone evaluation for the Little timber harvest plan, Little North Fork Gualala River, Mendocino County. Final Report prepared for Gualala Redwood Timber, LLC. Healdsburg, CA. 19 p.

OCE (O'Connor Environmental, Inc.). 2019a. Floodplain study for the Little North Fork Gualala River. Final Report prepared for Gualala Redwood Timber, LLC. Healdsburg, CA. 15 p. plus appendices.

OCE (O'Connor Environmental, Inc.). 2019b. Floodplain inundation duration study for the Little North Fork Gualala River. Final Report prepared for Gualala Redwood Timber, LLC. Healdsburg, CA. 12 p.

Olson, P.L., N.T. Legg, T.B. Abbe, M.A. Reinhart, and J.K. Radloff. 2014. A methodology for delineating planning-level channel migration zones. Washington State Department of Ecology Publication #14-06-025. Olympia, WA. 83 p.
https://fortress.wa.gov/ecy/publications/documents/1406025.pdf

Rapp, C.F. and T.B. Abbe. 2003. A framework for delineating channel migration zones. Washington State Departments of Ecology and Transportation Publication #03-06-027. Olympia, WA. 135 p. https://fortress.wa.gov/ecy/publications/documents/0306027.pdf

1/10/2021

366,167

Rosgen, D. 1996. Applied river morphology. Wildland Hydrology. Pagosa Springs, CO.

Spittler, T.E. 2004a. Engineering geologic review of THP 1-04-032 MEN. Memorandum to Mr. William Snyder, dated September 17, 2004. California Department of Conservation, California Geological Survey, Santa Rosa, CA. 11 p.

Spittler, T.E. 2004b. THP 1-04-032 MEN Information Needed to Review Activities on Floodplains. Memorandum to Mr. Jim Wright, dated June 15, 2004. California Department of Conservation, California Geological Survey, Santa Rosa, CA. 6 p.

Tarboton, D. 2003. Terrain analysis using digital elevation models in hydrology. Paper presented at the 23rd ESRI International Users Conference, July 7-11, 2003, San Diego, CA. 14 p. http://hydrology.usu.edu/dtarb/ESRI_paper_6_03.pdf

TCF (The Conservation Fund). 2014. Gualala River forest – integrated resource management plan. Caspar, California. 35 p. plus Appendices. https://www.conservationfund.org/images/projects/files/FINAL-Gualala-IRMP-sm.pdf

Ward, A.D. and S.W. Trimble, 2004. Environmental Hydrology. Boca Raton, FL: Lewis Publishers.

WFPB (Washington Forest Practices Board). 2004. Section 2. Standard methods for identifying bankfull channel features and channel migration zones. Forest Practices Board Manual. Washington Department of Natural Resources. Olympia, WA. 69 p. http://www.dnr.wa.gov/Publications/fp_board_manual_section02.pdf

Ziemer, R.R. and J. Lewis. 1984. The decline and recovery of root biomass in redwood and mixed conifer forests of northwestern California. Unpublished draft paper. USDA Forest Service, Pacific Southwest Research Station, Arcata, CA.

1/10/2021

366.168

Appendix A: Terrain Analysis for the Little North Fork of the Gualala River Channel and Floodplain[4]

A stream network was derived within the watershed using a 1-m LiDAR DEM of Mendocino County, flown in 2017, and created using the ArcPro toolbox "Terrain Analysis Using Digital Elevation Models" or TauDEM version 5.3.7 (Tarboton, 2003). A threshold of 10,000 m^2 was used to initiate watercourse centerlines, and the main channel centerline was extracted within the valley confines for this analysis. The TauDEM toolbox includes attributes for each segment, including the slope in percent, the stream segment length, and the straight stream segment length or point-to-point distance.

A relative elevation model (REM) was created as described in the Washington State Department of Natural Resources publication "A Methodology for Delineating Planning-Level Channel Migration Zones" (Olson et al., 2014), using the Inverse Distance Weighting (IDW) method developed by Dr. Jerry Franklin, Univ. of Washington, and Patricia Olson with the Washington State Department of Ecology. This analysis used points every 10-m (32.8 feet) along the main channel centerline, and elevations were extracted to each point from the 1-m LiDAR DEM. The elevation points were used in the IDW method to create a raster (using a 200 search radius for each point and the weighting), from which the 1-m DEM elevation data were subtracted, in order to create a DEM with elevations relativized to the stream centerline, to aid in identifying channel banks within the valley confines. The process was confined to only within the valley floor, and was not continued significantly upstream into any tributary junctions.

From the relative elevation model, an initial threshold of 1-m above the watercourse centerline was used to identify the bankfull channel width. This output was further refined using the 1-m hillshade, curvature profiles created in ArcPro, and slope breaks created in ArcPro. Within a large upper portion of the watershed, significant manual editing was done to identify the bankfull channels due to the DEM resolution and subtle topography present in that location.

The watercourse centerline was smoothed in ArcPro using the "Polynomial Approximation with Exponential Kernel" approach and a 30-m threshold. This was done in order to fit perpendicular transect lines every 5-m to the centerline, and subsequently the channel itself. The transects were then intersected with the bankfull channel layer to determine channel widths. Where there were islands in the bankfull channel layer, they were removed from the layer to assess the entire channel width in the GIS, uninterrupted. Additionally, data on the watercourse centerline segment slopes and lengths (both straight line and the channel length) were extracted to determine slope metrics and sinuosity.

---

[4] This analysis was conducted by Will Olsen, CAL FIRE WPP Environmental Scientist - Forest Practice Monitoring Specialist.

1/10/2021

366.169

This analysis also was done on a reach by reach basis: Reach 1 initiated from the Little North Fork of the Gualala River outlet to the next significant incoming tributary; Reach 2 between two significant tributaries; Reach 3 from a large tributary to Log Cabin Creek; Reach 4 from Log Cabin Creek to Doty Creek; and Reach 5 from Doty Creek upward to the end of the plan area under consideration.

Results

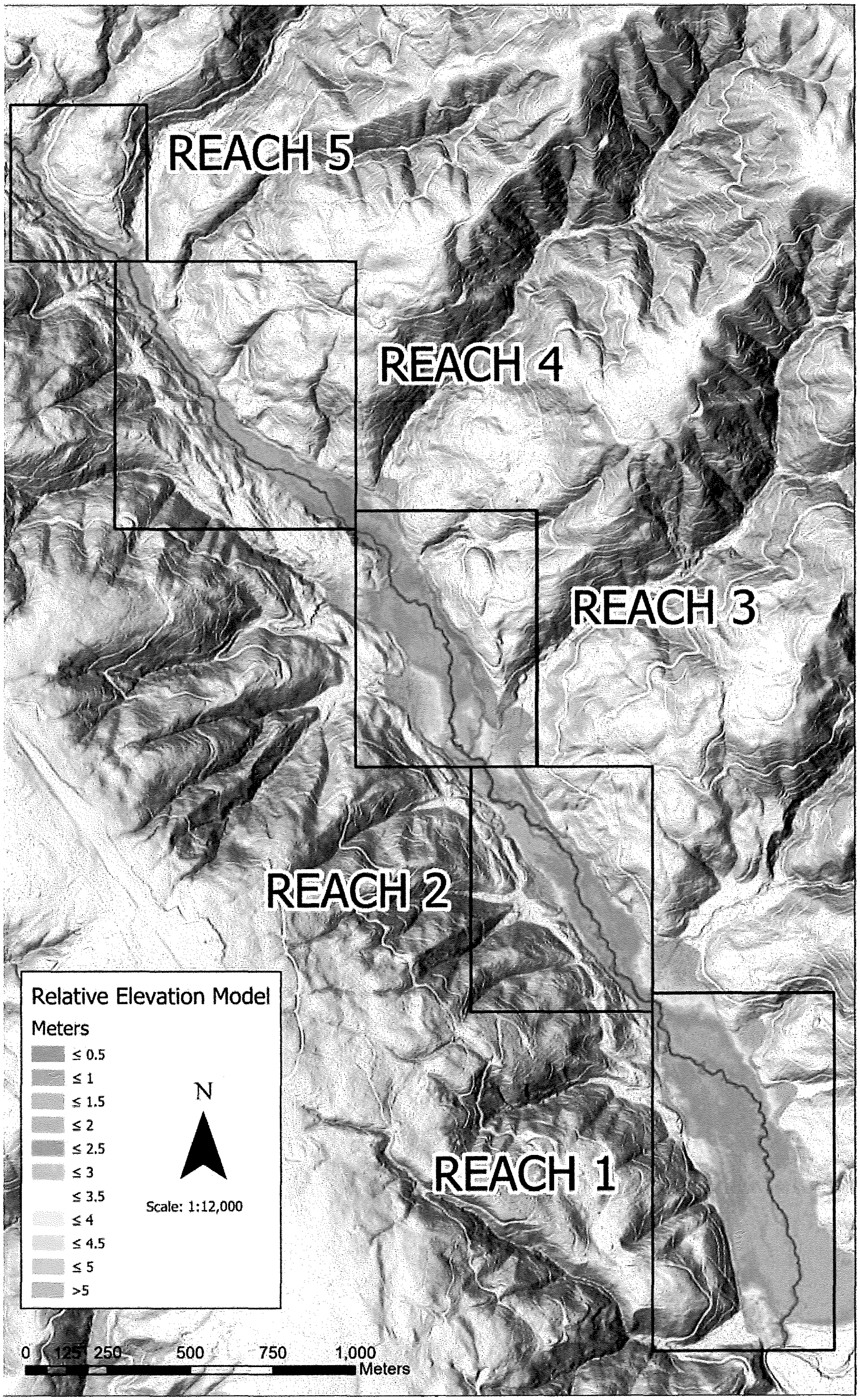
Full Watercourse	Mean BFW	Median BFW	Transects ≥ 15-m	Mean Slope	Median Slope	Sinuosity
	13.5 m	12.2 m	256/986	1.2%	1.1%	1.24
By Reach						
Reach 1	15.7	13.5	97/250	1.2%	-	1.27
Reach 2	15.6	12.8	70/194	0.7%	-	1.23
Reach 3	11.6	11.2	31/191	1.1%	-	1.28
Reach 4	12.5	12.1	40/227	1.2%	-	1.20
Reach 5	10.8	9.6	18/124	2.6%	-	1.18

The results indicate that the full watercourse mean bankfull channel width falls below the 15-m threshold found by Beechie et al. (2006) for a migrating river channel. By reach, the mean widths for Reach 1 and Reach 2 break the 15-m threshold by 0.7 and 0.6-m, respectively, for a migrating river channel. All median bankfull channel widths by reach fail to exceed the migrating threshold. There are individual transects that exceed 15-m in length, more predominantly in the lower portion of the watershed.

The entire watercourse has a mean slope of 1.2%, while the individual reaches range from 0.7% to 2.6% at the upper end of the watershed. The sinuosity for the entire watercourse channel is 1.24, which identifies the watercourse as either a sinuous but not meandering river (Ward and Trimble, 2004), or a single thread channel (Beechie et al., 2006). The individual reaches also all fall into the same sinuous-but-not-meandering or single-thread-channel classification.

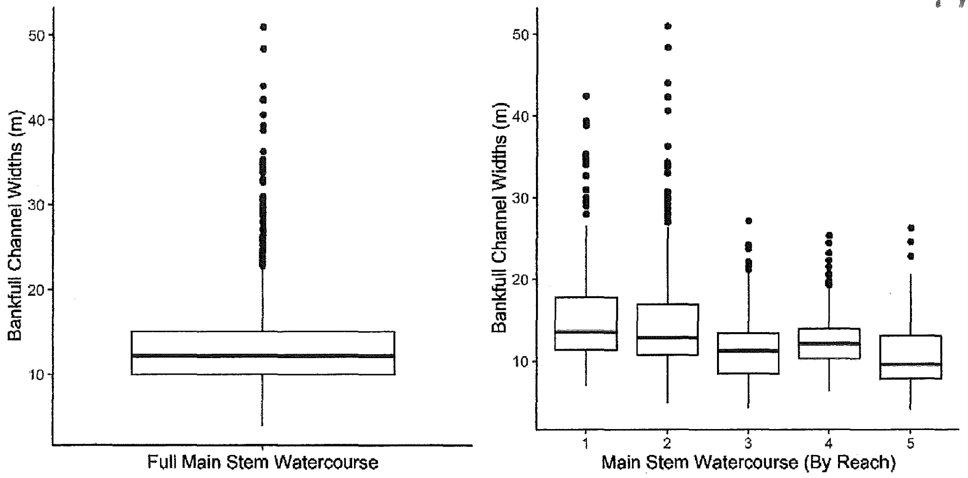
1/10/2021

366.170

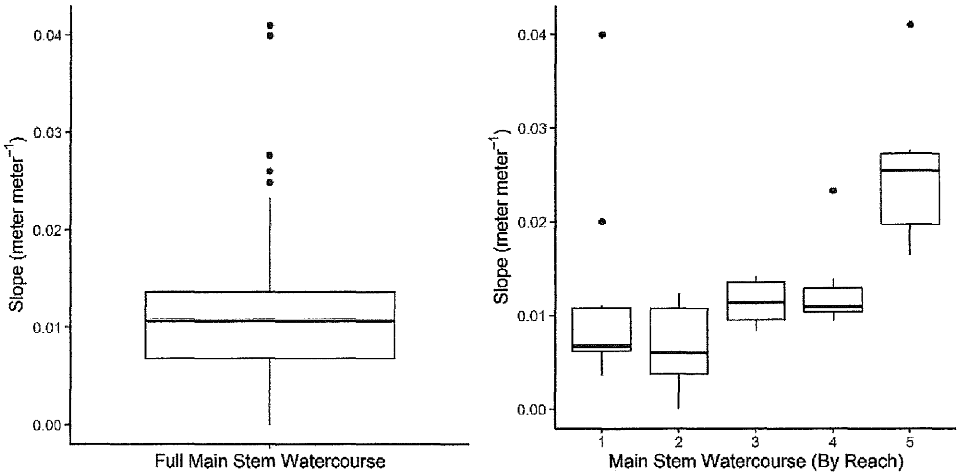


1/10/2021

366,171



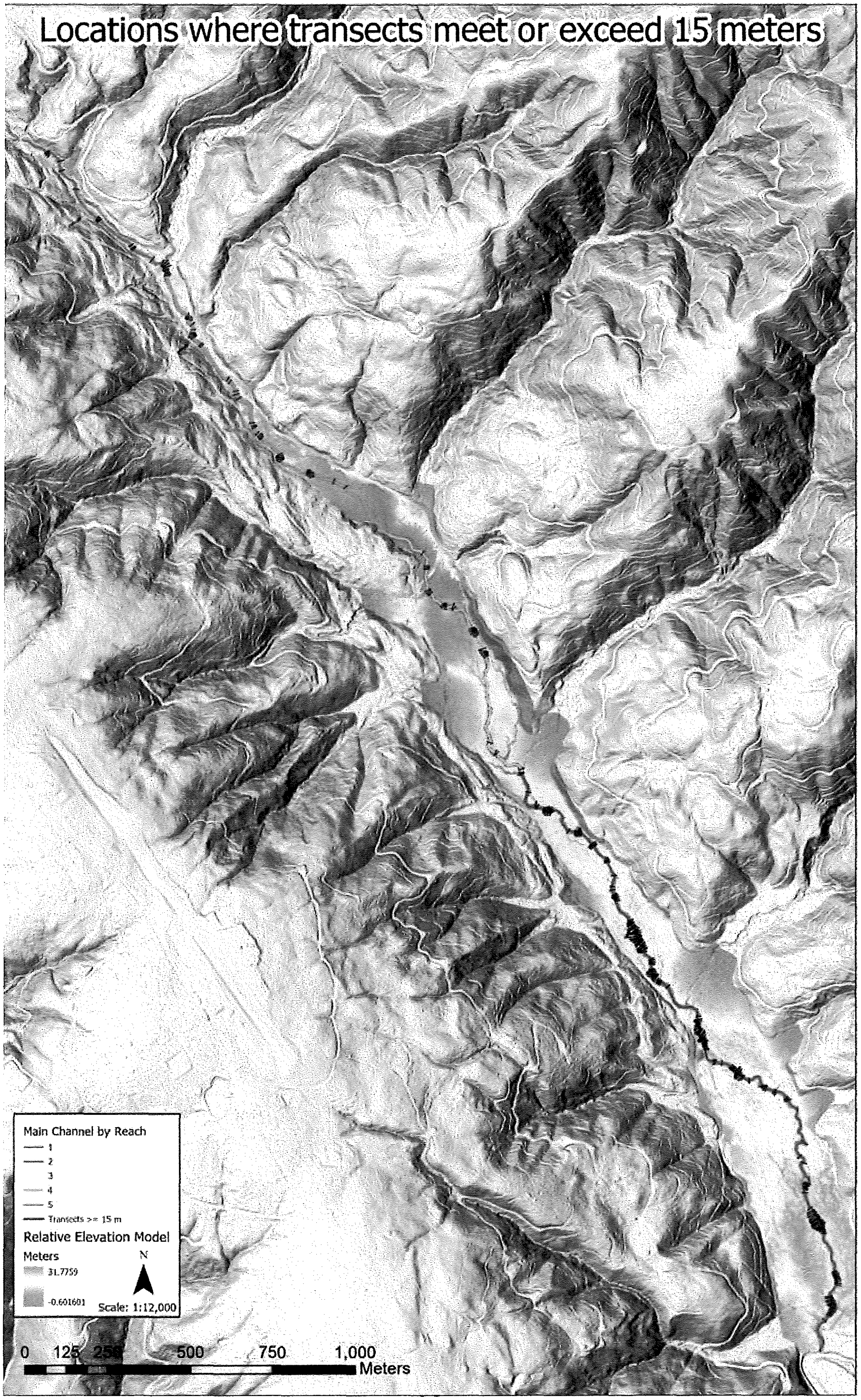
Boxplots of the channel transect lengths by the entire watercourse and by reach.



Boxplots of the segment channel slopes for the entire watercourse and by reach.

1/10/2021

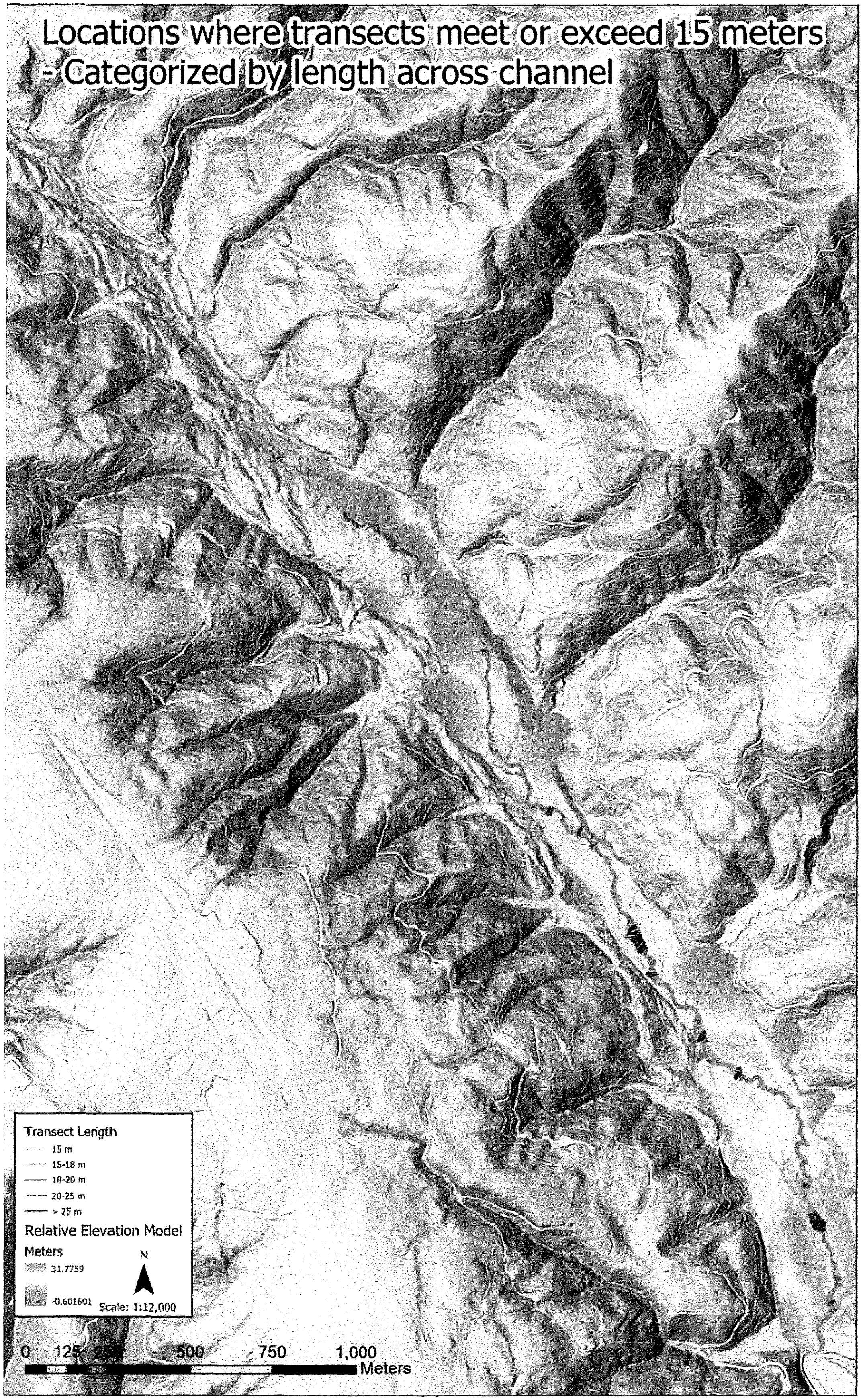
366.172



Locations where transects meet or exceed 15 meters

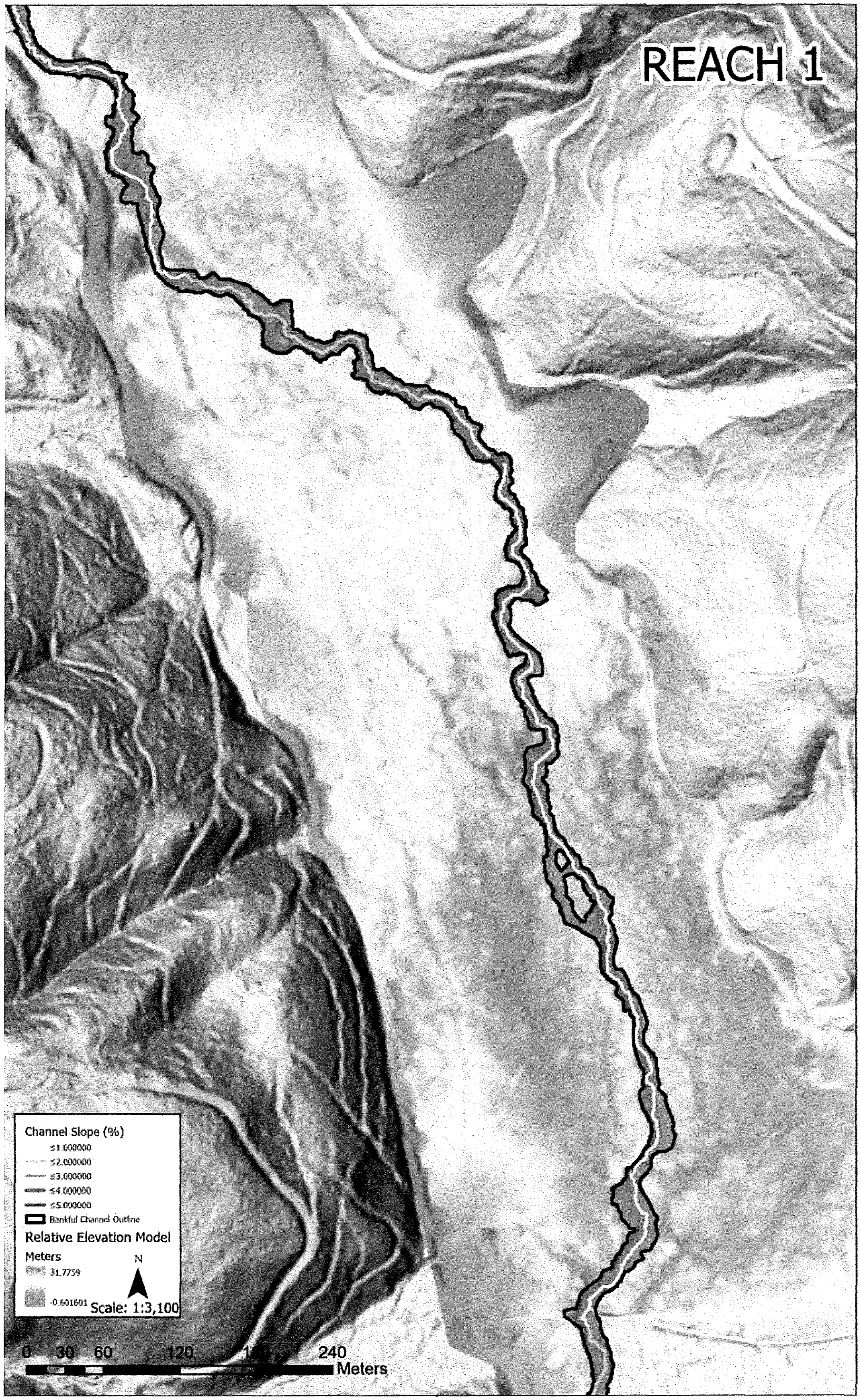
1/10/2021

366,173



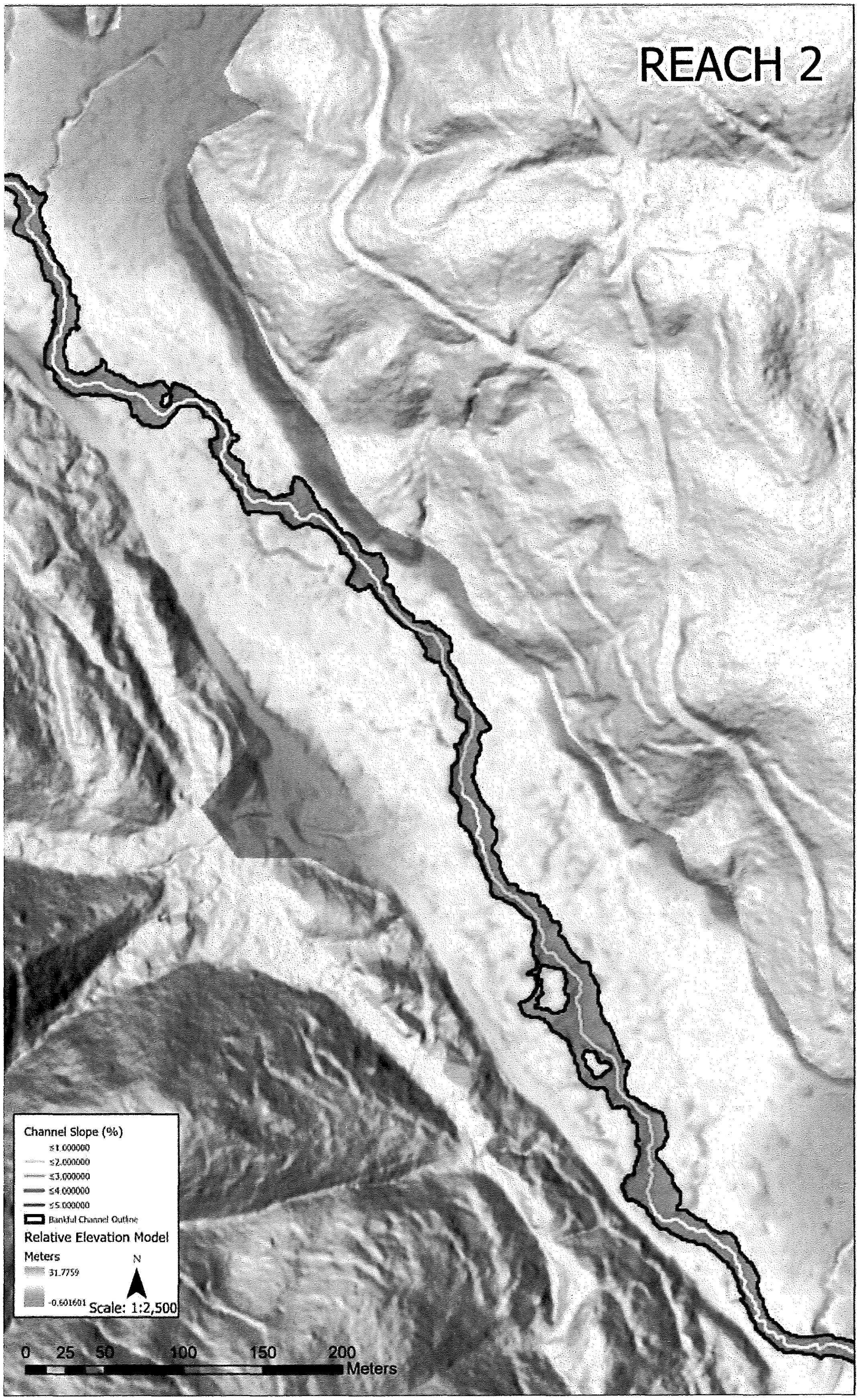
1/10/2021

366.174



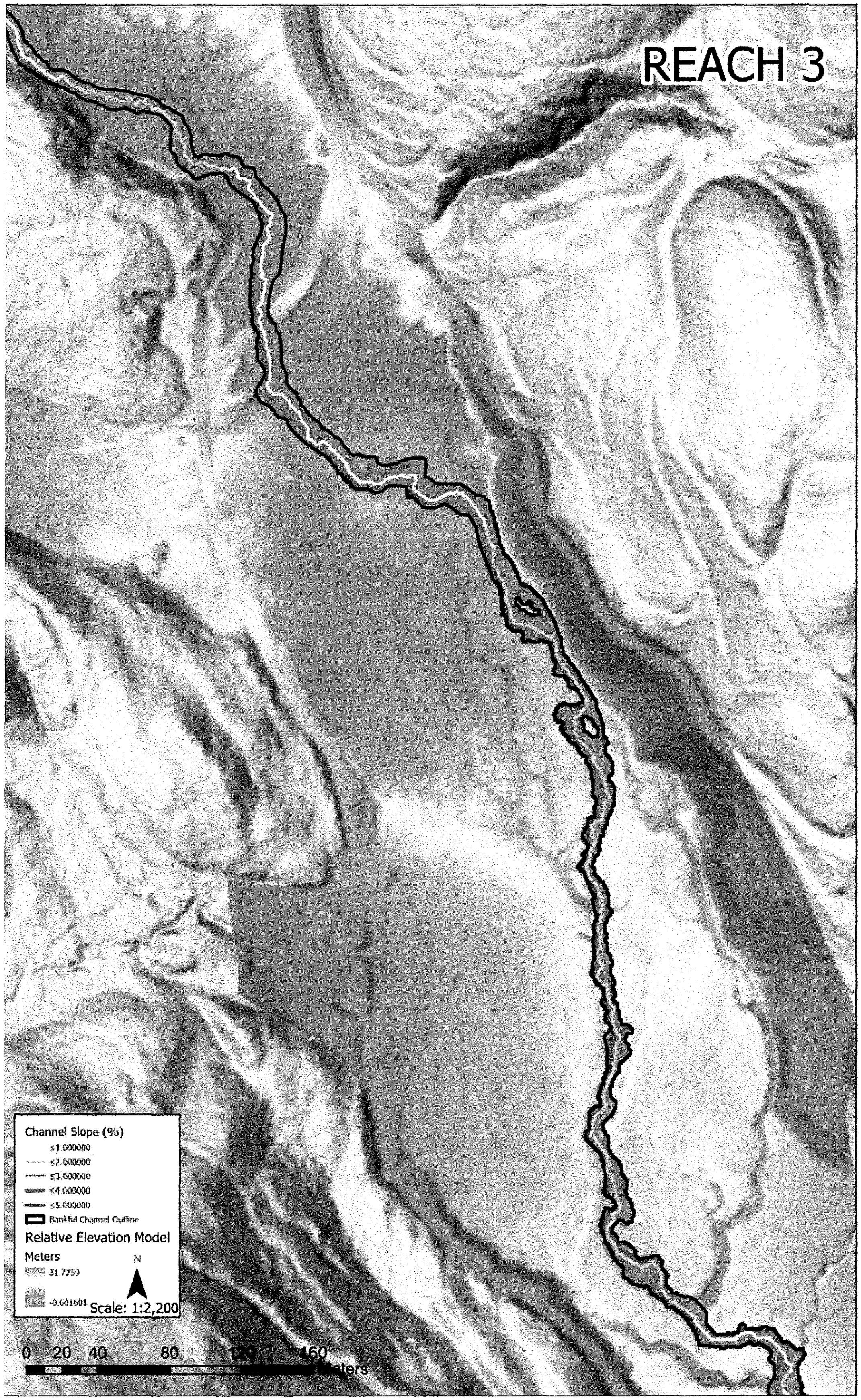
1/10/2021

366,175



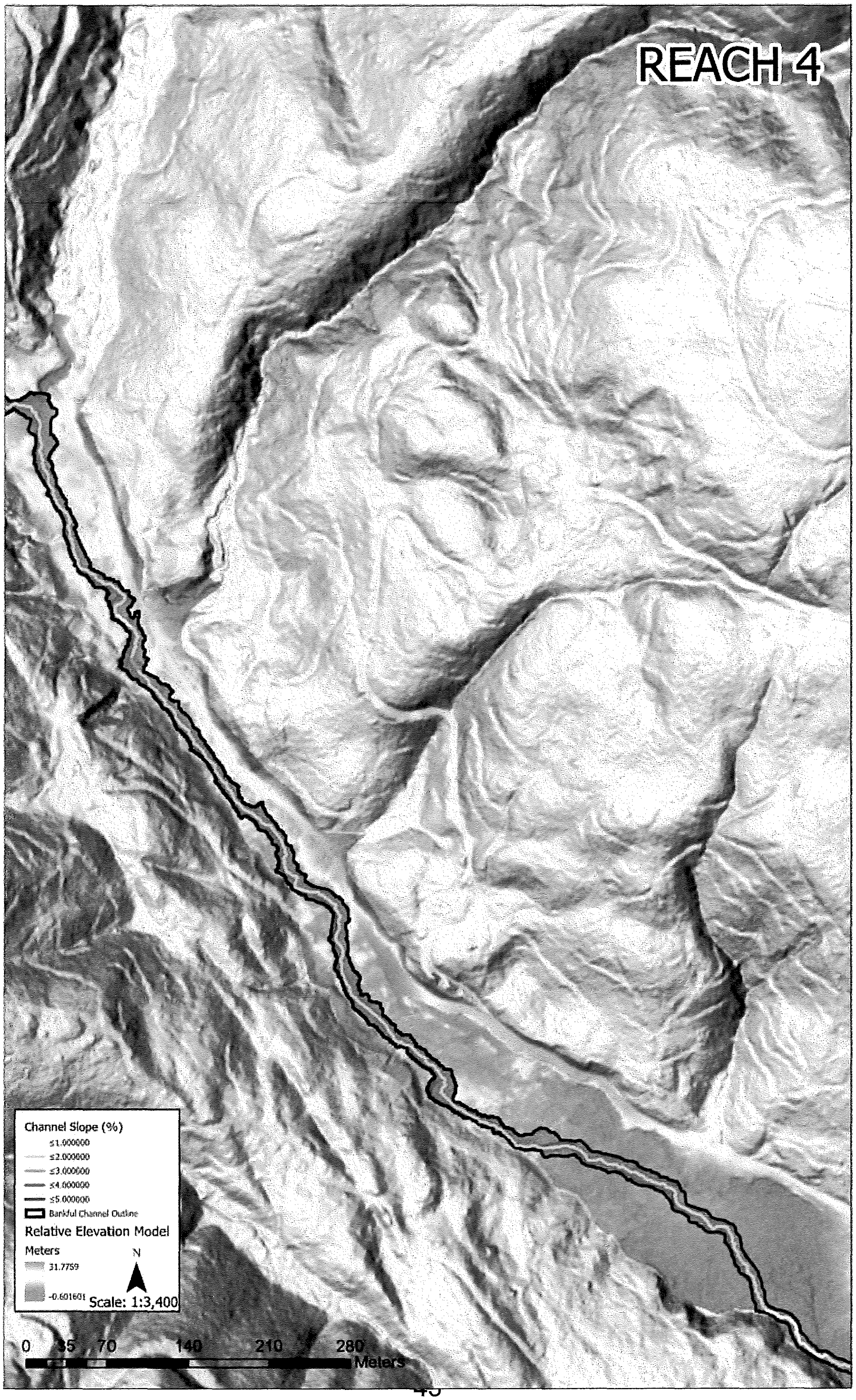
1/10/2021

366,176



1/10/2021

366,177



1/10/2021

366,178

1/10/2021

366,179

From: Cafferata, Pete@CALFIRE
Sent: Wednesday, November 6, 2019 9:31 AM
To: Longcrier, Jeff@CALFIRE; Sciocchetti, Lou@CALFIRE; Santa Rosa Review Team@CALFIRE; Schwab, Dominik@CALFIRE; Margiott, Ken@CALFIRE
Cc: Eng, Helge@CALFIRE; Hall, Dennis@CALFIRE; Huff, Eric@CALFIRE; Coe, Drew@CALFIRE; Stanish, Anastasia@CALFIRE; Olsen, Will@CALFIRE
Subject: Little THP PHI Report
Attachments: Little THP_WPP PHI Report_(Final 11-6-19).pdf

Please see the attached final CAL FIRE Watershed Protection Program Little THP PHI report.
Thank you.
Pete

Pete Cafferata
Watershed Protection Program Manager, Forester III
California Department of Forestry and Fire Protection
PO Box 944246
Sacramento, CA 94244
Office: (916) 653-9455
Cell: (916) 616-3317
Fax: (916) 653-8957

PART OF PLAN

RECEIVED
NOV 06 2019
COAST AREA
RESOURCE MANAGEMENT

RECEIVED
MAR 16 2021
COAST AREA
RESOURCE MANAGEMENT

1/10/2021

366,180

Environmental Study

Memorandum

To: Gualala Redwoods Inc
Attn: Art Haschak
From: Christy Wagner, Botanist
Date: May 10, 2019
Attachments: (2)
CC: Charll Stoneman

PART OF PLAN

Subject: This memo summarizes the data collected from two sample plots within the Little Timber Harvest Plan (THP). The purpose of this study was not to delineate the extent of wetlands throughout the THP but to demonstrate the variability of hydrophytic vegetation across the floodplain.

Field Methods

Evaluation of the two completed data sheets were based on the methods described in the 1987 *U.S. Army Corps of Engineers Wetlands Delineation Manual* (1987 Manual) (Environmental Laboratory 1987); the supplemental procedures and wetland indicators provided in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region, Version 2.0* (WMVC) (U.S. Army Corps of Engineers 2010); and the *National Wetland Plant List 2016 Wetland Ratings* (Lichvar et al. 2016). The Wetland Determination Data Forms for both samples are attached.

Vegetation

All plant species encountered within the designated plot areas were recorded. The wetland indicator status assigned to a plant species designates the probability of that species occurring in

1/10/2021

366, 181

a wetland. A species with an indicator of obligate wetland (OBL), facultative wetland (FACW), or facultative (FAC) is considered to be typically adapted for life in a wetland (i.e., hydrophytic vegetation). A species indicator of facultative upland (FACU) and obligate upland (UPL) indicates an upland species that is typically not found in wetland soils.

The dominant vegetation at both sampling points was noted and evaluated for prevalence of hydrophytes. Indicator status follows Lichvar et al. (2016). Scientific names follow Lichvar et al. (2016) and online updates (online updates (U.S. Army Corps of Engineers 2017), and *The Jepson Manual, second edition* (Baldwin et al. 2012).

Hydrology

Wetland hydrology is a term which encompasses hydrologic characteristics of areas that are periodically inundated or saturated near the surface. The wetland hydrology standard is considered met when soils are saturated within 12 inches of the surface in most years (>50%) for more than 12.5% of the growing season. In northern California, 12.5% of the growing season is typically 14 consecutive days during a year of normal or below-normal rainfall. Observation of inundation or saturation within 12 inches of the surface for 5–12.5% of the growing season may be considered a wetland depending upon the presence of hydrophytic vegetation and hydric soils. Areas with standing water or water saturation to the surface for less than 5% of the growing season will not meet the definition of a wetland.

Evidence of wetland hydrology includes primary indicators such as visible surface water, saturation, surface sediment deposits, and drift lines. Less reliable secondary indicators include dry season water table or drainage patterns. The presence of any primary or secondary wetland hydrologic indicators was noted at each sampling point.

Soils

Soils formed over long periods of time under anaerobic conditions sometimes possess characteristics that meet the definition of hydric soils. Most hydric soils exhibit characteristics such as redoximorphic (redox) concentrations or depletions that result from repeated periods of saturation or inundation that last more than a few days. Prolonged periods of wetness promote anaerobic conditions and redox features created by the reduction, translocation, or accumulation of iron, manganese, and other reducible elements. These processes result in

1/10/2021

366.182

distinctive characteristics that persist in the soil during both wet and dry periods, making them particularly useful for identifying hydric soils in the field.

At each sampling point, a soil pit was dug to a minimum depth of 20 inches. In each soil pit, the distinct soil layer depths were noted and their matrix and secondary soil colors were compared to the Munsell Soil Color Chart for color appearance (hue), intensity (value), and shade (chroma). Redox features were recorded and quantified and soil texture was noted.

Sample Points

In April 2019, Christy Wagner and Art Haschak sampled two adjacent plots of the floodplain that were representative of the diversity in plant communities throughout the floodplain within the Little THP. Both sample points included fringed corn lily (*Veratrum fimbriatum*) which is an obligate wetland species. These sample points were deliberately chosen to demonstrate similar plant species growing in different soils and under different hydrologic conditions.

Sampling point U1-001 provides data for a three-parameter wetland. Vegetation was dominated by facultative rated plants. The dominant species include red alder (*Alnus rubra*) (FAC), poison oak (*Toxicodendron diversilobum*) (FAC), western azalea (*Rhododendron occidentale*) (FAC), western lady fern (*Athyrium filix-femina var. cyclosorum*) (FAC), Bolander's sedge (*Carex bolanderi*) (FAC), and fringed corn lily (*Veratrum fimbriatum*) (OBL). Soils were classified as hydric by having a depleted matrix color of 10YR 4/1 and redox concentrations of 60 – 65% from 3 to 20 inches. Wetland hydrology was confirmed by saturated soil and a high water table. It is worth noting that the plant community in this plot was very diverse and had indicator status ratings from OBL to UPL.

Sampling point U1-002 does not provide data for hydrophytic vegetation, hydric soils, or wetland hydrology according to the methodologies outlined in the 87 Manual or the WMVC Regional Supplement. Vegetation was dominated by coast redwood (*Sequoia sempervirens*) (UPL), poison oak (FAC), fringed corn lily (OBL), and redwood sorrel (*Oxalis oregana*) (UPL). Although the fringed corn lily is an obligate species, it only comprised 5% cover of the sample area and was associated primarily with upland and facultative upland species. Indicators for wetland soil and hydrology must be present with within the upper 12 inches. Redox features and the water table did not appear until 20 inches below the surface. After 45 minutes, additional redox features did

1/10/2021

366,183

not appear in the soil profile and the pooling water in the soil pit did not increase but remained at the 20 inch mark.

Summary

The area sampled and described by the two data forms is an example of the floodplain throughout the Little THP. Due to the high water table and mottled depressions across the floodplain, there are pockets of wet areas that exhibit wetland soils and hydrology to support a dense community of wetland plants. Wetland rated plants are also scattered throughout the flood plain in thinner patches where wetland soils and hydrology are not present in the upper 12 inches of the soil profile. The most notable obligate present is the fringed corn lily. Other common wetland species found in variable conditions include common bog rush (*Juncus effusus*) (FACW), giant horse tail (Equisetum *telmateia*) (FACW), tall flat sedge (*Cyperus eragrostis*) (FACW), red alder, poison oak, western azalea, and stinging nettle (*Urtica dioica*) (FAC).

The data suggests in the drier areas, the water table is 20 inches below the soil surface. Plants growing in habitats with fluctuating conditions, i.e. floodplains, are highly adaptive. Their roots are able to follow a receding water table allowing them to persist once site conditions, including soil and hydrology, have change. This is one explanation for finding fringed corn lily and other wetland obligates throughout the floodplain in areas without wetland soils or hydrology.

Memo Author:

Christina Wagner received a B.S. in Environmental Protection from West Virginia University in 2006 and moved to California in fall of 2006 to begin her career. Since 2007, she has worked for the Trinity County Resource Conservation District, the US Forest Service, Natural Resource Management, and the California Department of Transportation performing botanical surveys, wetland delineations, native habitat restoration, and native plant program management in Trinity, Humboldt, and Mendocino counties. Ms. Wagner prepares, implements, and monitors Restoration Plans for projects requiring compliance with the California Environmental Quality Act (CEQA) and National Environmental Protection Act (NEPA) through meeting permit requirements for agencies including Water Quality Control Board, US Army Corps of Engineers, the California Coastal Commission, and the California Department of Fish and Wildlife.

1/10/2021

366.184

PART OF PLAN

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Unit 1 City/County: Mendocino Co. Sampling Date: 4/13/19

Applicant/Owner: Gualala Redwoods State: CA Sampling Point: U1-001

Investigator(s): Christy Wagner, Art Harchak Section, Township, Range: T11N R15W Sec

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): Concave Slope (%): 0%

Subregion (LRR): A Northwest Forests + Coast Lat: ______ Long: ______ Datum: MDBM

Soil Map Unit Name: ______ NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ______

Hydric Soil Present? Yes ______ No ______

Wetland Hydrology Present? Yes ______ No ______

Is the Sampled Area within a Wetland? Yes X No ______

Remarks:

VEGETATION – Use scientific names of plants.

50/20

33/13

17/7

48/19

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30')			
1. Alnus rubra	25	Y	FAC
2. Sequoia sempervirens	35	Y	UPL
3. Umbellularia californica	5	N	FAC
4.			
	65 = Total Cover		
Sapling/Shrub Stratum (Plot size: 30')			
1. Toxicodendron diversilobum	15	Y	FAC
2. Rubus spectabilis	5	N	FAC
3. Rubus parviflorus	2	N	FACU
4. Rhododendron occidentale	12	Y	FAC
5.			
	34 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Juncus effusus	3	N	FACW
2. Asarum caudatum	1	N	FACU
3. Equisetum telmateia	6	N	FACW
4. Athyrium filix-femina var. cyclosorum	25	Y	FAC
5. Veratrum fimbriatum	25	Y	Obl
6. Carex bolanderi	20	Y	FAC
7. Cyperus eragrostis	2	N	FACW
8. Galium triflorum	3	N	FACU
9. Polystichum munitum	10	N	FACU
10. Urtica dioica	1	N	FAC
11.			
	96 = Total Cover		
Woody Vine Stratum (Plot size: /)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 86% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	25	x 1 = 25
FACW species	11	x 2 = 22
FAC species	108	x 3 = 324
FACU species	16	x 4 = 64
UPL species	35	x 5 = 175
Column Totals:	195 (A)	610 (B)

Prevalence Index = B/A = 3.1

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ______

Remarks:
Where plants are not growing, the ground is completely covered by moss. Total moss cover is 15%. Where there is no moss, there is duff. Total cover of duff is 3%

RECEIVED
MAR 16 2021
COAST AREA
RESOURCE MANAGEMENT

1/10/2021

366.185

SOIL

Sampling Point: D-03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR3/3	100	—				Sandy clay loam	
3-15	10YR4/1	60	5YR5/5	40%	C	M	"	Depleted matrix
15-20	10YR4/1	65	2.5YR4/5	35%	C	M	"	Depleted matrix
								+ wet/saturated, +
								glossy, from 0-20"

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes X No ____

Remarks:

PART OF PLAN

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☒ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____

Water Table Present? Yes X No ____ Depth (inches): 0-20"

Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 0-20"

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Water pools to 3" from the surface in 10 mins. Pools to the surface in 45 mins. Before the pit filled w/ water, the soil was very wet and glistening.

1/10/2021

366,186

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

1.8

Project/Site: Unit 1 City/County: Mendocino Count. Sampling Date: 4/13/19
Applicant/Owner: Gualala Redwoods State: CA Sampling Point: U1-002
Investigator(s): Christy Wagner, Art Haschak Section, Township, Range: T11N R15W Sec
Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): flat Slope (%): 1%
Subregion (LRR): A Northwest Forests and Coast Lat: ______ Long: ______ Datum: MDBM
Soil Map Unit Name: ______ NWI classification: ______
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ___ No X
Hydric Soil Present? Yes ___ No X
Wetland Hydrology Present? Yes ___ No X

Is the Sampled Area within a Wetland? Yes ___ No X

Remarks:

PART OF PLAN

VEGETATION – Use scientific names of plants.

50/20

43/17

14/5

6/2

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Sequoia sempervirens	65	Y	UPL
2. Notholithocarpus densiflorus	15	N	UPL
3. Alnus rubra	5	N	FAC
4. Umbellularia californica	1	N	FAC
	86	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30')			
1. Toxicodendron diversilobum	25	Y	FAC
2. Umbellularia californica	1	N	FAC
3. Vaccinium ovatum	1	N	FACU
4.			
5.			
	27	= Total Cover	
Herb Stratum (Plot size: 5')			
1. Veratrum fimbriatum	5	Y	OBL
2. Pteridium aquilinum var. pubescens	1	N	FACU
3. Polystichum munitum	1	N	FACU
4. Lysimachia latifolia	1	N	FACW
5. Oxalis oregana	2	Y	FACU
6. Scoliopus bigelovii	1	N	UPL
7.			
8.			
9.			
10.			
11.			
	11	= Total Cover	
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	5	x 1 =	5
FACW species	1	x 2 =	2
FAC species	32	x 3 =	96
FACU species	5	x 4 =	20
UPL species	81	x 5 =	405
Column Totals:	124 (A)		528 (B)

Prevalence Index = B/A = 4.26

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks:
Ground is covered by a thick layer of redwood duff. Total duff cover is 90%. Plants are still young.

RECEIVED
MAR 16 2021
COAST AREA
RESOURCE MANAGEMENT

1/10/2021

366.187

PART OF PLAN

SOIL

Sampling Point: U1-002

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-20	10YR3/3	100	—				Silty clay loam	Profile full of
20-22	10YR 4/2	60	5YR 5/6	20	C	M		woody roots, assumed
			10YR 4/1	20	C	M		to be poison oak.
								Roots were found @
								22". Comprised 30%
								of profile.

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ____ No X

Remarks: The redox concentration are not w/in the upper 6" nor do they start w/in 10" of the soil surface. Does not meet the requirements for F3, F6, or F8.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5) NO. 2 upl/FACU 1 obl/FACW
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ______

Water Table Present? Yes ____ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ______

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Pooling water in the bottom 2" of sample pit. Correlated w/ change in soil profile. Does not meet the criteria for A2, A3, nor C4 as they occur more than 12" below the surface. Observed water pooling in pit for 45 mins. D2 = plot is near the toe of a slope

RECEIVED
MAR 16 2021
COAST AREA
RESOURCE MANAGEMENT

1/10/2021

366.188

PACIFIC WATERSHED ASSOCIATES

PACIFIC WATERSHED ASSOCIATES INC.

GSA Advantage!®
www.gsaadvantage.gov

PO Box 4433 • Arcata, CA 95518-4433
Phone 707-839-5130 • Fax 707-839-8168
www.pacificwatershed.com

Date: January 21, 2021

To: John Bennett, Forest Manager
Gualala Redwood Timber, Inc.
P.O. Box 197
39951 Old Stage Road
Gualala, CA. 95445

PART OF PLAN

From: Danny Hagans, Principal Earth Scientist
Pacific Watershed Associates
P. O. Box 4433, Arcata, CA 95518
(707) 839-5130, dannyh@pacificwatershed.com

Subject: Comments on the Proposed Far North THP 1-20-00150 MEN, Little THP 1-18-095 MEN and the Elk THP 1-19-098 MEN, as well as on the analysis provided by Kamman Hydrology & Engineering, Inc. on behalf of the Friends of Gualala River.

Introduction

My name is Danny Hagans, and I am a Principal Earth Scientist at Pacific Watershed Associates (PWA), a geological and environmental engineering consulting firm with offices in McKinleyville and Petaluma, California. Our 35-person environmental firm specializes in science-based watershed and fisheries restoration and protection work throughout northern and central California, and elsewhere. Our staff includes licensed and certified geologists, engineering geologists, water resource engineers, erosion and sediment control specialists, certified stormwater specialists and trainers, as well as hydrologists, fisheries biologists and botanists. I am coauthor of the *Handbook for Forest, Ranch and Rural Roads* (PWA, 2015) and Part X of the California Salmonid Stream Habitat Restoration Manual, titled *Upslope Erosion Inventory and Sediment Control Guidance (CDFW, 2006)*. These manuals and guidance documents have been funded and adopted by various state and federal agencies as the standard of practice. PWA has also played a substantial role in developing TMDL sediment source investigations and recovery targets related to sediment for the US EPA and NCRWQCB in the Gualala River watershed, as well as many other North Coast watersheds.

Because of our past extensive work on properties owned by Gualala Redwood Timber (GRT), and at the request of John Bennett, GRT Forest Manager, I have prepared a brief summary concerning our two decades of on-the-groundwork conducting road erosion assessments, restoration planning activities, and road "storm-proofing" on the former Gualala Redwood, Inc. (GRI) timberland properties, now owned and managed by GRT.

RECEIVED
MAR 16 2021
COAST AREA
RESOURCE MANAGEMENT

1/10/2021

366.189

My comments herein are specifically related to comments recently received by CAL FIRE regarding the proposed Far North THP's 1-20-00150 MEN, Little THP 1-18-095 MEN and the Elk THP 1-19-098 MEN from Kamman Hydrology & Engineering, Inc. (Kamman) dated November 20, 2020 in which they described their analysis and estimates of roadway sediment yield to the Gualala River and some of its tributaries. My comments will serve to: 1) document and illustrate the faulty assumptions employed in the Kamman estimates to derive the calculated sediment yield from forest roads in the 3 THP areas; and 2) describe and present evidence that all the roads within these THP areas and beyond were aggressively treated to hydrologically disconnect road surfaces and cutbanks from local streams in 2003, thereby dramatically decreasing sediment yields from road surfaces, ditches and cutbanks by over 90%, compared to what they would have been had the work on GRI properties not been done. The road storm-proofing measures PWA designed and that were performed were approved and jointly funded by state of California watershed restoration grants.

Background

PWA principals and professional staff has been refining the methods for, and conducting, watershed restoration activities at a significantly large geographic scale throughout public and privately-owned coastal watersheds in California for more than 3 decades. Specifically, the large body of work undertaken and completed by PWA over the last 30 years includes field-based sediment source investigations and studies that have led to the implementation of comprehensive, on-the-ground "road storm-proofing" projects involving literally thousands of miles of public and private road systems in California to protect water quality and contribute to the restoration of aquatic habitats as well as the restoration, recovery and protection of salmonids. These implementation projects have involved both: a) road upgrading to improve road drainage designs and drainage structures to accommodate 100-year recurrence interval streamflow events; and/or b) road decommissioning and road closure projects to significantly limit future erosion and sediment delivery from poorly located and designed roads that are either abandoned or no longer needed for access or future land management for an indeterminate amount of time.

In the late 1990's, PWA working in conjunction with the Sotoyome Resource Conservation District (SRCD), Santa Rosa, CA, (now known as the Sonoma RCD) initiated salmon recovery and protection efforts on several large rural subdivisions in both the Gualala River tributary Fuller Creek watershed near Annapolis, as well as in the upper South Fork Gualala River headwaters near Cazadero. These erosion and sediment control efforts were primarily funded by the California Department Fish and Game (CDFG) Fisheries Restoration Grant Program (FRGP) and constituted nearly 70 miles of road upgrading and storm-proofing to eliminate/reduce road erosion and sediment impacts to nearby streams, and eliminate future cumulative watershed impacts from the treated road systems.

Doty Creek Planning Watershed and Comments on the Far North, Little, and Elk THP's

In about 2000, the SRCD, on behalf of the non-profit Gualala River Watershed Council (GRWC) and PWA, applied for and received a CDFG FRGP Grant (#P9985012) to conduct the initial sediment reduction and salmonid recovery planning project on the GRI lands in the whole of the 7 mi^2 Little North Fork Gualala River (LNFGR) watershed, which constitutes the complete Doty Creek Planning Watershed Area. This area encompasses all the lands included in the Far North and Little THP's and a portion of the Elk THP. Over the next work year PWA professionals conducted

1/10/2021

PART OF PLAN 366.190

field-based inventories of all 45 miles of drivable and abandoned (non-drivable) roads in the Planning Watershed to identify, quantify, and develop preventative erosion control treatment plans to minimize ongoing and future anthropogenic sediment sources from degrading water quality and salmonid habitat.

In April 2002, the pre-requisite planning assessment project was completed, and the final report was provided to CDFG, along with a follow-up grant proposal seeking matching implementation funding to "storm-proof" the 45 miles of assessed roads in the LNFGR watershed (see Attachment A: PWA 2002 CDFG Watershed Assessment and Erosion Prevention Planning Project, LNFGR Watershed, Mendocino County Final Report). The road erosion assessment report identified 224 sites of current or potential erosion and sediment delivery risk from stream crossing, landslide and gully erosion sites, as well as 17 miles (38%) of mapped and field measured hydrologically connected roads in the LNFGR. The field-based erosion assessment estimated a total of 64,480 yd^3 of future erosion and sediment delivery (i.e., 31,235 yd^3 from the 224 sites of large storm generated episodic erosion, as well as 33,245 yd^3 of expected chronic, fine sediment delivery from the hydrologically connected roads and road segments over the next 2 decades, using the same methods utilized by Kamman but based on field measurements) would be prevented from entering the stream network in the LNFGR assessment area by implementing the erosion control plan.

In 2003, the SRCD received CDFG FRGP grant funding (CDFG contract #P0140405) to conduct the first comprehensive GRI basin-wide storm-proofing implementation project in the 7 mi^2 LNFGR watershed. Between May 15, 2003 and November 15, 2003, with joint funding from GRI and CDFG, two (2) qualified local construction companies (under PWA construction management and oversight) implemented the erosion prevention and sediment control treatments along the 45 miles of road in the 2002 LNFGR assessment area, as well as at several additional sites and road reaches outside the LNFGR watershed area in the North Fork Gualala River and Robinson Creek watersheds.

As shown on the attached CDFG final report map of the Doty Creek Planning Watershed Area prepared by GRI in 2004, virtually all the roads were treated with erosion control and erosion prevention measures either by: 1) upgrading and storm-proofing; and/or 2) decommissioning or properly closing. The water quality protection effort resulted in 35 miles of roads, which included the 17 miles of hydrologically connected roads identified in the 2002 assessment, being outsloped and receive periodic rolling dip drainage structures to insure effective and permanent hydrologic disconnection of roads from streams (i.e., little or no future sediment delivery from those treated road reaches), and 248 stream crossing, landslide and gully erosion sites being treated to largely prevent future episodic (storm related) erosion from the road network (see Attachment B. April 2004 CDFG Contract #P0140405 GRI Little North Fork Gualala River Sediment Reduction Project Final Report and Photo Album).

It is intended that my comments (above) about documented pre- and post-treatment ground conditions on these forest roads within the LNFGR watershed dismiss the remote analysis of "theoretical" road erosion provided in the Kamman reports, and that the documented state funded erosion prevention and storm-proofing work that has been done provides very significant reductions in current and future road erosion and sediment delivery threats to streams, as well as meets and exceeds the requirement for normalizing sediment reduction targets as established by the

1/10/2021 PART OF PLAN 366.191

NCRWQCB in the Gualala River TMDL. Hopefully, these comments profoundly refute, with documentation, the estimated sediment production and sediment yield calculations provided by the Kamman reports submitted to CAL FIRE.

I would also like to provide a final comment on the long-term effectiveness of road storm-proofing efforts pioneered and documented by Pacific Watershed Associates. Over the last 30 years, PWA has been a principal advocate encouraging landowners and land managers in proper road storm-proofing techniques, with an emphasis on hydrologically disconnecting connected segments and lengths of rural, ranch and timberland roads that annually impact water quality (Weaver and Hagans (1994), Weaver, Hagans and Weppner (2006), and Weaver, Weppner and Hagans (2015)). These road management principles and practices have become the standard-of-practice for forest, ranch and rural roads in much of northern and central California, been adopted by land and road managers and regulatory agencies, and implemented on public, private and industrial road systems with great effectiveness and success. In the process of implementing storm-proofing measures at 1,000's of stream crossings and hydrologically disconnecting roads from streams along 1,000's of miles of wildland roads since the early 1990's, we have worked extensively on virtually all the commercial timberland properties in northern California.

I have personally worked extensively guiding water quality protection efforts on GRI forest road systems and lands while these properties were under the management direction of Henry Alden, the former GRI timberland manager for nearly 15 years. My experiences over the years viewing the various north state timberland managers' approaches to hydrologically disconnecting roads from streams, indicates they are all strongly committed to utilizing road outsloping and frequent rolling dips as a key road drainage component in each of their management strategies for protecting water quality. Having seen and worked on various public and private road systems, especially those on commercial forest lands, it is my personal observation and experience that the aggressive methods GRI adopted and utilized to provide long-term permanence and effectiveness in their efforts to hydrologically disconnect roads as chronic sources of sediment delivery is unparalleled. GRI totally grasped and adopted the commitment to protecting water quality from road erosion impacts, but most importantly, they frequently outsloped and disconnected roadbeds and ditches that were not connected to streams as a measure to lower long-term road maintenance requirements and costs, and this is reflected in all their storm-proofed roads in the LNFGR, as well as elsewhere on their ownership in other Planning Watersheds.

Comments of the Methodology used in the Kamman Reports on the Far North, Little and Elk THP Sediment Yield Estimates.

As one of the coauthors of Part X of the *California Salmonid Stream Habitat Restoration Manual* (CDFW, 2006), which is the document referenced and utilized by Kamman in their computational approach and methods to estimate roadway sediment yields, it is also relevant for me to comment on the assumptions that were made and that drove their findings. In terms of the approach and methods utilized by Kamman per Part X, I find no irregularities with utilizing the computational methods as published by PWA. However, the methods as described in Part X are primarily describing *field methods* for conducting on-the-ground road erosion and connectivity assessments to develop real-time estimates for quantifying future erosion and sediment delivery risk. This field-based approach to data collection and condition assessment is necessary where the individual

1/10/2021 PART OF PLAN 366,192

hydrologically connected lengths of road within the overall road system assessment area are identified, field mapped and measured. Making desktop assumptions about the percentage of the road that is hydrologically connected (e.g., 100% or 50% as was done by Kamman) is potentially fraught with error and will lead to erroneous estimates of sediment delivery from the road network being discussed, especially where those road systems have already been effectively treated with state grant funding for hydrological disconnection.

In fact, the above described 45-mile 2002 road erosion and connectivity assessment within the LNFGR watershed only identified 17 miles of road (or 38%) as being hydrologically connected, based on direct field observations and measurements. That means the other 62% of the road network was not hydrologically connected or delivering eroded fine sediment to the stream system on an annual basis even before the roads were treated with CDFG monies. Subsequently, the 2003 CDFG grant funded and approved storm-proofing implementation work, as discussed above, where a total of 35 miles of road (or nearly 80% of the road network) was hydrologically disconnected, even if it was not, because of the aggressive approach taken by GRI to reduce erosion. This just reflects the GRI strategy at the time to drain all their roads properly, so very minimal lengths of road have any potential for surface and gully erosion risk and subsequent sediment delivery to nearby streams.

Finally, Kamman (paragraph 2 on page 1 in each of their three November 20, 2020 reports submitted to CAL FIRE in response to the 3 GRT THP's (Far North, Little and Elk)) suggests there are many other unquantified potential sediment sources, such as gullying, landslides and stream crossing failures that will contribute to additional sediment cumulative effects in the Planning Watershed. This conclusion is inaccurate and unrealistic as the 2003 CDFG grant funded and approved watershed restoration and erosion prevention work resulted in over 150 stream crossings that were: 1) reconstructed with properly sized culverts or armored fills designed to accommodate the 100-year return runoff event, installed at grade with stable fillslopes and critical dips to prevent stream diversion and gully formation; or 2) the stream crossings were properly decommissioned per the guidelines provided in the *Handbook for Forest, Ranch and Rural Roads* (Weaver, Weppner and Hagans, 2015). In addition, the 2003 watershed-wide storm-proofing work included the excavation and preventive stabilization of a minimum of 51 potential road-related unstable fillslopes that PWA had identified as exhibiting a potential for failure and sediment delivery to nearby streams.

Conclusion

The evidence presented here illustrate the difficulty and potential inaccuracy of utilizing and relying on remote sensed data and broad assumptions in drawing conclusions about sediment production and delivery risk associated with forest and ranch roads, especially within the three (3) proposed GRT THP areas in the LNFGR watershed, or elsewhere. The conditions and assumptions included in the Kamman reports are not consistent with those found on the ground in these areas. The field-based road erosion assessment completed in 2002, which was based on well-accepted methods published by CDFW in Part X of their restoration manual (*Upslope erosion inventory and sediment control guidance)* and approved, funded and/or adopted by other state agencies, presents actual road hydrologic connectivity data before the roads were treated, and identified the threat to the whole of the LNFGR. The mapped road threats of sediment delivery identified in 2002 were subsequently treated and largely eliminated in 2003 with joint funding by state grants and private landowner funding. The jointly funded state and private comprehensive road storm-proofing project in 2003, along the formerly under designed and poorly drained road network, including both unmaintained and maintained roads, has significantly reduced or largely eliminated the risk of future anthropogenic sediment delivery from road-related fluvial, fillslope mass wasting, and surface erosion processes, thereby substantially addressing the potential for ongoing road-related cumulative effects from occurring in the Planning Watershed. It should be noted, between the years 2000 to 2015, PWA professionals advised GRI on a very aggressive annual program for eliminating sediment production risks from formerly poorly designed, constructed and located forest roads in all the other GRI/GRT Planning Watersheds in the lower Gualala River watershed.

If you have any questions or need further information, please contact Danny Hagans, PWA Principal Earth Scientist at dannyh@pacificwatershed.com.

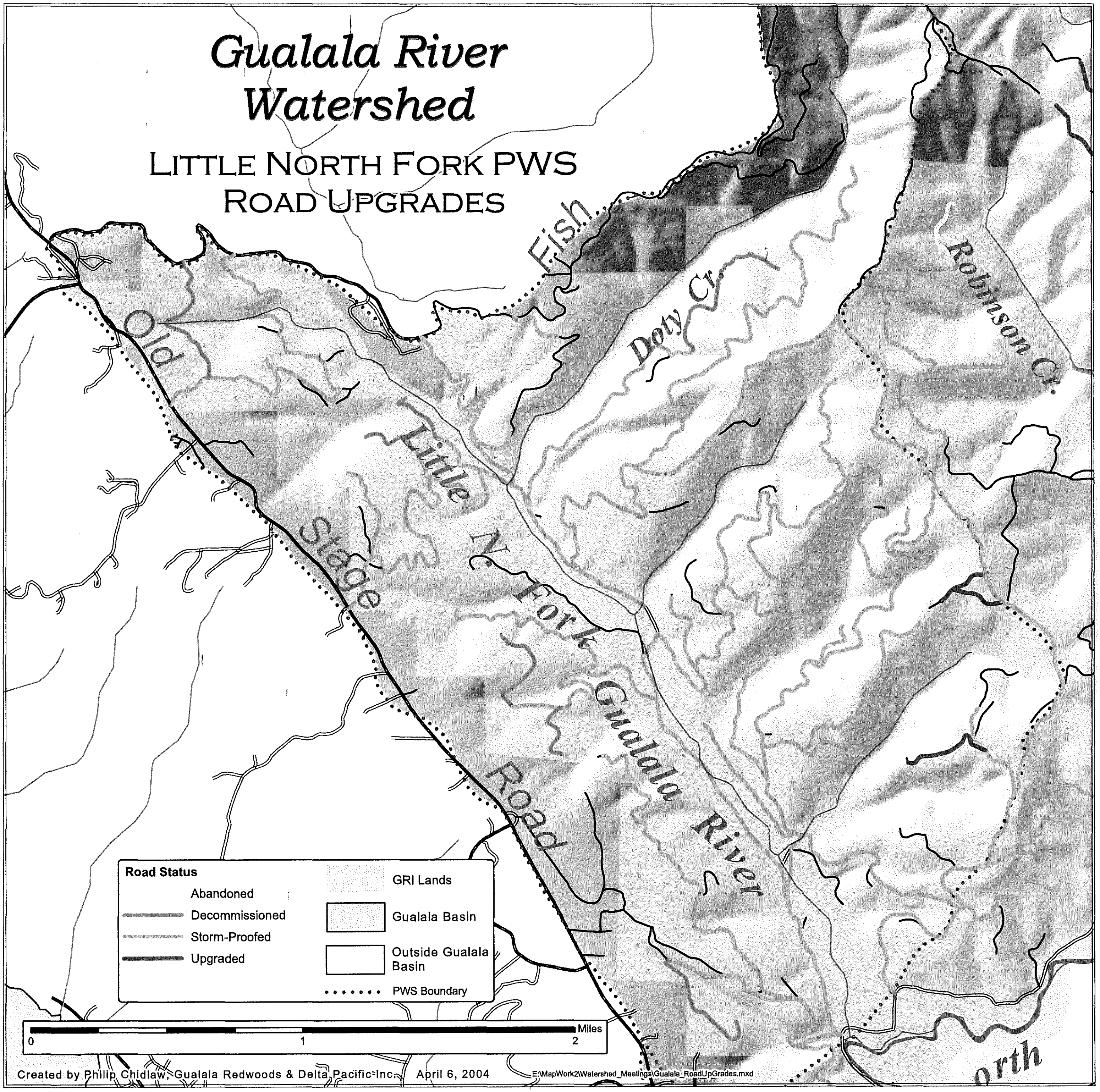
Sincerely,
PACIFIC WATERSHED ASSOCIATES INC.

Danny Hagans
Danny Hagans, Principal Earth Scientist

Encl:
Attachment 1. April 2002 CDFG Contract #P9985012 - PWA Watershed Assessment and Erosion Prevention Planning Project, LNFGR Watershed, Mendocino County Final Report.
Attachment 2. April 2004 CDFG Contract #P0140405 GRI Little North Fork Gualala River Sediment Reduction Project Final Report.

1/10/2021

366.194



PART OF PLAN

366.195

1/10/2021

Attachment 1.

Final Report:

PWA Watershed Assessment and Erosion Prevention Planning Project, Little North Fork Gualala River Watershed, Mendocino County, CA

for

Sotoyome Resource Conservation District
CDFG Contract #P9985012

April 2002

1/10/2021

366.196

Summary Report

Watershed Assessment and
Erosion Prevention Planning Project for the
Little North Fork Gualala River Watershed,
Mendocino County, California
Contract #: P9985012

prepared for

**Sotoyome Resource Conservation District,
Gualala Redwoods Inc.
and
California Department of Fish and Game**

by

***P**acific **W**atershed **A**ssociates*
**Arcata, California
(707) 839-5130**

March, 2002

1/10/2021 366.197

Summary Report
2000 S.B. 271 Watershed Assessment and Erosion Prevention Planning Project for the Little North Fork Gualala River watershed, Mendocino County, California
Contract #: P9985012

Table of Contents ***Page***

PART OF PLAN

1/10/2021

366.198

Table of Contents *Page*

List of Figures

List of Tables

List of Maps

1/10/2021

366.199

Summary Report

Watershed Assessment and Erosion Prevention Planning Project, Little North Fork Gualala River watershed, Mendocino County, California

prepared by
Pacific Watershed Associates

for
Sotoyome Resource Conservation District,
Gualala Redwoods Inc.
and the
California Department of Fish and Game

PART OF PLAN

I. Background

The Little North Fork Gualala River is a 7 mi^2 third order tributary to the North Fork Gualala River located in Mendocino County (Figure1). According to the USGS Gualala 7.5' quad, the Little North Fork Gualala River contains of approximately 5.8 miles of blue-line streams. Elevations in the watershed range between 40 feet at the mouth to 1,000 feet at the headwaters.

The Little North Fork Gualala River watershed is composed of private industrial timberland primarily owned by the Gualala Redwoods, Inc. Timberlands in the watershed are dominated by redwood and Douglas Fir with other hardwood species present The watershed has experienced several cycles of timber harvesting and contains an extensive historic and existing logging road network. Many of the historic or abandoned roads are currently causing erosion and sedimentation to the Little North Fork Gualala River.

The Little North Fork Gualala has value as a historic Coho salmon and Steelhead trout stream. In a stream inventory report produced by Entrix, Inc. for Gualala Redwoods, Inc. in March 1995, it was recommended that the Little North Fork Gualala River "should be managed as an anadromous salmonid, natural production stream". The report strongly recommended that the active and potential sources of erosion with sediment delivery to the stream system be identified, mapped and recommended for appropriate treatment.

The systematic inventory of road-related erosion and sediment delivery along 45 miles of logging roads and treatable sources of future erosion and delivery along 4.3 miles of Class I streams in the Little North Fork Gualala River is a part of a six-fold assessment and restoration planning project for the Gualala River watershed proposed in 1999 by the Sotoyome Resource Conservation District, the Gualala River Watershed Council, and Pacific Watershed Associates. The aim of the assessment and restoration planning project is to inventory "ongoing and potential sediment sources throughout the watershed, principally those human caused sources which can be most easily treated for control and prevention".

1/10/2021

366,200

Figure 1. Location map of the Little North Fork Gualala study area

1/10/2021

366,201

II. Little North Fork Gualala River watershed assessment

Perhaps the most important element needed for long term restoration of salmon habitat, and the eventual recovery of salmonid populations in the Little North Fork Gualala River watershed, is the reduction of accelerated erosion and sediment delivery to the channel system. This summary report describes the erosion assessment and inventory process that was employed in the Little North Fork Gualala River watershed. It also serves as a prioritized plan-of-action for cost-effective erosion control and erosion prevention treatments for the watershed. When implemented and employed in combination with protective land use practices, the proposed projects are expected to significantly contribute to the long term protection and improvement of salmonid habitat in the basin. The implementation of erosion control and erosion prevention work is an important step towards protecting and restoring watersheds and their anadromous fisheries (especially where sediment input is a limiting or potentially limiting factor to fisheries production, as is thought to be the case for the Little North Fork Gualala River).

Road systems are one of the most significant and most easily controlled sources of sediment production and delivery to stream channels. Little North Fork Gualala River is underlain by erodible and potentially unstable geologic substrate, and field observations suggest that roads have been a significant source of accelerated sediment production in the watershed. In the Little North Fork Gualala River, as in many other coastal watersheds, the disturbance caused by excess sediment input to stream channels during large rainfall events is perhaps one of the most significant factors affecting salmonid populations. Chronic sediment inputs to the channel system, from roads and other bare soil areas, are also thought to be important contributors to impaired habitat and reduced salmonid populations.

Unlike many watershed improvement and restoration activities, erosion prevention and "storm-proofing" of forest road systems has an immediate benefit to the streams and aquatic habitat of the basin. It helps ensure that the biological productivity of the watershed's streams is not impacted by future human-caused erosion, and that future storm runoff can cleanse the streams of accumulated coarse and fine sediment, rather than depositing additional sediment from managed areas. A number of sites targeted for immediate implementation in the Little North Fork Gualala River watershed have been identified as high priority for implementation so that fill failures, stream crossing washouts, stream diversions and chronic erosion do not degrade the stream system.

The sediment source inventory for Little North Fork Gualala River, funded through a CDFG S.B. 271 watershed restoration grant and supplemented by Gualala Redwoods Inc. funding, has recently been completed. Among other things, the assessment identified all recognizable current and future sediment sources from roads within the watershed. The field inventory identified future sediment sources from approximately 45 miles of logging road in the watershed.
A number of project sites were treated in the 2000 work season, and others have been targeted for implementation (decommissioning and upgrading) in 2002. The primary objective of these road upgrading and decommissioning projects is to implement cost-effective erosion control and erosion prevention work on high and moderate priority sites that were identified as a part of this comprehensive watershed assessment and inventory.

III. Project Description

The watershed assessment process consisted of two distinct project elements. These included: 1) a complete inventory of all future road-related sediment sources along 45 miles of logging roads

1/10/2021 PART OF PLAN 366.202

in the watershed and 2) an inventory of sediment sources and riparian conditions along approximately 4.3 miles of Class I streams in the watershed.

The first phase of the project involved a complete inventory of the road systems, selected hillslope areas and major stream channels. Technically, this assessment was neither an erosion inventory nor a road maintenance inventory. Rather, it was an inventory of sites where there is a potential for future sediment delivery to the stream system that could impact fish bearing streams in the watershed. All roads, including both maintained and abandoned routes, were walked and inspected by trained personnel and all existing and potential erosion sites were identified and described. Sites, as defined in this assessment, include locations where there is direct evidence that future erosion or mass wasting could be expected to deliver sediment to a stream channel. Sites of past erosion were not inventoried unless there was a potential for additional future sediment delivery. Similarly, sites of future erosion that were not expected to deliver sediment to a stream channel were not included in the inventory.

Inventoried sites generally consisted of stream crossings, potential and existing landslides related to the road system, gullies below ditch relief culverts and long sections of uncontrolled road and ditch surface runoff which currently discharge to the stream system. For each identified existing or potential erosion source, a database form was filled out and the site was mapped on a mylar overlay over a 1:15,840 scale aerial photograph. The database form (Figure 2) contained questions regarding the site location, the nature and magnitude of existing and potential erosion problems, the likelihood of erosion or slope failure and recommended treatments to eliminate the site as a future source of sediment delivery.

The erosion potential (and potential for sediment delivery) was estimated for each major problem site or potential problem site. The expected volume of sediment to be eroded and the volume to be delivered to streams was estimated for each site. The data provides quantitative estimates of how much material could be eroded and delivered in the future, if no erosion control or erosion prevention work is performed. In a number of locations, especially at stream diversion sites, actual sediment loss could easily exceed field predictions. All sites were assigned a treatment priority, based on their potential to deliver deleterious quantities of sediment to stream channels in the watershed and the cost-effectiveness of the proposed treatment.

In addition to the database information, tape and clinometer surveys were completed on virtually all stream crossings. These surveys included a longitudinal profile of the stream crossing through the road prism, as well as two or more cross sections. The survey data was entered into a computer program that calculates the volume of fill in the crossing. The survey allows for an accurate and repeatable quantification of future erosion volumes (assuming the stream crossing was to washout during a future storm), decommissioning volumes (assuming the road was to be closed) and/or excavation volumes that would be required to complete a variety of road upgrading and erosion prevention treatments (culvert installation, culvert replacement, complete excavation, etc.).

In the final phase of the watershed assessment project, the main stem of the Little North Fork Gualala River was inventoried for bank erosion sites, stream side landslides and the condition of riparian vegetation. Data was collected on the location and volume of sediment sources along approximately 4.3 miles of Class I stream channels. The channel survey procedures, results and

1/10/2021

366.203

Figure 2. Road erosion inventory data form used in the Little North Fork Gualala River watershed assessment

*ASAP*___ **PWA ROAD INVENTORY DATA FORM** (3/98 version) *Check*___

GENERAL	**Site No:** ___	GPS:	Watershed:		CALWAA:		
Treat (Y,N):	Photo: ___	T/R/S:	Road #:		Mileage: ___		
	Inspectors:___	Date: ___	Year built:___	Sketch (Y):			
	Maintained	Abandoned	Driveable	Upgrade	Decommission	Maintenance	
PROBLEM	Stream xing	Landslide (fill, cut, hill)	Roadbed (bed, ditch, cut)	DR-CMP	Gully	Other	
	Location of problem (U, M, L, S)	Road related? (Y)	Harvest history: (1=<15 yrs old; 2=>15 yrs old) TC1, TC2, CC1, CC2, PT1, PT2, ASG, No		Geomorphic association: Streamside, I.G., Stream Channel, Swale, Headwall, B.I.S.		
LANDSLIDE	Road fill	Landing fill	Deep-seated	Cutbank	Already failed	Pot. failure	
	Slope shape: (convergent, divergent, planar, hummocky)			Slope (%) ___	Distance to stream (ft) ___		
STREAM	CMP	Bridge	Humboldt	Fill	Ford	Armored fill	
	Pulled xing: (Y)	% pulled ___	Left ditch length (ft) ___		Right ditch length (ft) ___		
	cmp dia (in) ___	inlet (O, C, P, R)	outlet (O, C, P, R)	bottom (O, C,P, R)	Separated?		
	Headwall (in) ___	CMP slope (%) ___	Stream class (1, 2, 3)	Rustline (in)			
	% washed out ___	D.P.? (Y)	Currently dvted? (Y)	Past dvted? (Y)	Rd grade (%) ___		
	Plug pot: (H, M, L)	Ch grade (%) ___	Ch width (ft) ___	Ch depth (ft) ___			
	Sed trans (H, M, L)	Drainage area (mi^2) ___					
EROSION	E.P. (H, M, L)	Potential for extreme erosion? (Y, N)		Volume of extreme erosion (yds^3): 100-500, 500-1000, 1K-2K, >2K			
Past erosion...	Rd&ditch vol (yds^3) (yds^3)___	Gully fillslope/hillslope (yds^3)___	Fill failure volume (yds^3) ___	Cutbank erosion (yds^3)___	Hillslope slide vol. (yds^3)___	Stream bank erosion (yds^3) ___	xing failure vol (yds^3)
	Total past erosion (yds) ___	Past delivery (%) ___	Total past yield (yds) ___	Age of past erosion (decade)___			
Future erosion...	Total future erosion (yds) ___	Future delivery (%) ___	Total future yield (yds) ___	Future width (ft) ___	Future depth (ft) ___	Future length (ft) ___	
TREATMENT	Immed (H,M,L)	Complex (H,M,L)	Mulch (ft^2)				
	Excavate soil	Critical dip	Wet crossing (ford or armored fill) (circle)		sill hgt (ft) ___	sill width (ft) ___	
	Trash Rack	Downspout	D.S. length (ft) ___	Repair CMP	Clean CMP		
	Install culvert	Replace culvert	CMP diameter (in) ___	CMP length (ft) ___			
	Reconstruct fill	Armor fill face (up, dn)	Armor area (ft^2) ___	*Clean or cut ditch*	*Ditch length (ft)* ___		
	Outslope road (Y)	*OS and Retain ditch (Y)*	*O.S. (ft)* ___	*Inslope road*	*I.S. (ft)* ___	*Rolling dip*	*R.D. (#)* ___
	Remove berm	*Remove berm (ft)* ___	*Remove ditch*	*Remove ditch (ft)* ___		*Rock road- ft^2* ___	
	Install DR-CMP	*DR-CMP (#)* ___	Check CMP size? (Y)	Other tmt? (Y)	No tmt. (Y)		
COMMENT ON PROBLEM:							
EXCAVATION VOLUME	Total excavated (yds3) ___		Vol put back in (yds3) ___		Volume removed (yds3) ___		
	Vol stockpiled (yds^3)	Vol endhauled (yds^3) ___	Dist endhauled (ft) ___	Excav prod rate (yds^3/hr) ___			
EQUIPMENT HOURS	Excavator (hrs) ___	Dozer (hrs) ___	Dump truck (hrs) ___	Grader (hrs) ___			
	Loader (hrs) ___	Backhoe (hrs) ___	Labor (hrs) ___	Other (hrs) ___			
COMMENT ON TREATMENT:							

1/10/2021

366,204

treatment recommendations are detailed in Section V of the report. Data collected included the type of erosional process, the current activity level, the volume of sediment delivery, and applicable treatment prescriptions at sites where work has been recommended. In addition, erosion sites and general characteristics of the riparian vegetation were mapped on mylar overlays to the 1:15,840 scale aerial photos. Results from the stream channel assessment can be found in the back of this report.

IV. Little North Fork Gualala Road Assessment and Sediment Reduction Plan

A. Inventory Results

Approximately 45 miles of roads were inventoried for future sediment sources within the Little North Fork Gualala River watershed. Inventoried road-related erosion sites fell into one of two treatment categories: 1) upgrade sites - defined as sites on maintained open roads that are to be retained for access and management and 2) decommission sites - defined as sites exhibiting the potential for future sediment delivery that have been recommended for either temporary or permanent closure. Virtually all future road-related erosion and sediment yield in the Little North Fork Gualala River watershed is expected to come from three sources: 1) erosion at or associated with stream crossings (from several possible causes), 2) the failure of road and landing fills (landsliding), and 3) road surface and ditch erosion.

A total of 224 sites were identified with the potential to deliver sediment to streams. Of these, 222 sites were recommended for erosion control and erosion prevention treatment. Approximately 67 % (n=149) of the sites are classified as stream crossings and 23 % (n=51) as potential landslides (Table 1 and Maps 1). The remaining 11 % (n=24) of the inventoried sites consist of "other" sites which include ditch relief culverts, gullies, springs and bank erosion.

Stream crossings - One hundred forty-nine (149) stream crossings were inventoried in the Little North Fork Gualala River assessment area including 54 culverted crossings, 2 unculverted Humboldt crossings, 75 unculverted fill crossings, 2 bridges, 8 fords and 8 "pulled" (decommissioned) crossings. An unculverted fill crossing refers to a stream crossing with no formal drainage structure to carry the flow through the road prism. Flow is either carried beneath or through the fill, or it flows over the road surface, or it is diverted down the road to the inboard ditch. Most unculverted fill crossings are located at small Class III streams that exhibit flow only in the larger runoff events. If the crossing has been made temporary or decommissioned by removing the majority of the fill, then these crossings are commonly known as "pulled" or decommissioned crossings.

Approximately 26,044 yds^3 of future road-related sediment delivery in the Little North Fork Gualala River watershed assessment area could originate from stream crossings if they are not treated (Table 1). This amounts to about 40% of the total sediment yield from the road system. The most common problems that cause erosion at stream crossings include: 1) crossings with no or undersized culverts, 2) crossings with culverts that are likely to plug, 3) stream crossings with a diversion potential and 4) crossings with gully erosion at the culvert outlet. The sediment delivery from stream crossing sites is always classified as 100% because any sediment eroded is delivered to the channel. Any sediment delivered to small ephemeral streams will eventually be transported to downstream fish-bearing stream channels.

At stream crossings, the largest volumes of future erosion can occur when culverts plug or when potential storm flows exceed culvert capacity (i.e., the culvert is too small for the drainage area)

1/10/2021

366,205

Table 1. Site classification and sediment delivery from all inventoried sites with future sediment delivery in the Little North Fork Gualala watershed assessment area, Mendocino County, California.

Site Type	Number of sites or road miles	Number of sites or road miles to treat	Future yield (yds^3)	Stream crossings w/ a diversion potential (#)	Streams currently diverted (#)	Stream culverts likely to plug (plug potential rating = high or moderate)
Stream crossings	149	147	26,044	67	12	40
Landslides	51	51	4,516	NA	NA	NA
Other	24	24	678	NA	NA	NA
Total (all sites)	224	222	31,238	67	12	40
Persistent surface erosion[1]	17.0	17.0	33,246	NA	NA	NA
Totals	**224**	**222**	**64,484**	**67**	**12**	**40**

[1] Assumes 25' wide road prism and cutbank contributing area, and 0.2' of road/cutbank surface lowering over a two decade period.

and flood runoff spills onto or across the road. When stream flow goes over the fill, part or all of the stream crossing fill may be eroded. Alternately, when flow is diverted down the road, either on the road bed or in the ditch (instead of spilling over the fill and back into the same stream channel), the crossing is said to have a "diversion potential" and the road bed, hillslope and/or stream channel that receives the diverted flow can become deeply gullied or destabilized. These hillslope gullies can be quite large and can deliver significant quantities of sediment to stream channels. Diverted stream flows discharged onto steep, potentially unstable slopes can also trigger large hillslope landslides.

Of the 147 stream crossings recommended for treatment, 67 (46%) have the potential to divert in the future and 12 (8%) streams are currently diverted (Table 1). Forty of the 54 existing culverts have a moderate to high plugging potential. Because the roads were constructed many years ago, many culverted stream crossings are under designed for the 100 year storm flow. At stream crossings with no or undersized culverts, or where there is a diversion potential, corrective prescriptions have been outlined on the data sheets and in the following tables. Preventative treatments include such measures as constructing critical dips (rolling dips) at stream crossings to prevent stream diversions, installing larger culverts wherever current pipes are under designed for the 100 year storm flow (or where they are prone to plugging), installing culverts at the natural channel gradient to maximize the sediment transport efficiency of the pipe and ensure that the culvert outlet will discharge on the natural channel bed below the base of the road fill, installing debris barriers and/or downspouts to prevent culvert plugging and outlet erosion, respectively, armoring the downstream fill face of the crossing to minimize or prevent future erosion, or properly excavating the stream crossing of all fill material.

Landslides - Only those landslide sites with a potential for sediment delivery to a stream channel were inventoried. Fifty-one (51) potential landslides were identified and account for approximately 7% of the inventoried sites in the Little North Fork Gualala River assessment area

1/10/2021

366.206

(Table 1). Most of the potential landslide sites were found along roads where material had been sidecast during earlier construction and now shows signs of instability. Potential landslides are expected to deliver approximately 4,516 yds^3 of sediment to Little North Fork Gualala River and its tributaries in the future. Correcting or preventing potential landslides associated with the road is relatively straightforward, and involves the physical excavation of potentially unstable road fill and sidecast materials.

There are a number of potential landslide sites located in the Little North Fork Gualala River assessment area that will not deliver sediment to streams. These sites were not inventoried using data sheets due to the lack of expected sediment delivery to a stream channel. They are generally shallow and of small volume, or located far enough away from an active stream such that delivery is unlikely to occur. For reference, all landslide sites were mapped on the mylar overlays of the aerial photographs, but only those with the potential for future sediment delivery were inventoried using a data sheet (Figure 2).

"Other"sites **-** A total of 24 "other" sites were also identified in the Little North Fork Gualala River watershed assessment area. "Other" sites include ditch relief culverts, major springs, gullies and bank erosion sites which exhibited the potential to deliver sediment to streams. One of the main causes of existing or future erosion at these sites is surface runoff and uncontrolled flow from long sections of undrained road surface and/or inboard ditch. Uncontrolled flow along the road or ditch may affect the road bed integrity as well as cause gully erosion on the hillslopes below the outlet of ditch relief culverts. All 24 sites have been recommended for erosion control and erosion prevention treatment. We estimate 678 yds^3 of sediment will be delivered to streams if they are left untreated (Table 1). Sediment delivery from these sites represents nearly 1% of the total potential sediment yield from sites recommended for erosion control and erosion prevention treatment.

Chronic erosion **-** Road runoff is also a major source of fine sediment input to nearby stream channels. We measured approximately 17 miles of road surface and/or road ditch (representing 38% of the total inventoried road mileage) which currently drain directly to stream channels and deliver ditch flow, road runoff and fine sediment to stream channels in the Little North Fork Gualala watershed assessment area (Table 1). These roads are said to be "hydrologically connected" to the stream channel network.

From the 17 miles, we calculated approximately 33,246 yds^3 of sediment could be delivered to stream channels within the Little North Fork Gualala watershed over the next two decades, depending on road use, if no efforts are made to change road drainage patterns. This will occur through a combination of 1) cutbank erosion (e.g. dry ravel, rainfall, freeze-thaw processes, cutbank failures and brushing/grading practices) delivering sediment to the ditch, 2) inboard ditch erosion and sediment transport, 3) mechanical pulverizing and wearing down of the road surface, and 4) erosion of the road surface during wet weather periods.

Relatively straight-forward erosion prevention treatments can be applied to upgrade road systems to prevent fine sediment from entering stream channels. These treatments generally involve dispersing road runoff and disconnecting road surface and ditch drainage from the natural stream channel network.

B. Treatment Priority

An inventory of future or potential erosion and sediment delivery sites is intended to provide

1/10/2021

366,207

information which can guide long range transportation planning, as well as identify and prioritize erosion prevention, erosion control and road decommissioning activities in the watershed. Not all of the sites that have been recommended for treatment have the same priority, and some can be treated more cost effectively than others. Treatment priorities are evaluated on the basis of several factors and conditions associated with each potential erosion site. These include:

1) the expected volume of sediment to be delivered to streams (future delivery - yds^3),
2) the potential or "likelihood" for future erosion (erosion potential - high, moderate, low),
3) the "urgency" of treating the site (treatment immediacy - high, moderate, low),
4) the ease and cost of accessing the site for treatments, and
5) recommended treatments, logistics and costs.

The ***erosion potential*** of a site is a professional evaluation of the likelihood that future erosion will occur during a future storm event. Erosion potential is an estimate of the potential for additional erosion, based field observations of a number of local site conditions. Erosion potential was evaluated for each site, and expressed as "High", "Moderate" or "Low." The evaluation of erosion potential is a subjective estimate of the probability of erosion, and not an estimate of how much erosion is likely to occur. It is based on the age and nature of direct physical indicators and evidence of pending instability or erosion. The likelihood of erosion (erosion potential) and the volume of sediment expected to enter a stream channel from future erosion (sediment delivery) play significant roles in determining the treatment priority of each inventoried site (see "treatment immediacy," below). Field indicators that are evaluated in determining the potential for sediment delivery include such factors as slope steepness, slope shape, distance to the stream channel, soil moisture and evaluation of erosion process. The larger the potential future contribution of sediment to a stream, the more important it becomes to closely evaluate its potential for cost-effective treatment.

Treatment immediacy (treatment priority) is a professional evaluation of how important it is to "quickly" perform erosion control or erosion prevention work. It is also defined as "High", "Moderate" and "Low" and represents both the severity and urgency of addressing the threat of sediment delivery to downstream areas. An evaluation of treatment immediacy considers erosion potential, future erosion and delivery volumes, the value or sensitivity of downstream resources being protected, and treatability, as well as, in some cases, whether or not there is a potential for an extremely large erosion event occurring at the site (larger than field evidence might at first suggest). If mass movement, culvert failure or sediment delivery is imminent, even in an average winter, then treatment immediacy might be judged "High". *Treatment immediacy is a summary, professional assessment of a site's need for immediate treatment.* Generally, sites that are likely to erode or fail in a normal winter, and that are expected to deliver significant quantities of sediment to a stream channel, are rated as having a high treatment immediacy or priority.

One other factor influencing a site's treatment priority is the difficulty (cost and environmental impact) of reaching the site with the necessary equipment to effectively treat the potential erosion. Many sites found on abandoned or unmaintained roads require brushing and tree removal to provide access to the site(s). Other roads require minor or major road rebuilding of washed out stream crossings and/or existing landslides in order to reach potential work sites farther out the alignment. Road reconstruction adds to the overall cost of erosion control work and reduces project cost-effectiveness. Potential work sites with lower cost-effectiveness, in turn

1/10/2021

366,208

may be of relatively lower priority. However, just because a road is abandoned and/or overgrown with vegetation is not sufficient reason to discount its need for assessment and potential treatment. Treatments on heavily overgrown, abandoned roads may still be both beneficial and cost-effective.

C. Evaluating Treatment Cost-Effectiveness

Treatment priorities are developed from the above factors, as well as from the estimated cost-effectiveness of the proposed erosion control or erosion prevention treatment. Cost-effectiveness is determined by dividing the cost ($) of accessing and treating a site, by the volume of sediment prevented from being *delivered* to local stream channels. For example, if it would cost $2000 to develop access and treat an eroding stream crossing that would have delivered 500 yds^3 (had it been left to erode), the predicted cost-effectiveness would be $4/yds^3 ($2000/500yds^3).

To be considered for a priority treatment a site should typically exhibit: 1) potential for significant (>25-50 yds^3) sediment delivery to a stream channel (with the potential for transport to a fish-bearing stream), 2) a high or moderate treatment immediacy and 3) a predicted cost-effectiveness value averaging in the general range of approximately $5 to $15/yds^3, or less. Treatment cost-effectiveness analysis is often applied to a group of sites (rather than on a single site-by-site basis) so that only the most cost-effective groups of sites or projects are undertaken. During road decommissioning, groups of sites are usually considered together since there will only be one opportunity to treat potential sediment sources along the road. In this case, cost-effectiveness may be calculated for entire roads or road reaches that fall into logical treatment units.

Cost-effectiveness can be used as a tool to prioritize potential treatment sites throughout a sub-watershed (Weaver and Sonnevil, 1984; Weaver and others, 1987). It assures that the greatest benefit is received for the limited funding that is typically available for protection and restoration projects. Sites, or groups of sites, that have a predicted marginal cost-effectiveness value (>$15/yds^3), or are judged to have a lower erosion potential or treatment immediacy, or low sediment delivery volumes, are less likely to be treated as part of the primary watershed protection and "erosion-proofing" program. However, these sites should be addressed during future road reconstruction (when access is reopened into areas for future management activities), or when heavy equipment is performing routine maintenance or restoration at nearby, higher priority sites.

D. Types of Prescribed Heavy Equipment Erosion Prevention Treatments

Forest roads can be storm-proofed by one of two methods: upgrading or decommissioning (Weaver and Hagans, 1994). Upgraded roads are kept open and are inspected and maintained. Their drainage facilities and fills are designed or treated to accommodate or withstand the 100-year storm. In contrast, properly decommissioned roads are closed and no longer require maintenance. The goal of storm-proofing is to make the road as "hydrologically invisible" as is possible; that is, to disconnect the road from the stream system and thereby preserve aquatic habitat. The characteristics of storm-proofed roads, including those which are either upgraded or decommissioned, are depicted in Figure 3.

1/10/2021

FIGURE 3. CHARACTERISTICS OF STORM-PROOFED ROADS

The following abbreviated criteria identify common characteristics of "storm-proofed" roads. Roads are "storm-proofed" when sediment delivery to streams is strictly minimized. This is accomplished by dispersing road surface drainage, preventing road erosion from entering streams, protecting stream crossings from failure or diversion, and preventing failure of unstable fills which would otherwise deliver sediment to a stream. Minor exceptions to these "guidelines" can occur at specific sites within a forest or ranch road system.

STREAM CROSSINGS

- ✓ all stream crossings have a drainage structure designed for the 100-year flow
- ✓ stream crossings have no diversion potential (functional critical dips are in place)
- ✓ stream crossing inlets have low plug potential (trash barriers & graded drainage)
- ✓ stream crossing outlets are protected from erosion (extended, transported or dissipated)
- ✓ culvert inlet, outlet and bottom are open and in sound condition
- ✓ undersized culverts in deep fills (> backhoe reach) have emergency overflow culvert
- ✓ bridges have stable, non-eroding abutments & do not significantly restrict design flood
- ✓ fills are stable (unstable fills are removed or stabilized)
- ✓ road surfaces and ditches are "disconnected" from streams and stream crossing culverts
- ✓ decommissioned roads have all stream crossings completely excavated to original grade
- ✓ Class 1 (fish) streams accommodate fish passage

PART OF PLAN

ROAD AND LANDING FILLS

- ✓ unstable nd potentially unstable road and landing fills are excavated (removed)
- ✓ excavated spoil is placed in locations where eroded material will not enter a stream
- ✓ excavated spoil is placed where it will not cause a slope failure or landslide

ROAD SURFACE DRAINAGE

- ✓ road surfaces and ditches are "disconnected" from streams and stream crossing culverts
- ✓ ditches are drained frequently by functional rolling dips or ditch relief culverts
- ✓ outflow from ditch relief culverts does not discharge to streams
- ✓ gullies (including those below ditch relief culverts) are dewatered to the extent possible
- ✓ ditches do not discharge (through culverts or rolling dips) onto active or potential landslides
- ✓ decommissioned roads have permanent road surface drainage and do not rely on ditches

Road upgrading involves a variety of treatments used to make a road more resilient to large storms and flood flows. The most important of these include stream crossing upgrading (especially culvert up-sizing to accommodate the 100-year storm flow (including debris) and to eliminate stream diversion potential), removal of unstable sidecast and fill materials from steep slopes, and the application of drainage techniques to improve dispersion of road surface runoff.

Road decommissioning basically involves "reverse road construction," except that full topographic obliteration of the road bed is not normally required to accomplish sediment prevention goals. Generic treatments for decommissioning roads and landings range from

1/10/2021

outsloping or simple cross-road drain construction to full road decommissioning (closure), including the excavation of unstable and potentially unstable sidecast materials and road fills, and all stream crossing fills.

E. Treatments

Basic treatment priorities and prescriptions were formulated concurrent with the identification, description and mapping of both potential sources of road-related sediment yield and road maintenance sites with no potential sediment delivery. Table 2 and Map 2 outline the treatment priorities for all 222 inventoried sites with future sediment delivery that have been recommended for treatment in the Little North Fork Gualala River watershed assessment area. Of the 222 sites with future sediment delivery, forty-three (43) sites were identified as having a high or high-moderate treatment immediacy with a potential sediment delivery of approximately 18,467 yds^3. One hundred and thirty-nine (139) sites were listed with a moderate or moderate-low treatment immediacy and account for nearly 38,225 yds^3 of future sediment delivery. Finally, forty (40)

Table 2. Treatment priorities for all inventoried sediment sources in the Little North Fork Gualala River watershed assessment area, Mendocino County, California

Treatment Priority	Upgrade sites (# and site #)	Decommission sites (# and site #)	Problem	Future sediment delivery (yds^3)
High	**9** (site #: 6, 52, 56, 58, 65, 90, 130, 184, 217)	**2** (site #: 80, 220)	11 stream crossings	7,788
High Moderate	**28** (site #: 4, 14, 17, 19, 21, 22, 31, 42, 49, 53, 63, 69, 71, 75, 85, 86, 95, 97, 102, 103, 140, 154, 159, 200, 212, 213, 216, 218)	**4** (site #: 160, 173, 198, 223)	24 stream crossings, 5 landslides, 3 other	10,679
Moderate	**71** (site #: 5, 7, 10, 10.1, 11, 13, 15, 18, 28, 29, 32, 34, 41, 44, 47, 54, 57, 60, 62, 66, 68, 73, 76, 78, 81, 87, 91, 92, 93, 99, 100, 109, 119, 122, 123, 124, 125, 126, 127, 131, 133, 134, 135, 137, 139, 141, 142, 143, 144, 145, 148, 153, 161, 167, 169, 170, 171, 174, 178, 180, 182, 186, 187, 199, 206, 207, 208, 209, 214, 215, 222)	**16** (site #: 1, 30, 37, 39, 104, 105, 111, 112, 147, 156, 162, 163, 176, 183, 189, 219)	61 stream crossings, 21 landslides, 4 other	26,162
Moderate Low	**44** (site #: 8, 9, 12, 16, 25, 35, 38, 45, 48, 51, 64, 67, 72, 74, 77, 83, 89, 94, 98, 106, 107, 113, 116, 117, 128, 129, 132, 138, 146, 149, 151, 152, 157, 164, 165, 168, 172, 175, 181, 185, 188, 195, 201, 211)	**8** (site #: 2, 23, 79, 155, 190, 203, 204, 221)	31 stream crossings, 16 landslide, 5 other	12,063
Low	**38** (site #: 20, 24, 26, 27, 33, 36, 40, 43, 46, 50, 55, 59, 61, 70, 82, 84, 88, 96, 101, 108, 110, 114, 115, 118, 120, 121, 136, 150, 158, 166, 177, 179, 191, 193, 194, 196, 197, 210)	**2** (site #: 3, 205)	19 stream crossings, 9 landslides, 12 other	7,792
Total	**190**	**32**	**147 stream crossings, 51 landslides, 24 other**	**64,484**

1/10/2021

sites were listed as having a low treatment immediacy with approximately 7,792 yds^3 of future sediment delivery.

Road priority - An efficient way of addressing treatment priorities is to identify high priority roads for treatment. This manner of treating sites maximizes equipment efficiency and minimizes the need to "jump around" the watershed treating only the high priority sites. Prioritizing roads is the preferred method of establishing watershed work plans for erosion prevention, and there are several way of developing a prioritized list.

Table 3 summarizes the proposed treatments for sites inventoried on all roads in the Little North Fork Gualala River watershed assessment area. These prescriptions include both upgrading and road closure measures. The database, as well as the field inventory sheets, provide details of the treatment prescriptions for each site. Most treatments require the use of heavy equipment, including an excavator, tractor, dump truck and grader. Some hand labor is required at sites needing new culverts, downspouts, culvert repairs, trash racks and/or for applying seed, plants and mulch following ground disturbance activities.

A total of 46 critical rolling dips have been recommended to prevent future diversions at streams that currently have a diversion potential. A total of 67 culverts are recommended for installation, either to upgrade existing culverts or to install culverts at unculverted streams. It is estimated that erosion prevention work will require the removal of approximately 33,347 yds^3 at 172 sites. Approximately 59% of the total volume excavated is associated with upgrading or excavating stream crossings and about 40% is proposed for excavating potentially unstable road fills (landslides). We have recommended 298 rolling dips be constructed and 8 ditch relief culverts be installed at selected locations, at spacings dictated by the steepness of the road. A total of 949 yds^3 of mixed and clean rip-rap sized rock is proposed to construct 40 armored wet crossings and armor 7 fillslope faces. Approximately 1,409 yds^3 of road rock is required to rock the road surface at 91 rolling dips, 24 stream crossing culvert installations, 3 critical dips and 3 other site specific locations. All recommended treatments conform to guidelines described in "The Handbook for Forest and Ranch Roads" prepared by PWA (1994) for the California Department of Forestry, Natural Resources Conservation Service and the Mendocino County Resource Conservation District.

F. Equipment Needs and Costs

Treatments for the 222 sites identified with future sediment delivery in the Little North Fork Gualala River assessment area will require approximately 1,223 hours of excavator time and 1,424 hours of tractor time to complete all prescribed upgrading, road closure, erosion control and erosion prevention work (Table 4). Excavator and tractor work is not needed at all the sites that have been recommended for treatment and, likewise, not all the sites will require both a tractor and an excavator. Approximately 492 hours of dump truck time has been listed for work in the basin for end-hauling excavated spoil from stream crossings and at unstable road and landing fills where local disposal sites are not available. Approximately 453 hours of labor time is needed for a variety of tasks such as installation or replacement of culverts, and the installation of debris barriers and downspouts. Another 171 hours are allocated for seeding, mulching and planting activities. Approximately 154 hours of grader time is necessary to apply road surface treatments, including outsloping.

1/10/2021

Table 3. Recommended treatments along all inventoried roads in the Little North Fork Gualala River watershed assessment area, Mendocino County, California.

Treatment	No.	Comment	Treatment	No.	Comment
Critical dip	46	To prevent stream diversions	Outslope road and remove ditch	97	Outslope 58,011 feet of road to improve road surface drainage
Install CMP	22	Install a CMP at an unculverted fill	Outslope road and retain ditch	9	Outslope 1,450 feet of road to improve road surface drainage
Replace CMP	45	Upgrade an undersized CMP	Install rolling dips	298	Install rolling dips to improve road drainage
Excavate soil	172	Typically fillslope & crossing excavations; excavate a total of 33,347 yds^3	Remove berm	52	Remove 30,392 feet of berm to improve road surface drainage
Down spouts	2	Installed to protect the outlet fillslope from erosion	Install ditch relief CMP	8	Install ditch relief culverts to improve road surface drainage
Wet crossing	40	Install 2 rocked fords and 38 armored fill crossing using 873 yds^3 rip-rap and armor	Clean/cut ditch	13	Clean/cut 1,545 feet of ditch
Clean CMP	1	Remove debris and/or sediment from CMP inlet	Rock road surface	121	Rock or re-rock road surface using 1,409 yds^3 road rock
Install bridge	5	Install bridge	Cross road drains	20	Install cross road drains to improve road drainage
Add trash rack	5	Install trash rack	Other	5	Miscellaneous treatments
Armor fill face	7	Rock armor to protect fillslope from erosion using 76 yds^3 of rock	No treatment recommended	3	
Inslope road	6	Inslope 590 feet of road to improve road surface drainage			

PART OF PLAN

Estimated costs for erosion prevention treatments - Prescribed treatments are divided into two components: a) site specific erosion prevention work identified during the watershed inventories, and b) control of persistent sources of road surface, ditch and cutbank erosion and associated sediment delivery to streams. The site-specific work is further divided into road upgrading activities and road closure (decommissioning) activities. The total costs for road-related erosion control at sites with future sediment delivery is estimated at approximately $630,554 for an average cost-effectiveness value of approximately $9.78 per cubic yard of sediment prevented from entering Little North Fork Gualala River and its tributaries (Table 5).

Overall site specific erosion prevention work: Equipment needs for site specific erosion prevention work at sites with future sediment delivery are expressed in the database, and summarized in Table 4, as direct excavation times, in hours, to treat all sites having a high, moderate, or low treatment immediacy. These hourly estimates include only the time needed to treat each of the sites, and do not include travel time between work sites, times for basic road surface treatments that are not associated with a specific "site," or the time needed for work conferences at each site. These additional times are accumulated as "logistics" and must be added to the work times to determine total equipment costs as shown in Table 5. Finally, the

1/10/2021

366.213

Table 4. Estimated heavy equipment and labor requirements for treatment of all inventoried sites with future sediment delivery, Little North Fork Gualala River watershed assessment area, Mendocino County, California.

Treatment Immediacy	Site (#)	Excavated Volume (yds^3)	Excavator (hrs)	Tractor (hrs)	Dump Trucks (hrs)	Grader (hrs)	Labor (hrs)
High, High/Moderate	43	11,025	344	395	137	23	149
Moderate, Moderate/Low	139	29,838	783	897	337	104	271
Low	40	2,733	96	132	18	27	33
Total	**222**	**43,596**	**1,223**	**1,424**	**492**	**154**	**453**

estimated equipment time needed to reconstruct or open roads which have been abandoned are listed as a separate line item in Table 5.

The costs in Table 5 are based on a number of assumptions and estimates, and many of these are included as footnotes to the table. The costs provided are assumed reasonable if work is performed by outside contractors, with no added overhead for contract administration and pre- and post-project surveying. Movement of equipment to and from the site will require the use of low-boy trucks. The majority of treatments listed in this plan are not complex or difficult for equipment operators experienced in road upgrading and road decommissioning operations on forest lands. The use of inexperienced operators or the wrong combination of heavy equipment would require additional technical oversight and supervision in the field, as well as escalation of the cost to implement the work.

Table 5 lists a total of 712 hours for "supervision" time for detailed pre-work layout, project planning (coordinating and securing equipment and obtaining plant and mulch materials), on-site equipment operator instruction and supervision, establishing effectiveness monitoring measures, and post-project cost effectiveness analysis and reporting. It is expected that the project coordinator will be on-site full time at the beginning of the project and intermittently after equipment operations have begun.

G. Conclusion

The expected benefit of completing the erosion control and prevention planning work lies in the reduction of long term sediment delivery to the North Fork Gualala River, an important salmonid tributary to the Gualala River watershed. A critical first-step in the overall risk-reduction process is the development of a watershed transportation analysis and plan. In developing this plan, all roads in an ownership or sub-watershed are considered for either decommissioning or upgrading, depending upon the owner's needs and the risk of erosion and sediment delivery to streams. Not all roads are high risk roads and those that pose a low risk of degrading aquatic habitat in the watershed may not need immediate attention. It is therefore important to rank and prioritize roads in each sub-watershed, and within each ownership, based on their potential to impact downstream resources, as well as their importance to the overall transportation system and to management needs.

1/10/2021

366,214

Table 5. Estimated logistic requirements and costs for road-related erosion control and erosion prevention work on all inventoried sites with future sediment delivery in the Little North Fork Gualala River watershed assessment area, Mendocino County, California

Cost Category[1]		Cost Rate[2] ($/hr)	Estimated Project Times			Total Estimated Costs[5] ($)
			Treatment[3] (hours)	Logistics[4] (hours)	Total (hours)	
Move-in; move-out[6] (Low Boy expenses)	Excavator	95	6.0	--	6.0	570
	D-5 tractor	95	6.0	--	6.0	570
Heavy Equipment requirements for site specific treatments	Excavator	130	1,199	360	1,559	202,670
	D-5 tractor	90	1,118	335	1,453	130,770
	Dump Truck	65	492	148	640	41,600
Heavy Equipment requirements for road drainage treatments	Excavator	130	24	7	31	4,030
	D-5 tractor	90	309	93	402	36,180
	Grader	90	155	47	202	18,180
Laborers[7]		28	600	180	780	21,840
Rock Costs: (includes trucking for 1,409 yds^3 of road rock and 979 yds^3 of rip-rap sized rock)						40,596
Culvert materials costs (320' of 18', 1790' of 24", 890' of 30", 695' of 36", 50' of 42", 365' of 48", 80' of 54", 350' of 60". Costs included for couplers)						92,070
Mulch, seed and planting materials for 10.7 acres of disturbed ground[8]						5,878
Layout, Coordination, Supervision, and Reporting[9]		50	--	--	712	35,600
Total Estimated Costs						**$ 630,554**
Potential sediment savings: 64,484 yds^3						
Overall project cost-effectiveness: $ 9.78 spent per cubic yard saved						

[1] Costs for tools and miscellaneous materials have not been included in this table. Costs for administration and contracting are variable and have not been included. Costs and dump truck time (if needed) for re-rocking the road surface at sites where upgraded roads are outsloped are not included.

[2] Costs listed for heavy equipment include operator and fuel. Costs listed are estimates for favorable local private sector equipment rental and labor rates.

[3] Treatment times include all equipment hours expended on excavations and work directly associated with erosion prevention and erosion control at all the sites.

[4] Logistic times for heavy equipment (30%) include all equipment hours expended for opening access to sites on maintained and abandoned roads, travel time for equipment to move from site-to-site, and conference times with equipment operators at each site to convey treatment prescriptions and strategies. Logistic times for laborers (30%) includes estimated daily travel time to project area.

[5] Total estimated project costs listed are averages based on private sector equipment rental and labor rates.

[6] Lowboy hauling for tractor and excavator, 6 hours round trip for two (2) crews to areas within the Little North Fork Gualala watershed. Costs assume 2 hauls each for two pieces of equipment (one to move in and one to move out).

[7] An additional 171 hours of labor time is added for straw mulch and seeding activities.

[8] Seed costs equal $6/pound for erosion control seed. Seed costs based on 50# of erosion control seed per acre. Straw costs include 50 bales required per acre at $5 per bale. Sixteen hours of labor are required per acre of straw mulching. Does not include additional seed and mulch required on decommissioned road surfaces within the Water/Lake Protection Zones.

[9] Supervision time includes detailed layout (flagging, etc) prior to equipment arrival, training of equipment operators, supervision during equipment operations, supervision of labor work and post-project documentation and reporting). Supervision times based on 50% of the total excavator time plus 2 weeks prior and 2 weeks post project implementation.

1/10/2021

366,215

Good land stewardship requires that roads either be upgraded and maintained, or intentionally closed ("put-to-bed"). The old practice of abandoning roads, by either installing barriers to traffic (logs, "tank traps" or gates) or simply letting them naturally revegetate, is no longer considered acceptable. Typically, roads continue to fail and erode for decades following abandonment.

All currently open and maintained roads within the Little North Fork Gualala River assessment area were recommended for upgrade treatments. Unmaintained and/or abandoned roads were evaluated on a road by road basis to determine whether roads should be upgraded and maintained, or temporarily or permanently decommissioned. With this prioritized plan of action, the landowners can work with the Sotoyome RCD or other entities to obtain potential funding to implement the proposed projects.

Road upgrading consists of a variety of techniques employed to "erosion-proof" and to "storm-proof" a road and prevent unnecessary future erosion and sedimentation. Erosion-proofing and storm-proofing typically consists of stabilizing slopes and upgrading drainage structures so that the road is capable of withstanding both annual winter rainfall and runoff as well as a large storm event without failing or delivering excessive sediment to the stream system. The goal of road upgrading is to strictly minimize the contributions of fine sediment from roads and ditches to stream channels, as well as to minimize the risk of serious erosion and sediment yield when large magnitude, infrequent storms and floods occur.

The proper word for pro-active road closure is "decommissioning". Decommissioning may be either permanent or temporary, but the treatments are largely the same. Properly decommissioned roads no longer require maintenance and are no longer sources of accelerated erosion and sediment delivery to a watershed's streams. The impacts of reopening old, abandoned roads so that they can be correctly decommissioned has been evaluated on a case-by-case basis, but the benefits (large reductions in long term erosion) almost always far outweigh the negative effects (small, short-term increases in erosion from bare soil areas). Decommissioning does not necessarily suggest permanent closure. Most decommissioned roads, if they are in stable locations, can be rebuilt and reopened at a future date, if they are needed, by simply reinstalling the stream crossings and regrading the former road bed.

1/10/2021

366.216

V. Little North Fork Gualala Stream Channel Inventory

A. Introduction

Approximately 4.3 miles of Class 1 stream channel was inventoried within the Little North Fork Gualala River watershed in October 2000. This assessment involved inventories along the major anadromous tributaries within the watershed. Stream channel inventories were conducted along the Mainstem North Fork Gualala River (2.2 mi), Dump Creek (0.4 mi), Doty Creek (1.0 mi), Log Cabin Creek (0.2 mi), and along 2 un-named tributaries (0.5 mi). The specific reaches that were inventoried are shown in Figure 4. The goals of the stream channel assessment were two-fold: 1) to identify stream side erosional processes and channel conditions along the anadromous stream channel reaches, and 2) to identify locations where cost-effective erosion control and habitat improvements could be implemented along or within the stream channels.

Aerial photos (1:15,840) were used as a base map to record stream channel observations. The stream channel survey started at the confluence of Little North Fork Gualala River and North Fork Gualala River and extended up the various channels listed above as depicted in Figure 4.

The individual channel base map depicts the location of past and future landslides greater than 50 yds^3 (both debris landslides and deep seated landslides) and bank erosion sites greater than 10 yds^3. In addition, these base maps include estimates of the feature dimensions. Each site that was identified as having the potential for future erosion and sediment delivery was assigned a site number and was quantified and described using a stream channel inventory data form (Figure 5).

Besides documenting locations of past and current erosion and landsliding along the channel, efforts were made to document other important channel features. These included:

- the location of fish structures and concentrations of large woody debris;
- the location of log jams;
- stream gradients, and
- the location of tributary stream junctions

Channel survey protocol

Erosion sites were identified based on field observations of past and active erosion with future sediment delivery and/or field evidence of potential failure (i.e. scarps and cracks) or erosion at locations that have not yet experienced any soil loss. Most of the stream channel inventory sites with potential future sediment delivery were not considered for treatment due to limited access and/or the inability to cost-effectively control the erosion. Some active bank erosion was not quantified because 1) it was spread out over long reaches with localized areas having relatively small erosion volumes and 2) it was considered not treatable. The following information about each site was collected on the PWA stream inventory data form (Figure 5).

<u>Location:</u> Location of the site includes left bank, right bank, or both.

<u>Road related</u>: If a site was considered road related, it was meant to imply a road had some role contributing to the erosion or failure.

<u>Problem</u>: The problem identified was generally the dominant type of erosion observed. Most if not all of the debris slide sites were being actively undercut, so there was also a component of

1/10/2021

366.217

Figure 4

1/10/2021

366.218

Figure 5. Stream channel inventory data form used in the Little North Fork Gualala watershed assessment

PWA STREAM CHANNEL INVENTORY DATA FORM

General	Site #:	Station#:	Date:	Mappers:	Watershed:	Stream:	
	Air Photo:	Location (LB,RB,Both)	Treat? (Y)	Road related? (Y)			
Problem	Debris slide	Debris torrent source	Slow, deep slide	Bank erosion	Log jam	Other	
	Past, future, both	Activity (A,W,IA):	Age (decade):	Hillslope (%):	Land use:	Undercut? (Y)	
Erosion	Past width:	Past depth:	Past length:	Past vol:	Past del (%)	Past yld (yds):	
E.P.: (H,M,L)	Future width:	Future depth:	Future length:	Future vol:	Fut del (%)	Fut yld (yds):	
Treatment	Immed: (H,M,L)	Complexity: (H,M,L)	Equipment or labor (E, L, B):	Access: (Easy, Moderate, Hard)	Local materials? (Y)	Import materials? (Y)	
	Excavate soil (Y)	Width (ft)	Depth (ft)	Length (ft)	Vol excavated (yds^3):	Rock armor buttress (Y)	Rock armor area (ft^2)
	Rock armor size (ft)	Log protection (Y)	Log protection width (ft)	Log protection length (ft)	Log protection height (ft)	Remove logs/rocks/debris (Y)	
	Plant erosion control (Y)	Plant riparian enhancement (Y)	Area Planted (ft^2)	Exclusionary fencing (Y)	Length of fence (ft)	Other (Y)	
Hours:	Excavator:	Dozer:	Dump truck:	Backhoe:	Labor:	Other:	
Problem:				Sketch:			
Treatment:							

PART OF PLAN

bank erosion associated with these features. Log jams were listed as the problem if they were the causal mechanism by which erosion was occurring but their sediment yield volumes have been tabulated under the actual type of erosion associated with the log jam.

Activity: The activity level was either documented as active, waiting or inactive. Debris slides with active bank erosion undercutting their toes were listed as active. Those without significant active undercutting but with some future potential were listed as waiting.

Volumes: Quantifying erosional features, both past and future, includes an element of professional judgement. Estimation of erosional activity and future volumes of bank erosion is based on considering factors such as:

1) location (is the site on a relatively straight reach or on the outside of a tight meander bend?);
2) average channel width;
3) stream energy; influenced by the size of the stream, stream gradient, obstructions and their orientation(s), degree of channel constriction and confinement;

1/10/2021

366.219

4) height of bank or banks being eroded;
5) composition and resistance of the materials in the bank to erosion;
6) presence or absence of natural armor.

Estimation of future volumes of debris slides is based on considering the geomorphology of the potential slide area and includes factors such as:

1) slope shape; (concave, convex, or planar)
2) break-in-slope; may indicate likely limit of slide or may extend up slope further; and
3) slope gradient or gradients if breaks-in-slope are present;

The estimation of future bank erosion volume also depends upon the time frame one is considering. In this survey, a 30 to 50 year time frame was envisioned. Past erosion was only documented when it was part of a future erosion site.

Erosion potential: The erosion potential (likelihood of future erosion) was listed as high, moderately high, moderate, moderately low, or low taking into account the factors previously noted.

Treatment immediacy: The combination of the erosion potential, the volume of sediment (in relation to the size and gradient of the stream), the feasibility of carrying out the treatment, and the long term effectiveness of the treatment factored into the treatment immediacy.

B. Results

A total of twenty-nine (29) past and potential future sites with sediment delivery were identified along inventoried Class I stream channel reaches within the Little North Fork Gualala watershed area. Inventoried sites include 20 bank erosion sites, 8 debris landslides and 1 log jam (Table 6). It is estimated that approximately 9,409 yds^3 was delivered in the past from these sites and 2,688 yds^3 could be delivered from these sites if they are not treated.

When evaluating erosion sites on the Little North Fork Gualala it is clear that the dominant erosion processes change from the main stem to the main tributaries. On the main stem, where stream gradients are low, the channel is unconfined and meandering, fluvial terraces are the dominant sediment source and bank erosion is the most common type of erosional process. On main tributaries where stream gradients are higher, the channel is confined, thick heterogeneous, low strength colluvial sediments are the dominant sideslope material and debris landsliding is the most common erosional process (Table 6).

Of the 29 sites identified, 2 have been recommended for erosion control and erosion prevention treatment. The remaining 27 sites identified have not been recommended for treatment because 1) some sites with future erosion and delivery are located in remote locations with little to no equipment access or 2) sites with no future erosion potential did not require treatment. Treating erosional sites along stream channels and tributaries is not as straight forward or cost effective as treating erosion related to the road system. In most cases, pioneering a road to allow heavy equipment access may generate more sediment and long term maintenance costs than is justifiable by either a sediment savings cost or sediment production analysis.

Estimated costs to treat the two sites recommended for erosion control and erosion prevention treatment is approximately $1,506. Heavy equipment needs for treatment implementation will

1/10/2021

366,220

include excavator and dozer. In addition, estimated costs are included for 30% logistics for all equipment hours expended to open access to sites, travel time for equipment to move from site-to-site, conference times with equipment operators at each site to convey treatment prescriptions and strategies; and "supervision" time for detailed pre-work layout, project planning and on-site equipment operator instruction and supervision.

Taking into consideration all the factors including: treatment immediacy, total sediment delivery, treatment cost-effectiveness, likelihood of controlling or preventing erosion, treatment complexity and equipment access, leads us to the conclusion that monies would be better spent treating sediment sources along the road system where equipment access is readily available and treatments are likely to be more effective.

Table 6. Stream channel survey sites by site number, Little North Fork Gualala River assessment area, Mendocino County, California

Stream name	Site #	Erosion Type	Erosion Potential	Past delivery (yds^3)	Future yield (yds^3)	Treat?	Treatment prescription	Estimated Treatment costs ($)
LNF Gualala	1	Bank erosion	ML	23	23	No	None/No access	0
LNF Gualala r	2	Bank erosion	L	22	3	No	None/No access	0
LNF Gualala	3	Bank erosion	M	96	96	No	None/No access	0
LNF Gualala	6	Bank erosion	ML	72	72	No	None/No access	0
LNF Gualala	7	Bank erosion	ML	385	96	No	None/No access	0
LNF Gualala	8	Bank erosion	L	74	74	No	None/No access	0
LNF Gualala	9	Bank erosion	L	61	0	No	None/No access	0
LNF Gualala	10	Bank erosion	L	56	0	No	None/No access	0
LNF Gualala	11	Bank erosion	M	187	62	No	None/No access	0
LNF Gualala	12	Bank erosion	ML	741	148	No	None/No access	0
LNF Gualala	15	Bank erosion	ML	100	24	No	None/No access	0
LNF Gualala	16	Log jam	M	178	89	No	None/No access	0
LNF Gualala	17	Debris slide	L	1,422	1,333	No	None/No access	0
LNF Gualala	18	Bank erosion	L	0	44	Yes	Excavate soil	310
LNF Gualala	19	Bank erosion	M	59	36	No	None/No access	0
LNF Gualala	20	Bank erosion	ML	83	17	No	None/No access	0
Doty Creek	21	Debris slide	L	231	0	No	None/No access	0
Doty Creek	22	Debris slide	L	417	0	No	None/No access	0
Doty Creek	23	Debris slide	L	56	0	No	None/No access	0
Doty Creek	24	Debris slide	L	133	0	No	None/No access	0
Doty Creek	25	Debris slide	L	97	0	No	None/No access	0
Doty Creek	26	Debris slide	M	1,800	0	No	None/No access	0
Doty Creek	27	Bank erosion	L	59	9	No	None/No access	0
No Name #1	29	Bank erosion	ML	2,222	111	No	None/No access	0
Log Cabin	30	Debris slide	L	97	0	No	None/No access	0
LNF Gualala	31	Bank erosion	M	222	222	No	None/No access	0
No Name # 2	32	Bank erosion	L	222	0	No	None/No access	0
LNF Gualala	33	Bank erosion	ML	250	185	Yes	Excavate soil	1,196
LNF Gualala	34	Bank erosion	L	44	44	No	None/No access	0
Totals	**29**	**20 bank erosion, 8 debris slides, 1 log jam**		**9,409**	**2,688**			**1,506**

1/10/2021

366,221

References

Harr, R.D. and R.A. Nichols. 1993. Stabilizing forest roads to help restore fish habitats: A Northwest Washington example. Fisheries. Vol.18, no. 4. pages 18-22.

Pacific Watershed Associates. 1994. Handbook for forest and ranch roads. Prepared for the Mendocino County Resource Conservation District in cooperation with the California Department of Forestry and the U.S. Soil Conservation Service. Mendocino Resource Conservation District, Ukiah, California. 163 pages.

Weaver, W.E. and D.K. Hagans. 1999. Storm-proofing forest roads. In: Proceedings of the Skyline Forest Sedimentation Conference, Corvallis, Oregon. April, 1999, pages 230-245.

Weaver, W.E. and D.K. Hagans. 1996. Sediment treatments and road restoration: protecting and restoring watersheds from sediment-related impacts. Chapter 4, IN: Healing the Watershed, A Guide to Native Fish Restoration, Pacific Rivers Council, Eugene, Oregon. pages 109-143.

Weaver, W.E., D.K. Hagans and M.A. Madej. 1987. Managing forest roads to control cumulative erosion and sedimentation effects. In: Proc. of the California watershed management conference, Report 11 (18-20 Nov. 1986, West Sacramento, Calif.), Wildland Resources Center, Univ. of California, Berkeley, California. 6 pages.

Weaver, W.E. and R.A. Sonnevil. 1984. Relative cost-effectiveness of erosion control for forest land rehabilitation, Redwood National Park. In: Erosion Control...Man and Nature, Proceedings of Conference XV, Int'l Erosion Control Assoc, Feb 23-24, 1984, Denver, CO. pages 83-115.

PART OF PLAN

1/10/2021

366,222

Attachment 2.

Final Report:

GRI Little North Fork Gualala River Sediment Reduction Project, Mendocino County, CA

for

Sotoyome Resource Conservation District
CDFG Contract #P0140405

April 2004

1/1·/2021

366,223

Little North Fork of the Gualala River Sediment Reduction Project - 2003

In the summer of 2003, Gualala Redwoods, Inc. and the California Department of Fish and Game, using SB-271 funds, shared equally in the costs of upgrading all the roads in the Little North Fork of the Gualala River. The grant was awarded to and administered by the Sotoyome Resoruce Conservation District. The actual work was planned and overseen by Pacific Watershed Associates and Gualala Redwoods. CDF&G administration was by Scott Monday and Doug Albin. The pricipal contractors were McCanless Excavating and L.D. Giacomini Enterprises. The work was completed on budget and on time.

10/14/03 Before **PPt** Up **Dir** **Cr Station** 0 **LWD Site** **Photo** 1714
Road# 60.4 **Mi.** 1.610 **Map Pt.** 1470 **THP** 271 LN LNF P01030405A **PID** 0
Blowing straw.

F:\GRI Photos\Small\Big Num\1714 DCP_1450.jpg

1/10/2021

366.224

Little North Fork of the Gualala River Sediment Reduction Project
2003

In the summer of 2003, Gualala Redwoods, Inc. (GRI) and the California Department of Fish and Game (DFG), using SB-271 funds, shared equally in the costs of upgrading all the roads in the Little North Fork of the Gualala River. The grant was awarded to and administered by the Sotoyome Resource Conservation District (SRCD). The SRCD contracted with GRI to conduct the work. The actual work was planned and overseen by Pacific Watershed Associates (PWA) and Gualala Redwoods, Inc. CDF&G administration was by Scott Monday and Doug Albin. The principal contractors were McCanless Excavating and L.D. Giacomini Enterprises. The work was completed on budget and on time.

1. The Little North Fork of the Gualala River sediment reduction project was completed under grant agreement P0130405.

2. The work was located in the Doty Creek (Little North Fork of the Gualala River) planning watershed.

3. The project can be accessed by turning off Highway One in Gualala on Old State Highway (GRI road 60) and proceeding 2.1 miles up the river road to the Green Bridge at the confluence of the North Fork of the Gualala River and the South Fork of the Gualala River. Turn left on GRI's river road (Still GRI road 60. Go 1.1 miles to the confluence of the Little North Fork and the North Fork of the Gualala River. This is the beginning of the project area. The landowner is Gualala Redwoods, Inc. P.O. Box 197, Gualala, CA 95445. GRI's phone number is 707-884-4226.

4. The project was initiated by the Gualala River Watershed Council and Gualala Redwoods, Inc. The SRCD applied for an SB271 assessment grant from DFG. The SRCD was awarded Contract #: P9985012 which allowed them to contract with PWA to assess the Little North Fork of the Gualala River watershed. In the summer of 2001 this work was completed and resulted in a Report Dated March 2002.

   Another SB271 grant was applied for by the SRCD to implement the recommendations of the PWA assessment. It was to be a 50/50 cost share with GRI. The SRCD was awarded Contract #: P0140405.

   In the summer of 2003, work began. The project was jointly administered by PWA and GRI. Crews from McCanless Excavating and L.D. Giacomini Enterprises were used. Two cats, two excavators and an assortment of other equipment worked all summer.

1/10/2021

366,225

Some of the work in on the east side of the watershed was completed in the summer of 2001, but was not billed under this contract.

Danny Hagans from PWA reviewed the sites ahead of the crews and revised the prescriptions as necessary. Many changes were made. The most common change was to install a rocked ford instead of a culvert in small (class III) stream crossings.

The work went smoothly and was completed on time and on budget.

5. Work was completed on 248 PWA sites. Thirty-five miles (80%) of road in the watershed were out sloped and dipped. During the project, 38,079 yards of material were excavated which prevented 54,186 yards of sediment from entering the streams. At the end of the season, when it appeared that there would be surplus money, three additional culverts were replaced outside the project area. Nineteen minor sites were left for future work. The attached database report gives a detailed record of each site completed.

6. The work occurred between May 15 and November 15, 2003. There were 704 person hours of supervision, 4,501 person hours of equipment operation and 724 person hours of general labor expended on the project.

7. See the attached photo album for photographs of the work. The Photos are sorted by road number, mileage, direction of photo and date.

8. A total of $563,687.61 was spent on the project. The state was billed $276,382.00. GRI's share was $287,305.61.

1/10/2021

366,226

The Little North Fork of the Gualala River Sediment Reduction Project - 2003

In the summer of 2003, Gualala Redwoods, Inc. and the California Department of Fish and Game, using SB-271 funds, shared equally in the costs of upgrading all the roads in the Little North Fork of the Gualala River. The grant was awarded to and administered by the Sotoyome Resoruce Conservation District. The actual work was planned and overseen by Pacific Watershed Associates and Gualala Redwoods. CDF&G administration was by Scott Monday and Doug Albin. The pricipal contractors were McCanless Excavating and L.D. Giacomini Enterprises. The work was completed on budget and on time.

Road Upgrading **Photo #** 1881
11/10/03

Map Pt 0 **Road** 1.08 **Mi.** 0.08

Old **New**

PPt 0 **Dir** 310 **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

The estuary of the Gualala River after the first rain in the fall of 2003.

People in Photo:

F:\GRI Photos\Small\BigNum\1879 DCP_1688.jpg

Road Upgrading **Photo #** 1882
10/19/01

Map Pt 0 **Road** 60 **Mi.** 2.8

Old **New**

PPt 0 **Dir** 320 **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

This is a view of the Little North Fork of the Gualala watershed with Elk Prairie in the foreground.

People in Photo:

F:\GRI Photos\Small\786 LNF Heli DCP_0752.jpg

PART OF PLAN

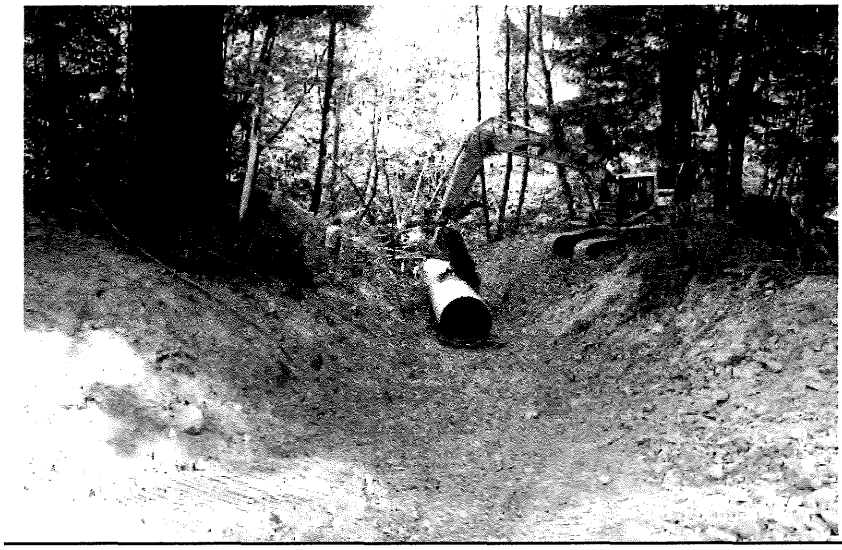
1/10/2021

366,227

Road Upgrading **Photo #** 1825
10/27/03
Map Pt 2300 **Road** 60 **Mi.** 3.12
Culv. Replace **Old** 30" **New** 48"
PPt down **Dir** **PW** Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1825 DCP_1557.jpg



Road Upgrading **Photo #** 1842
10/30/03
Map Pt 2300 **Road** 60 **Mi.** 3.12
Culv. Replace **Old** 30" **New** 48"
PPt down **Dir** **PW** Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Bob Neal Stan Stornetta

F:\GRI Photos\Small\BigNum\1842 DCP_1592.jpg

Road Upgrading **Photo #** 1843
10/30/03
Map Pt 2300 **Road** 60 **Mi.** 3.12
Culv. Replace **Old** 30" **New** 48"
PPt down **Dir** **PW** Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1843 DCP_1593.jpg

1/10/2021 366.228

Road Upgrading **Photo #** 1869
11/5/03
Map Pt 2300 **Road** 60 **Mi.** 3.12
Culv. Replace **Old** 30" **New** 48"
PPt down **Dir** **PW** Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1869 DCP_1656.jpg

Road Upgrading **Photo #** 1870
11/5/03
Map Pt 2300 **Road** 60 **Mi.** 3.12
Culv. Replace **Old** 30" **New** 48"
PPt down **Dir** **PW** Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1870 DCP_1657.jpg

Road Upgrading **Photo #** 1827
10/27/03
Map Pt 2300 **Road** 60 **Mi.** 3.12
Culv. Replace **Old** 30" **New** 48"
PPt left **Dir** **PW** Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1827 DCP_1561.jpg

1/10/2021 366,229

Road Upgrading **Photo #** 1826
10/27/03
Map Pt 2300 **Road** 60 **Mi.** 3.12
Culv. Replace **Old** 30" **New** 48"
PPt Up **Dir** **PW** Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1826 DCP_1560.jpg

Road Upgrading **Photo #** 1844
10/30/03
Map Pt 2300 **Road** 60 **Mi.** 3.12
Culv. Replace **Old** 30" **New** 48"
PPt Up **Dir** **PW** Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1844 DCP_1596.jpg

Road Upgrading **Photo #** 1871
11/5/03
Map Pt 2300 **Road** 60 **Mi.** 3.12
Culv. Replace **Old** 30" **New** 48"
PPt Up **Dir** **PW** Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1871 DCP_1660.jpg

1/10/2021 366,230

Road Upgrading **Photo #** 1872
11/5/03
Map Pt 2300 **Road** 60 **Mi.** 3.12
Culv. Replace **Old** 30" **New** 48"
PPt Up **Dir** **PW** Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1872 DCP_1661.jpg

Road Upgrading **Photo #** 1023
7/9/02
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\1023 1519 DCP_1615.JPG

Road Upgrading **Photo #** 1571
8/20/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1571 DCP_1235.jpg

1/10/2021 366.231

Road Upgrading **Photo #** 1817
10/27/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Vic Spurgeon

F:\GRI Photos\Small\BigNum\1817 DCP_1526.jpg

Road Upgrading **Photo #** 1818
10/27/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Vic Spurgeon Kelly McCanless

F:\GRI Photos\Small\BigNum\1818 DCP_1534.jpg

Road Upgrading **Photo #** 1828
10/29/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1828 DCP_1562.jpg

1/10/2021

366,232

Road Upgrading **Photo #** 1862
11/5/03

Map Pt 1519 **Road** 60.39 **Mi.** 0.210

Culv. Maintenance **Old** 48" **New** 84"

PPt down **Dir** **PW** Doty Creek

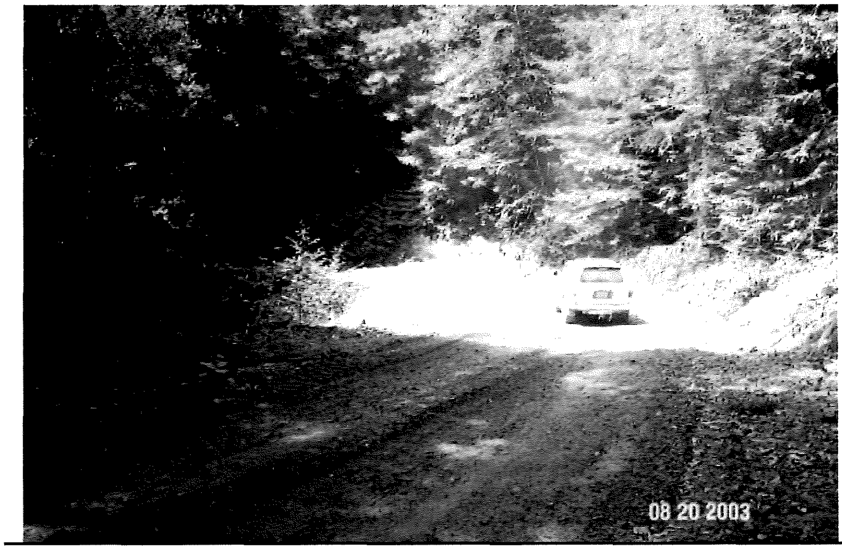
THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1862 DCP_1643.jpg



Road Upgrading **Photo #** 1570
8/20/03

Map Pt 1519 **Road** 60.39 **Mi.** 0.210

Culv. Maintenance **Old** 48" **New** 84"

PPt Right **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1570 DCP_1234.jpg

Road Upgrading **Photo #** 1816
10/27/03

Map Pt 1519 **Road** 60.39 **Mi.** 0.210

Culv. Maintenance **Old** 48" **New** 84"

PPt Right **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:
Vic Spurgeon

F:\GRI Photos\Small\BigNum\1816 DCP_1525.jpg

1/10/2021

366,233

Road Upgrading **Photo #** 1829
10/29/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1829 DCP_1563.jpg

Road Upgrading **Photo #** 1863
11/5/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1863 DCP_1646.jpg


08 20 2003

Road Upgrading **Photo #** 1573
8/20/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1573 DCP_1238.jpg

PART OF PLAN

1/10/2021

366,234

Road Upgrading **Photo #** 1815
10/27/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Vic Spurgeon

F:\GRI Photos\Small\BigNum\1815 DCP_1520.jpg

Road Upgrading **Photo #** 1830
10/29/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1830 DCP_1564.jpg

Road Upgrading **Photo #** 1864
11/5/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1864 DCP_1648.jpg

1/10/2021

366,235

Road Upgrading **Photo #** 1569
8/20/03
Map Pt 2171 **Road** 60.39 **Mi.** 0.9
Rock Pit **Old** - **New** -
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1569 DCP_1233.jpg

Road Upgrading **Photo #** 1567
8/20/03
Map Pt 1506 **Road** 60.39 **Mi.** 1.19
Other **Old** - **New** -
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1567 DCP_1230.jpg

Road Upgrading **Photo #** 1568
8/20/03
Map Pt 1506 **Road** 60.39 **Mi.** 1.19
Other **Old** - **New** -
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1568 DCP_1231.jpg

1/10/2021

366,236

Road Upgrading **Photo #** 1562
8/20/03

Map Pt 1494 **Road** 60.39 **Mi.** 1.515

Other **Old** 18" **New** 24"

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1562 DCP_1206.jpg

Road Upgrading **Photo #** 1680
10/9/03

Map Pt 1494 **Road** 60.39 **Mi.** 1.515

Other **Old** 18" **New** 24"

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1680 DCP_1378.jpg

Road Upgrading **Photo #** 1563
8/20/03

Map Pt 1494 **Road** 60.39 **Mi.** 1.515

Other **Old** 18" **New** 24"

PPt Right **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1563 DCP_1207.jpg

PART OF PLAN

1/10/2021

366.237

Road Upgrading **Photo #** 1564
8/20/03

Map Pt 1494 **Road** 60.39 **Mi.** 1.515

Other **Old** 18" **New** 24"

PPt Right **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:
Rick Loghry Vic Spurgeon

F:\GRI Photos\Small\BigNum\1564 DCP_1216.jpg

Road Upgrading **Photo #** 1565
8/20/03

Map Pt 1494 **Road** 60.39 **Mi.** 1.515

Other **Old** 18" **New** 24"

PPt Right **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:
Vic Spurgeon Rick Loghry

F:\GRI Photos\Small\BigNum\1565 DCP_1218.jpg

Road Upgrading **Photo #** 1566
8/20/03

Map Pt 1494 **Road** 60.39 **Mi.** 1.515

Other **Old** 18" **New** 24"

PPt Right **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:
Rick Loghry Vic Spurgeon

F:\GRI Photos\Small\BigNum\1566 DCP_1224.jpg

1/10/2021

366,238

Road Upgrading **Photo #** 1678

10/9/03

Map Pt 1494 **Road** 60.39 **Mi.** 1.515

Other **Old** 18" **New** 24"

PPt Right **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1678 DCP_1372.jpg

Road Upgrading **Photo #** 1679

10/9/03

Map Pt 1494 **Road** 60.39 **Mi.** 1.515

Other **Old** 18" **New** 24"

PPt Right **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1679 DCP_1374.jpg

Road Upgrading **Photo #** 1535

8/11/03

Map Pt 1516 **Road** 60.3915 **Mi.** 0.520

Other **Old** **New** 60"

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1535 DCP_1197.jpg

PART OF PLAN

366,239

1/10/2021

Road Upgrading **Photo #** 1536
8/11/03
Map Pt 1516 **Road** 60.3915 **Mi.** 0.520
Other **Old** **New** 60"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1536 DCP_1198.jpg

Road Upgrading **Photo #** 1682
10/9/03
Map Pt 1516 **Road** 60.3915 **Mi.** 0.520
Other **Old** **New** 60"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1682 DCP_1380.jpg

Road Upgrading **Photo #** 1683
10/9/03
Map Pt 1516 **Road** 60.3915 **Mi.** 0.520
Other **Old** **New** 60"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1683 DCP_1381.jpg

366,240

1/10/2021

Road Upgrading **Photo #** 1539
8/11/03
Map Pt 1516 **Road** 60.3915 **Mi.** 0.520
Other **Old** **New** 60"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1539 DCP_1204.jpg

Road Upgrading **Photo #** 1681
10/9/03
Map Pt 1516 **Road** 60.3915 **Mi.** 0.520
Other **Old** **New** 60"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1681 DCP_1379.jpg

Road Upgrading **Photo #** 1537
8/11/03
Map Pt 1516 **Road** 60.3915 **Mi.** 0.520
Other **Old** **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1537 DCP_1199.jpg

1/10/2021 366,241

Road Upgrading **Photo #** 1538
8/11/03
Map Pt 1516 **Road** 60.3915 **Mi.** 0.520
Other **Old** **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1538 DCP_1201.jpg

Road Upgrading **Photo #** 1684
10/9/03
Map Pt 1516 **Road** 60.3915 **Mi.** 0.520
Other **Old** **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1684 DCP_1383.jpg

Road Upgrading **Photo #** 1473
6/10/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Pre work inspection with AT&T

People in Photo:

F:\GRI Photos\Small\BigNum\1473 DCP_2556.jpg

1/10/2021

366,242

Road Upgrading **Photo #** 1474
6/10/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Pre work inspection with AT&T

People in Photo:

F:\GRI Photos\Small\BigNum\1474 DCP_2557.jpg

Road Upgrading **Photo #** 1692
10/10/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1692 DCP_1400.jpg

Road Upgrading **Photo #** 1700
10/13/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1700 DCP_1411.jpg

PART OF PLAN

1/10/2021

366.243

Road Upgrading **Photo #** 1701
10/13/03

Map Pt 1553 **Road** 60.4 **Mi.** 0.04

Bridge - Perm **Old** 48" **New** 1Br

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1701 DCP_1413.jpg

Road Upgrading **Photo #** 1471
6/10/03

Map Pt 1553 **Road** 60.4 **Mi.** 0.04

Bridge - Perm **Old** 48" **New** 1Br

PPt Right **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

Pre work inspection with AT&T

People in Photo:
Bob Neal

F:\GRI Photos\Small\BigNum\1471 DCP_2553.jpg

Road Upgrading **Photo #** 1472
6/10/03

Map Pt 1553 **Road** 60.4 **Mi.** 0.04

Bridge - Perm **Old** 48" **New** 1Br

PPt Up **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

Pre work inspection with AT&T

People in Photo:

F:\GRI Photos\Small\BigNum\1472 DCP_2554.jpg

PART OF PLAN

1/10/2021

366.244

Road Upgrading **Photo #** 1690
10/9/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1690 DCP_1392.jpg

Road Upgrading **Photo #** 1691
10/9/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1691 DCP_1397.jpg

Road Upgrading **Photo #** 1693
10/10/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

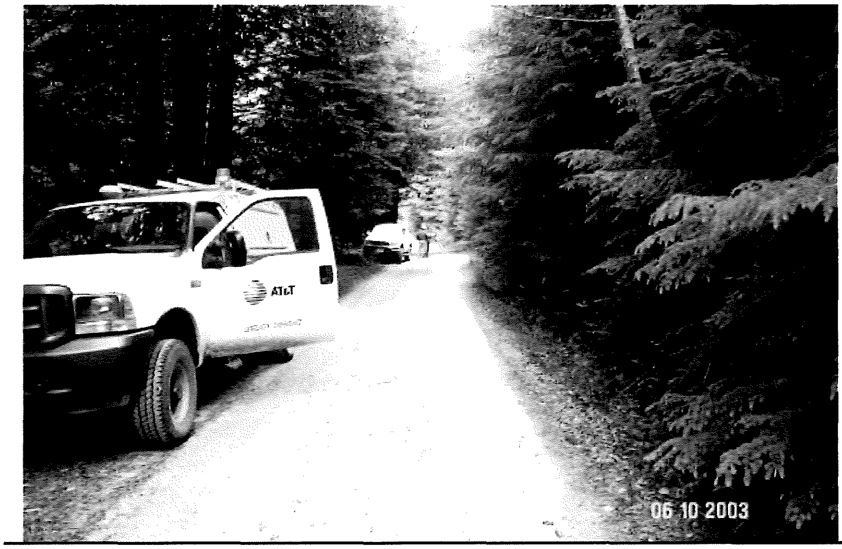
F:\GRI Photos\Small\BigNum\1693 DCP_1401.jpg

1/10/2021 366,245

Road Upgrading **Photo #** 1699
10/13/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1699 DCP_1410.jpg



Road Upgrading **Photo #** 1475
6/10/03
Map Pt 1552 **Road** 60.4 **Mi.** 0.265
Other **Old** 18" **New** 30"
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Pre work inspection with AT&T

People in Photo:
Bob Neal

F:\GRI Photos\Small\BigNum\1475 DCP_2560.jpg

Road Upgrading **Photo #** 1477
6/10/03
Map Pt 1534 **Road** 60.4 **Mi.** 0.49
Other **Old** 36" **New** 48"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Pre work inspection with AT&T

People in Photo:

F:\GRI Photos\Small\BigNum\1477 DCP_2562.jpg

1/10/2021

366.246

Road Upgrading **Photo #** 1478
6/10/03
Map Pt 1534 **Road** 60.4 **Mi.** 0.49
Other **Old** 36" **New** 48"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Pre work inspection with AT&T

People in Photo:

F:\GRI Photos\Small\BigNum\1478 DCP_2564.jpg

Road Upgrading **Photo #** 1661
10/6/03
Map Pt 1534 **Road** 60.4 **Mi.** 0.49
Other **Old** 36" **New** 48"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1661 DCP_1343.jpg

Road Upgrading **Photo #** 1732
10/20/03
Map Pt 1534 **Road** 60.4 **Mi.** 0.49
Other **Old** 36" **New** 48"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1732 DCP_1491.jpg

1/10/2021 366,247

Road Upgrading **Photo #** 1476
6/10/03
Map Pt 1534 **Road** 60.4 **Mi.** 0.49
Other **Old** 36" **New** 48"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Pre work inspection with AT&T

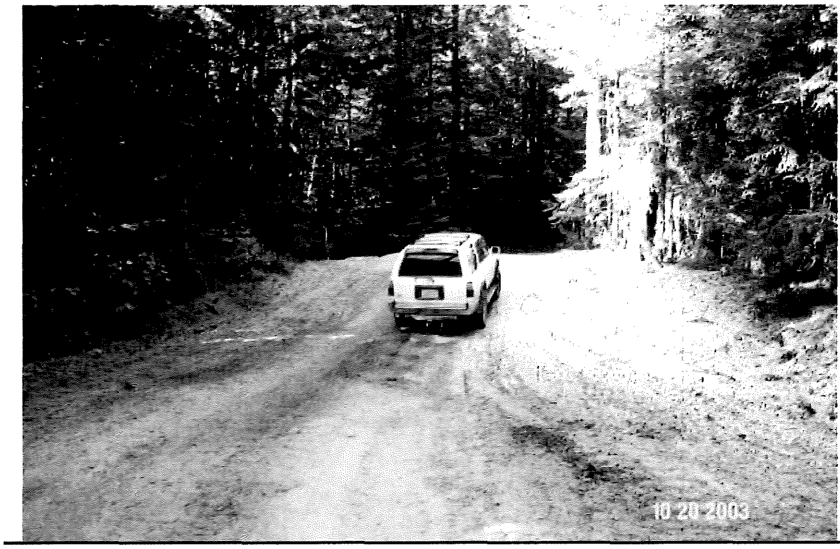
People in Photo:

F:\GRI Photos\Small\BigNum\1476 DCP_2561.jpg

Road Upgrading **Photo #** 1658
10/6/03
Map Pt 1534 **Road** 60.4 **Mi.** 0.49
Other **Old** 36" **New** 48"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1658 DCP_1337.jpg



Road Upgrading **Photo #** 1730
10/20/03
Map Pt 1534 **Road** 60.4 **Mi.** 0.49
Other **Old** 36" **New** 48"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1730 DCP_1489.jpg

1/10/2021 366,248

Road Upgrading **Photo #** 1659
10/6/03
Map Pt 1534 **Road** 60.4 **Mi.** 0.49
Other **Old** 36" **New** 48"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1659 DCP_1339.jpg

Road Upgrading **Photo #** 1731
10/20/03
Map Pt 1534 **Road** 60.4 **Mi.** 0.49
Other **Old** 36" **New** 48"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1731 DCP_1490.jpg

Road Upgrading **Photo #** 1479
6/10/03
Map Pt 1667 **Road** 60.4 **Mi.** 0.710
Other **Old** 18" **New** -
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Pre work inspection with AT&T

People in Photo:

F:\GRI Photos\Small\BigNum\1479 DCP_2565.jpg

1/10/2021 366,249

Road Upgrading **Photo #** 1654
10/5/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1654 DCP_1334.jpg

Road Upgrading **Photo #** 1657
10/6/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry Bob Neal

F:\GRI Photos\Small\BigNum\1657 DCP_1348.jpg

Road Upgrading **Photo #** 1660
10/6/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1660 DCP_1342.jpg

1/10/2021 366,249

Road Upgrading **Photo #** 1710
10/14/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1710 DCP_1432.jpg

Road Upgrading **Photo #** 1722
10/15/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1722 DCP_1469.jpg

Road Upgrading **Photo #** 1653
10/5/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1653 DCP_1333.jpg

1/10/2021

366,250

Road Upgrading **Photo #** 1667
10/9/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

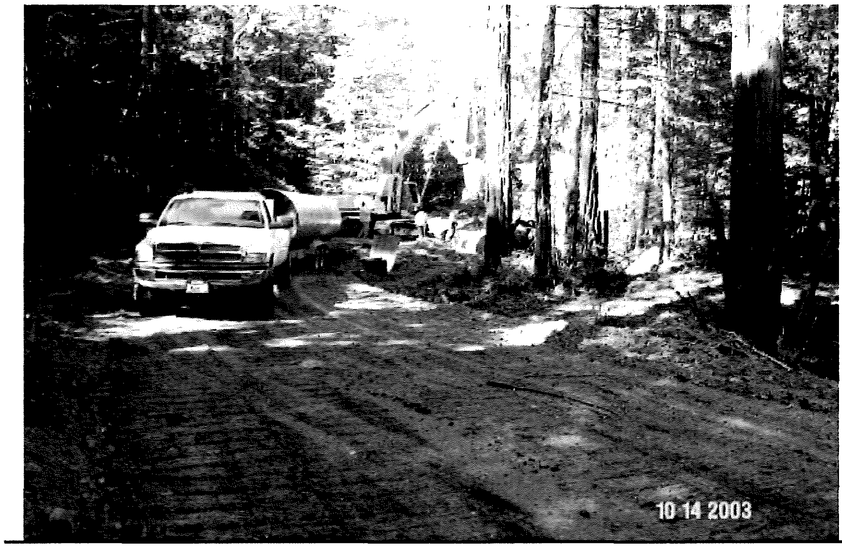
People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1667 DCP_1354.jpg

Road Upgrading **Photo #** 1708
10/14/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1708 DCP_1429.jpg



Road Upgrading **Photo #** 1711
10/14/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Vic Spurgeon Rick Loghry

F:\GRI Photos\Small\BigNum\1711 DCP_1464.jpg

PART OF PLAN

1/10/2021 366,251

Road Upgrading **Photo #** 1725
10/15/03

Map Pt 1473 **Road** 60.4 **Mi.** 0.960

Other **Old** 36" **New** 60"

PPt left **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1725 DCP_1472.jpg

Road Upgrading **Photo #** 1669
10/9/03

Map Pt 1473 **Road** 60.4 **Mi.** 0.960

Other **Old** 36" **New** 60"

PPt Right **Dir** **PW** Doty Creek

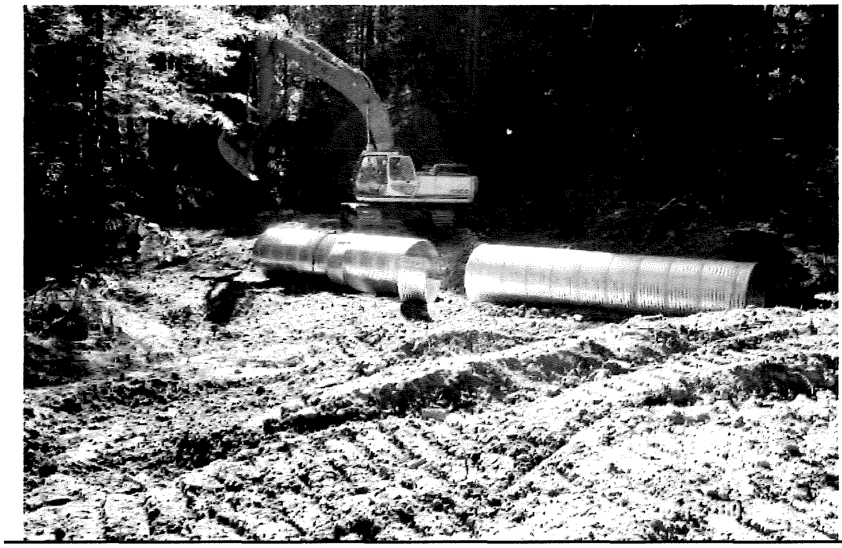
THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1669 DCP_1356.jpg



Road Upgrading **Photo #** 1709
10/14/03

Map Pt 1473 **Road** 60.4 **Mi.** 0.960

Other **Old** 36" **New** 60"

PPt Right **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

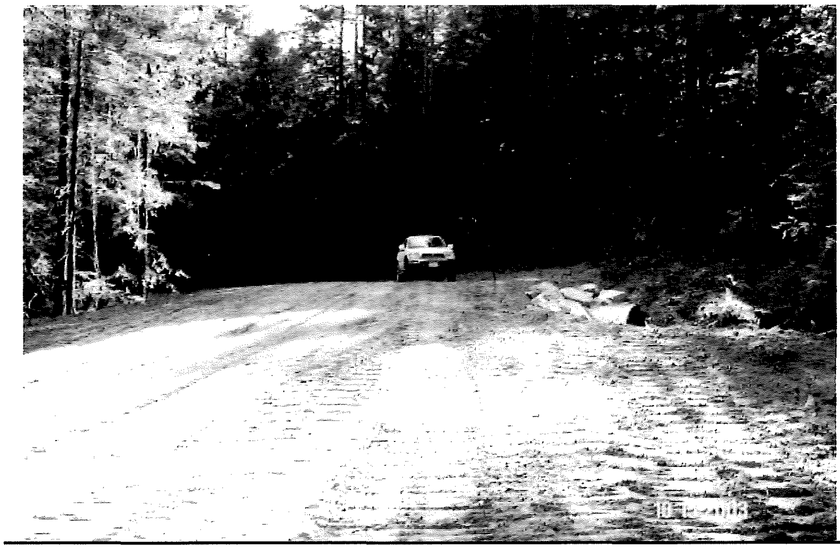
PID 0 **LWD**

Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1709 DCP_1431.jpg

1/10/2021 366,252



Road Upgrading **Photo #** 1723
10/15/03

Map Pt 1473 **Road** 60.4 **Mi.** 0.960

Other **Old** 36" **New** 60"

PPt Right **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1723 DCP_1470.jpg

Road Upgrading **Photo #** 1655
10/5/03

Map Pt 1473 **Road** 60.4 **Mi.** 0.960

Other **Old** 36" **New** 60"

PPt Up **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

Note the bottom is worn out.

People in Photo:

F:\GRI Photos\Small\BigNum\1655 DCP_1335.jpg

Road Upgrading **Photo #** 1656
10/6/03

Map Pt 1473 **Road** 60.4 **Mi.** 0.960

Other **Old** 36" **New** 60"

PPt Up **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1656 DCP_1347.jpg

1/10/2021

366.253

Road Upgrading **Photo #** 1668
10/9/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Up

People in Photo:

F:\GRI Photos\Small\BigNum\1668 DCP_1355.jpg

Road Upgrading **Photo #** 1707
10/14/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1707 DCP_1427.jpg

Road Upgrading **Photo #** 1724
10/15/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1724 DCP_1471.jpg

1/10/2021

366,254

Road Upgrading **Photo #** 1665
10/9/03

Map Pt 1658 **Road** 60.4 **Mi.** 1.45

Bridge - Perm **Old** 42" **New** 1Br

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

down

People in Photo:

F:\GRI Photos\Small\BigNum\1665 DCP_1352.jpg

Road Upgrading **Photo #** 1867
11/5/03

Map Pt 1658 **Road** 60.4 **Mi.** 1.45

Bridge - Perm **Old** 42" **New** 1Br

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1867 DCP_1653.jpg

Road Upgrading **Photo #** 1666
10/9/03

Map Pt 1658 **Road** 60.4 **Mi.** 1.45

Bridge - Perm **Old** 42" **New** 1Br

PPt Up **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

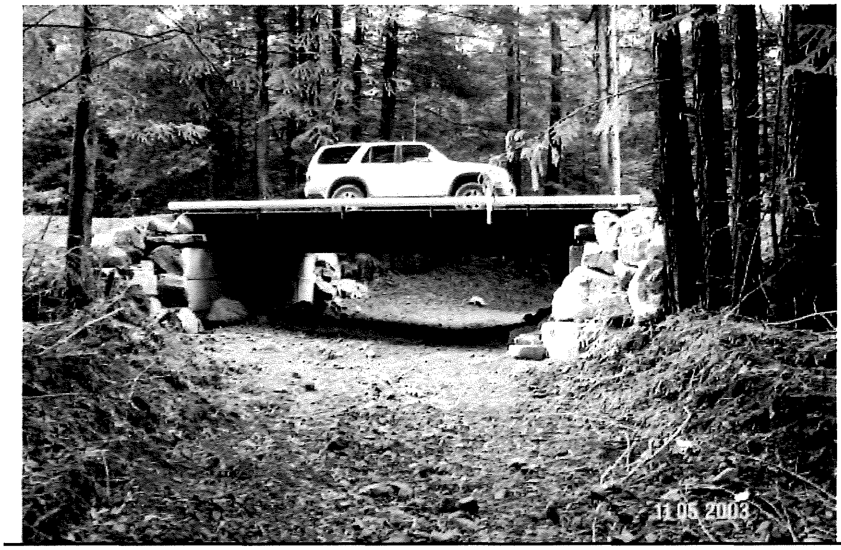
Up

People in Photo:

F:\GRI Photos\Small\BigNum\1666 DCP_1353.jpg

1/10/2021

366,255



Road Upgrading **Photo #** 1868

11/5/03

Map Pt 1658 **Road** 60.4 **Mi.** 1.45

Bridge - Perm **Old** 42" **New** 1Br

PPt Up **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1868 DCP_1654.jpg

Road Upgrading **Photo #** 1604

9/2/03

Map Pt 1470 **Road** 60.4 **Mi.** 1.610

Bridge - Perm **Old** 48" **New** 1Br

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

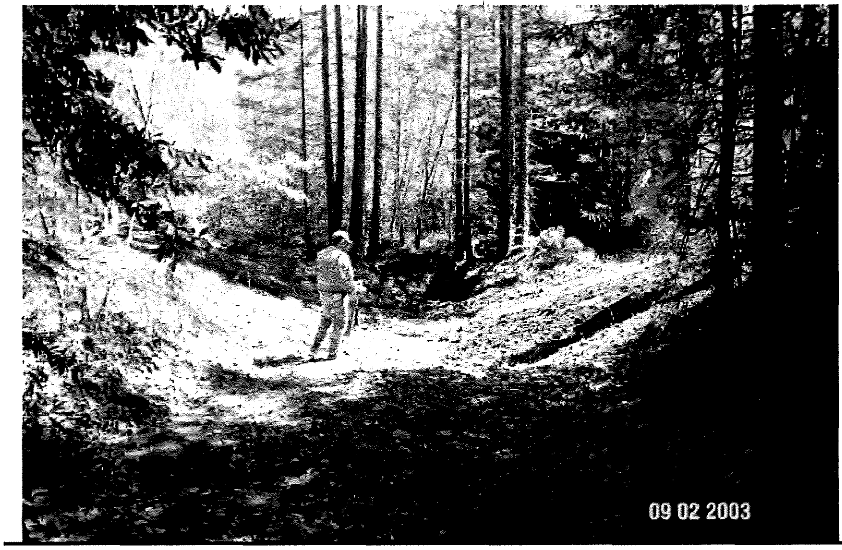
Monitoring 0

Bridge installation.

People in Photo:

Stan Stornetta	Danny Hagans
Rick Loghry	Jerry Orth
Bob Neal	

F:\GRI Photos\Small\BigNum\1604 DCP_1256.jpg



Road Upgrading **Photo #** 1605

9/2/03

Map Pt 1470 **Road** 60.4 **Mi.** 1.610

Bridge - Perm **Old** 48" **New** 1Br

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

Bridge installation.

People in Photo:

Bob Neal

F:\GRI Photos\Small\BigNum\1605 DCP_1260.jpg

PART OF PLAN

1/10/2021

366,256

Road Upgrading **Photo #** 1606
9/2/03
Map Pt 1470 **Road** 60.4 **Mi.** 1.610
Bridge - Perm **Old** 48" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Bridge installation.

People in Photo:
Danny Hagans Stan Stornetta
Jerry Orth

F:\GRI Photos\Small\BigNum\1606 DCP_1265.jpg

Road Upgrading **Photo #** 1607
9/2/03
Map Pt 1470 **Road** 60.4 **Mi.** 1.610
Bridge - Perm **Old** 48" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Bridge installation.

People in Photo:
Jerry Orth

F:\GRI Photos\Small\BigNum\1607 DCP_1269.jpg

Road Upgrading **Photo #** 1608
9/2/03
Map Pt 1470 **Road** 60.4 **Mi.** 1.610
Bridge - Perm **Old** 48" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Bridge installation.

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1608 DCP_1277.jpg

1/10/2021 366,257

Road Upgrading **Photo #** 1609
9/2/03
Map Pt 1470 **Road** 60.4 **Mi.** 1.610
Bridge - Perm **Old** 48" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Bridge installation.

People in Photo:
Rick Loghry Stan Stornetta
Jerry Orth

F:\GRI Photos\Small\BigNum\1609 DCP_1279.jpg

Road Upgrading **Photo #** 1713
10/14/03
Map Pt 1470 **Road** 60.4 **Mi.** 1.610
Bridge - Perm **Old** 48" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Blowing straw.

People in Photo:
Hay Blower

F:\GRI Photos\Small\BigNum\1713 DCP_1443.jpg

Road Upgrading **Photo #** 1712
10/14/03
Map Pt 1470 **Road** 60.4 **Mi.** 1.610
Bridge - Perm **Old** 48" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Blowing straw.

People in Photo:
Hay Blower

F:\GRI Photos\Small\BigNum\1712 DCP_1440.jpg

1/10/2021

366,258

Road Upgrading **Photo #** 1714
10/14/03
Map Pt 1470 **Road** 60.4 **Mi.** 1.610
Bridge - Perm **Old** 48" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Blowing straw.

People in Photo:
Hay Blower

F:\GRI Photos\Small\BigNum\1714 DCP_1450.jpg

Road Upgrading **Photo #** 1738
10/22/03
Map Pt 1572 **Road** 60.4 **Mi.** 2.43
Other **Old** - **New** -
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1738 DCP_1506.jpg

Road Upgrading **Photo #** 1737
10/22/03
Map Pt 1572 **Road** 60.4 **Mi.** 2.43
Other **Old** - **New** -
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1737 DCP_1501.jpg

1/10/2021 366,259

Road Upgrading **Photo #** 1820
10/27/03
Map Pt 1590 **Road** 60.402 **Mi.** 0.64
Other **Old** 36" **New** 48"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1820 DCP_1545.jpg

Road Upgrading **Photo #** 1819
10/27/03
Map Pt 1590 **Road** 60.402 **Mi.** 0.64
Other **Old** 36" **New** 48"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1819 DCP_1543.jpg

Road Upgrading **Photo #** 1821
10/27/03
Map Pt 1586 **Road** 60.402005 **Mi.** 0.04
Temp. Crossing **Old** - **New** 1Br
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1821 DCP_1546.jpg

PART OF PLAN

1/10/2021 366,260

Road Upgrading **Photo #** 764
9/10/01

Map Pt 1580 **Road** 60.402005 **Mi.** 0.770
Other **Old** - **New** -
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

This is a rocked dip in a class III

People in Photo:

F:\GRI Photos\Small\764 LNF roadDcp_0667.jpg

Road Upgrading **Photo #** 792
10/20/01

Map Pt 1580 **Road** 60.402005 **Mi.** 0.770
Other **Old** - **New** -
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

This is a rocked Ford with outsloping and dips on either side to disconnect the road from the Class III.

People in Photo:

F:\GRI Photos\Small\792 Rd 1580 Dcp_0954.jpg

Road Upgrading **Photo #** 1121
8/23/02

Map Pt 1580 **Road** 60.402005 **Mi.** 0.770
Other **Old** - **New** -
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1121 1580 DCP_0411.jpg

1/10/2021 316,261

Road Upgrading **Photo #** 791
10/20/01
Map Pt 1580 **Road** 60.402005 **Mi.** 0.770
Other **Old** - **New** -
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

This is a rocked Ford with outsloping and dips on either side to disconnect the road from the Class III.

People in Photo:

F:\GRI Photos\Small\791 Rd 1580 DCP_0927.jpg

Road Upgrading **Photo #** 1634
9/24/03
Map Pt 2258 **Road** 60.40200501 **Mi.** 0
Dip Rolling **Old** - **New** -
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

The outside berm is moved to the inside.

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1634 DCP_1304.jpg

Road Upgrading **Photo #** 1635
9/24/03
Map Pt 2258 **Road** 60.40200501 **Mi.** 0
Dip Rolling **Old** - **New** -
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

The outside berm is moved to the inside.

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1635 DCP_1307.jpg

1/10/2021

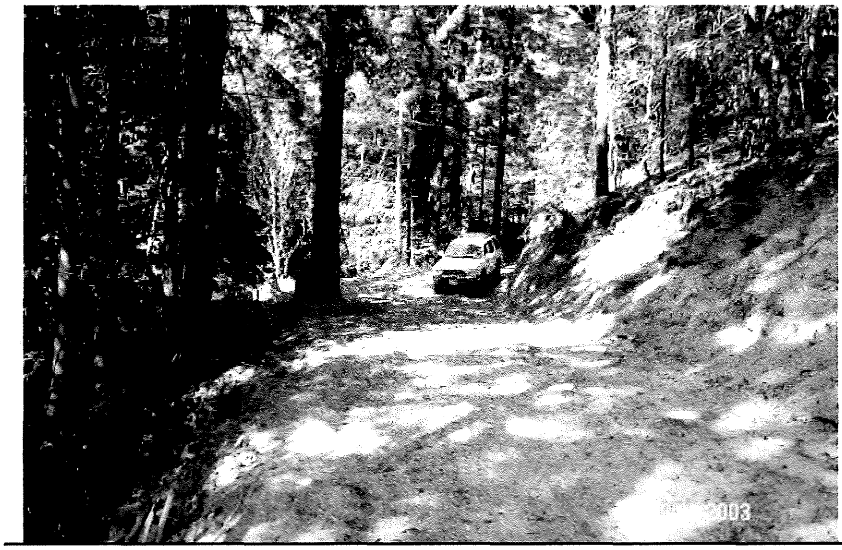
366,262

Road Upgrading **Photo #** 1649
9/30/03
Map Pt 2258 **Road** 60.40200501 **Mi.** 0
Dip Rolling **Old** - **New** -
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

The road is outsloped and a dip has been installed about where the excavator was sitting

People in Photo:

F:\GRI Photos\Small\BigNum\1649 DCP_1324.jpg



Road Upgrading **Photo #** 1650
9/30/03
Map Pt 2258 **Road** 60.40200501 **Mi.** 0
Dip Rolling **Old** - **New** -
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1650 DCP_1325.jpg

Road Upgrading **Photo #** 1636
9/24/03
Map Pt 2258 **Road** 60.40200501 **Mi.** 0
Dip Rolling **Old** - **New** -
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

The outside berm is moved to the inside.

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1636 DCP_1308.jpg

1/10/2021

366,263

Road Upgrading **Photo #** 1648
9/30/03

Map Pt 2258 **Road** 60.40200501 **Mi.** 0
Dip Rolling **Old** - **New** -
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

The road is outsloped and a dip has been installed about where the excavator was sitting

People in Photo:

F:\GRI Photos\Small\BigNum\1648 DCP_1321.jpg

Road Upgrading **Photo #** 1637
9/23/03

Map Pt 1584 **Road** 60.40200501 **Mi.** 0.53
Other **Old** - **New** -
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1637 DCP_1309.jpg

Road Upgrading **Photo #** 1646
9/30/03

Map Pt 1584 **Road** 60.40200501 **Mi.** 0.53
Other **Old** - **New** -
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1646 DCP_1319.jpg

366,264

Road Upgrading **Photo #** 1647

9/30/03

Map Pt 1584 **Road** 60.40200501 **Mi.** 0.53

Other **Old** - **New** -

PPt 0 **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1647 DCP_1320.jpg

Road Upgrading **Photo #** 701

8/21/01

Map Pt 1596 **Road** 60.4020051886 **Mi.** 0.1

Other **Old** - **New** -

PPt Up **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

Excavated class III corssing.

People in Photo:
John Edmunds

F:\GRI Photos\Small\701 crossing Dcp_0562.jpg

Road Upgrading **Photo #** 1720

10/15/03

Map Pt 2293 **Road** 60.4024 **Mi.** 0.03

Bridge - Perm **Old** - **New** 1Br

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1720 DCP_1466.jpg

1/10/2021

366,265

Road Upgrading **Photo #** 1846
10/30/03
Map Pt 2293 **Road** 60.4024 **Mi.** 0.03
Bridge - Perm **Old** - **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

Keying in riprap for the bridge abutment.

People in Photo:
Rick Loghry Vic Spurgeon

F:\GRI Photos\Small\BigNum\1846 DCP_1638.jpg

Road Upgrading **Photo #** 1865
11/5/03
Map Pt 2293 **Road** 60.4024 **Mi.** 0.03
Bridge - Perm **Old** - **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1865 DCP_1651.jpg

Road Upgrading **Photo #** 1823
10/27/03
Map Pt 2293 **Road** 60.4024 **Mi.** 0.03
Bridge - Perm **Old** - **New** 1Br
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

Large logs staged for placement in stream

People in Photo:

F:\GRI Photos\Small\BigNum\1823 DCP_1552.jpg

1/10/2021 366,266

Road Upgrading **Photo #** 1845
10/30/03
Map Pt 2293 **Road** 60.4024 **Mi.** 0.03
Bridge - Perm **Old** - **New** 1Br
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

The 67' railroad car bridge is ready to place.

People in Photo:

F:\GRI Photos\Small\BigNum\1845 DCP_1636.jpg

Road Upgrading **Photo #** 1822
10/27/03
Map Pt 2293 **Road** 60.4024 **Mi.** 0.03
Bridge - Perm **Old** - **New** 1Br
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1822 DCP_1549.jpg

Road Upgrading **Photo #** 1847
10/30/03
Map Pt 2293 **Road** 60.4024 **Mi.** 0.03
Bridge - Perm **Old** - **New** 1Br
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

Keying in riprap for the bridge abutment. Vic directs Rick as to proper placement.

People in Photo:
Rick Loghry Vic Spurgeon

F:\GRI Photos\Small\BigNum\1847 DCP_1641.jpg

1/10/2021 366,267

Road Upgrading **Photo #** 1721
10/15/03
Map Pt 2293 **Road** 60.4024 **Mi.** 0.03
Bridge - Perm **Old** - **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1721 DCP_1467.jpg

Road Upgrading **Photo #** 1866
11/5/03
Map Pt 2293 **Road** 60.4024 **Mi.** 0.03
Bridge - Perm **Old** - **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1866 DCP_1652.jpg

Road Upgrading **Photo #** 1739
10/22/03
Map Pt 1558 **Road** 60.407209 **Mi.** 0.170
Other **Old** - **New** -
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1739 DCP_1507.jpg

1/10/2021

366.268

Road Upgrading **Photo #** 1428
5/20/03
Map Pt 1624 **Road** 80.32 **Mi.** 0.04
Other **Old** 24" **New** 36"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

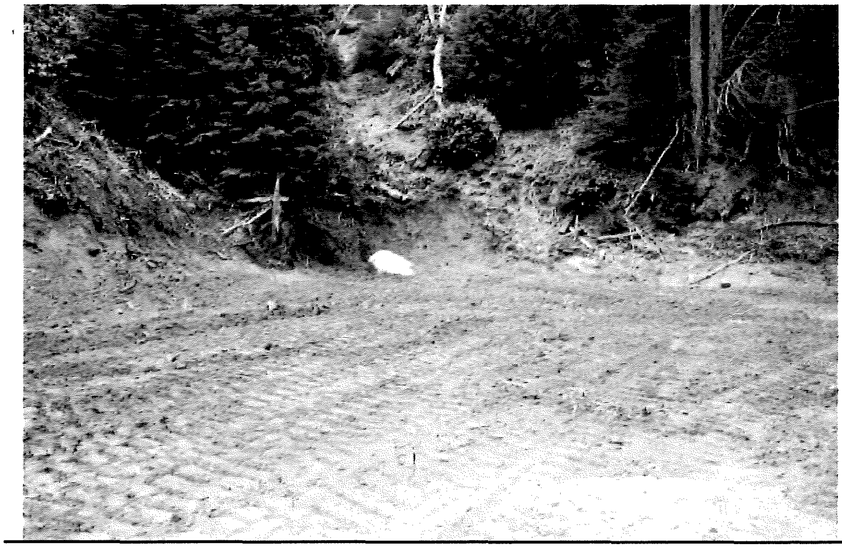
F:\GRI Photos\Small\BigNum\1428 DCP_2418.jpg

Road Upgrading **Photo #** 1462
6/5/03
Map Pt 1624 **Road** 80.32 **Mi.** 0.04
Other **Old** 24" **New** 36"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

Finishing up a critical dip on the hinge.

People in Photo:
Scott Giacomini

F:\GRI Photos\Small\BigNum\1462 DCP_2545.jpg



Road Upgrading **Photo #** 1463
6/5/03
Map Pt 1624 **Road** 80.32 **Mi.** 0.04
Other **Old** 24" **New** 36"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

The inlet is too high, above the road surface.

People in Photo:

F:\GRI Photos\Small\BigNum\1463 DCP_2546.jpg

1/10/2021

366,269

Road Upgrading **Photo #** 1465

6/9/03

Map Pt 1624 **Road** 80.32 **Mi.** 0.04

Other **Old** 24" **New** 36"

PPt left **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

The inlet is fixed with a dam.

People in Photo:

F:\GRI Photos\Small\BigNum\1465 DCP_2547.jpg

Road Upgrading **Photo #** 1426

5/20/03

Map Pt 1624 **Road** 80.32 **Mi.** 0.04

Other **Old** 24" **New** 36"

PPt Right **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1426 DCP_2413.jpg

Road Upgrading **Photo #** 1427

5/20/03

Map Pt 1624 **Road** 80.32 **Mi.** 0.04

Other **Old** 24" **New** 36"

PPt Right **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1427 DCP_2415.jpg

PART OF PLAN

1/10/2021

366,270

Road Upgrading **Photo #** 1460
6/5/03
Map Pt 1624 **Road** 80.32 **Mi.** 0.04
Other **Old** 24" **New** 36"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Stan is working on 1623

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1460 DCP_2544.jpg

Road Upgrading **Photo #** 1464
6/9/03
Map Pt 1624 **Road** 80.32 **Mi.** 0.04
Other **Old** 24" **New** 36"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Stan fixed the inlet

People in Photo:

F:\GRI Photos\Small\BigNum\1464 DCP_2549.jpg

Road Upgrading **Photo #** 1461
6/5/03
Map Pt 1623 **Road** 80.32 **Mi.** 0.070
Other **Old** 18" **New** 24"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1461 DCP_2542.jpg

1/10/2021 366.271

Road Upgrading **Photo #** 1429
5/20/03
Map Pt 1621 **Road** 80.32 **Mi.** 0.470
Culv. Maintenance **Old** 72" **New** 1Br
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1429 DCP_2419.jpg

Road Upgrading **Photo #** 1432
5/20/03
Map Pt 1621 **Road** 80.32 **Mi.** 0.470
Culv. Maintenance **Old** 72" **New** 1Br
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1432 DCP_2422.jpg

Road Upgrading **Photo #** 1433
5/20/03
Map Pt 1621 **Road** 80.32 **Mi.** 0.470
Culv. Maintenance **Old** 72" **New** 1Br
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1433 DCP_2425.jpg

1/10/2021

366,272

Road Upgrading **Photo #** 1435
5/21/03
Map Pt 1621 **Road** 80.32 **Mi.** 0.470
Culv. Maintenance **Old** 72" **New** 1Br
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1435 DCP_2428.jpg

Road Upgrading **Photo #** 1430
5/20/03
Map Pt 1621 **Road** 80.32 **Mi.** 0.470
Culv. Maintenance **Old** 72" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1430 DCP_2420.jpg

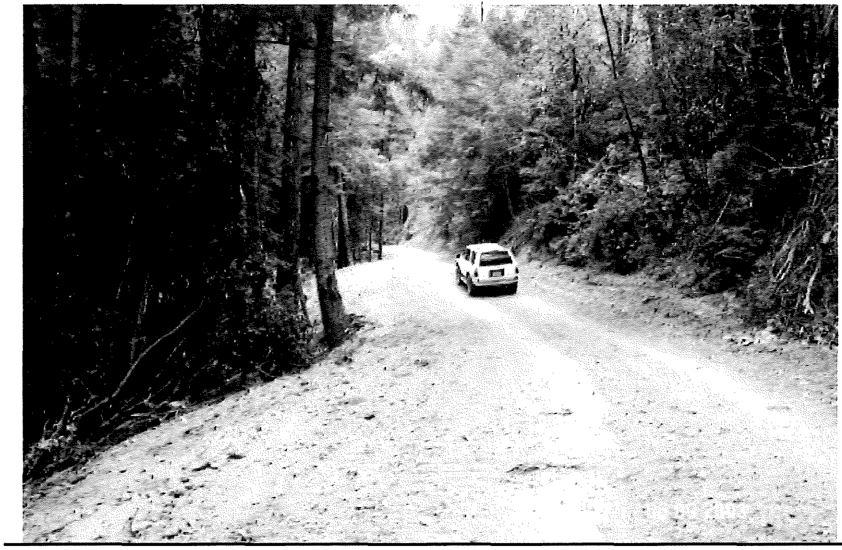
Road Upgrading **Photo #** 1434
5/21/03
Map Pt 1621 **Road** 80.32 **Mi.** 0.470
Culv. Maintenance **Old** 72" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
There can be too much outslope. This was 22%.

People in Photo:
Scott Giacomini

F:\GRI Photos\Small\BigNum\1434 DCP_2427.jpg

1/10/2021

366.273



Road Upgrading **Photo #** 1466
6/9/03

Map Pt 1621 **Road** 80.32 **Mi.** 0.470

Culv. Maintenance **Old** 72" **New** 1Br

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1466 DCP_2550.jpg

Road Upgrading **Photo #** 1470
6/9/03

Map Pt 1621 **Road** 80.32 **Mi.** 0.470

Culv. Maintenance **Old** 72" **New** 1Br

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1470 DCP_2552.jpg


05 20 2003

Road Upgrading **Photo #** 1431
5/20/03

Map Pt 1621 **Road** 80.32 **Mi.** 0.470

Culv. Maintenance **Old** 72" **New** 1Br

PPt Up **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1431 DCP_2421.jpg

PART OF PLAN

1/10/2021

366,274

Road Upgrading **Photo #** 1467
6/9/03
Map Pt 1621 **Road** 80.32 **Mi.** 0.470
Culv. Maintenance **Old** 72" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1467 DCP_2551.jpg

Road Upgrading **Photo #** 1436
5/20/03
Map Pt 1620 **Road** 80.32 **Mi.** 0.74
Other **Old** 36" **New** 36"
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1436 DCP_2423.jpg

Road Upgrading **Photo #** 1437
5/20/03
Map Pt 1620 **Road** 80.32 **Mi.** 0.74
Other **Old** 36" **New** 36"
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1437 DCP_2424.jpg

PART OF PLAN

1/10/2021

366,275

Road Upgrading **Photo #** 1663
10/6/03

Map Pt 1433 **Road** 80.4 **Mi.** 0.245

Other **Old** 24" **New** 36"

PPt 0 **Dir** **PW** Doty Creek

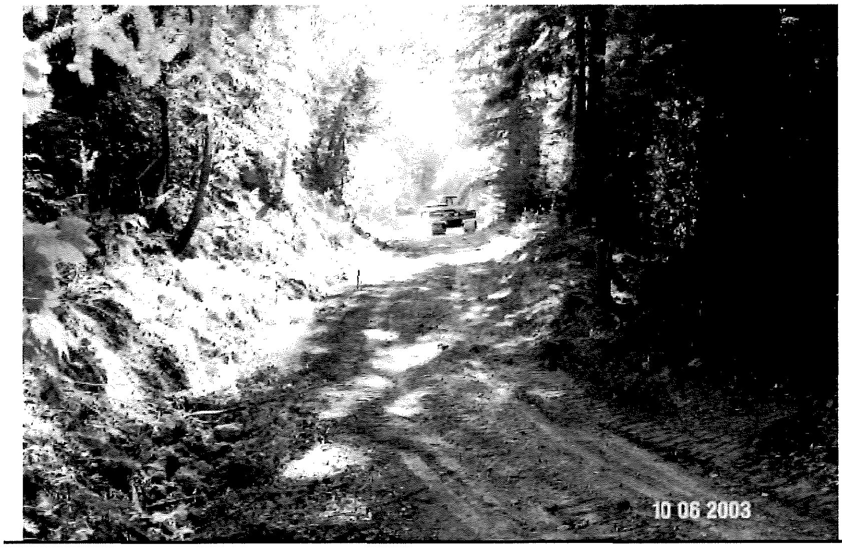
THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1663 DCP_1350.jpg



Road Upgrading **Photo #** 1664
10/6/03

Map Pt 1433 **Road** 80.4 **Mi.** 0.245

Other **Old** 24" **New** 36"

PPt 0 **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

Note the inside ditch and the large outside berm.

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1664 DCP_1349.jpg

Road Upgrading **Photo #** 1455
6/2/03

Map Pt 1436 **Road** 80.4 **Mi.** 0.49

Other **Old** 36" **New** 60"

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

Culvert inlet

People in Photo:

F:\GRI Photos\Small\BigNum\1455 DCP_2533.jpg

1/10/2021

366.276

Road Upgrading **Photo #** 1688

10/9/03

Map Pt 1436 **Road** 80.4 **Mi.** 0.49

Other **Old** 36" **New** 60"

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1688 DCP_1390.jpg

Road Upgrading **Photo #** 1689

10/9/03

Map Pt 1436 **Road** 80.4 **Mi.** 0.49

Other **Old** 36" **New** 60"

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

This is looking downstream from where the old channel disappears.

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1689 DCP_1391.jpg

Road Upgrading **Photo #** 1702

10/13/03

Map Pt 1436 **Road** 80.4 **Mi.** 0.49

Other **Old** 36" **New** 60"

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1702 DCP_1417.jpg

1/16/2021

366.277

Road Upgrading **Photo #** 1703
10/13/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Jerry Orth Stan Stornetta

F:\GRI Photos\Small\BigNum\1703 DCP_1422.jpg

Road Upgrading **Photo #** 1715
10/15/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1715 DCP_1465.jpg

Road Upgrading **Photo #** 1717
10/15/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Stan Stornetta Bob Neal

F:\GRI Photos\Small\BigNum\1717 DCP_1476.jpg

1/10/2021

366,278

Road Upgrading **Photo #** 1718
10/15/03

Map Pt 1436 **Road** 80.4 **Mi.** 0.49

Other **Old** 36" **New** 60"

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:
Kathleen Morgan Danny Hagans

F:\GRI Photos\Small\BigNum\1718 DCP_1481.jpg

Road Upgrading **Photo #** 1719
10/15/03

Map Pt 1436 **Road** 80.4 **Mi.** 0.49

Other **Old** 36" **New** 60"

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

Clarence walks the walk

People in Photo:
Jerry Orth Clerance Giacomini

F:\GRI Photos\Small\BigNum\1719 DCP_1482.jpg

Road Upgrading **Photo #** 1733
10/20/03

Map Pt 1436 **Road** 80.4 **Mi.** 0.49

Other **Old** 36" **New** 60"

PPt down **Dir** **PW** Doty Creek

THP 271 LNF LNF P01030405A

PID 0 **LWD**

Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1733 DCP_1492.jpg

1/10/2021

366,279

Road Upgrading **Photo #** 1735
10/20/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1735 DCP_1496.jpg

Road Upgrading **Photo #** 1452
6/2/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1452 DCP_2530.jpg

Road Upgrading **Photo #** 1685
10/9/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Stan Stornetta Jerry Orth

F:\GRI Photos\Small\BigNum\1685 DCP_1386.jpg

1/10/2021

366,280

Road Upgrading **Photo #** 1454
6/2/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1454 DCP_2532.jpg

Road Upgrading **Photo #** 1687
10/9/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1687 DCP_1389.jpg

Road Upgrading **Photo #** 1736
10/20/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1736 DCP_1497.jpg

PART OF PLAN

1/10/2021 366,281

06 03 2003

Road Upgrading **Photo #** 1451
6/2/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1451 DCP_2529.jpg

06 03 2003

Road Upgrading **Photo #** 1453
6/2/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Culvert outlet

People in Photo:

F:\GRI Photos\Small\BigNum\1453 DCP_2531.jpg

10 09 2003

Road Upgrading **Photo #** 1686
10/9/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Stan Stornetta Jerry Orth

F:\GRI Photos\Small\BigNum\1686 DCP_1388.jpg

PART OF PLAN

1/10/2021

366,282

Road Upgrading **Photo #** 1704
10/13/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1704 DCP_1424.jpg

Road Upgrading **Photo #** 1705
10/14/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

Stan removes the old culvert. The bottom is worn out.

People in Photo:
Bob Neal Stan Stornetta

F:\GRI Photos\Small\BigNum\1705 DCP_1458.jpg

Road Upgrading **Photo #** 1706
10/14/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

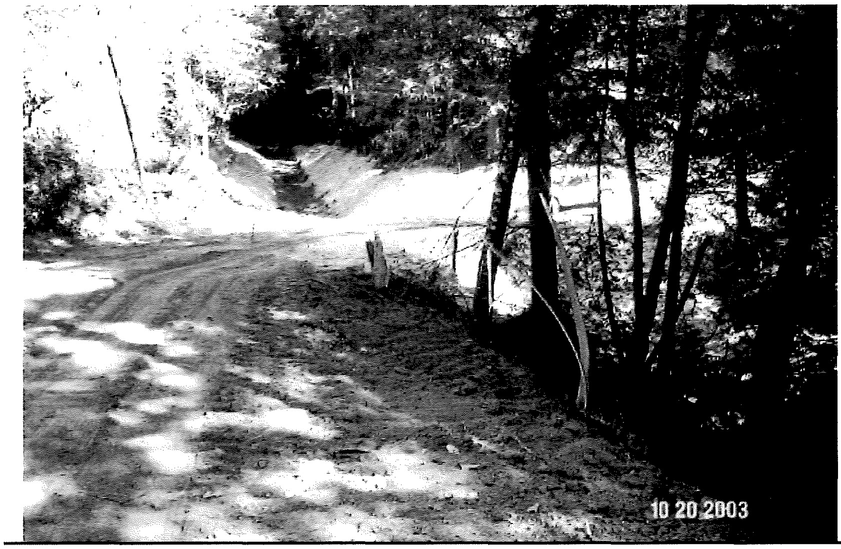
The bottom of the culvert is worn through

People in Photo:

F:\GRI Photos\Small\BigNum\1706 DCP_1462.jpg

1/10/2021

366,283



Road Upgrading **Photo #** 1734
10/20/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1734 DCP_1495.jpg

Road Upgrading **Photo #** 1612
9/2/03
Map Pt 1467 **Road** 80.4 **Mi.** 1.58
Bridge - Perm **Old** 60" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Bridge installation.

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1612 DCP_1271.jpg

Road Upgrading **Photo #** 1652
10/6/03
Map Pt 1467 **Road** 80.4 **Mi.** 1.58
Bridge - Perm **Old** 60" **New** 1Br
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
We were able to outslope and elevate the northern approach.

People in Photo:

F:\GRI Photos\Small\BigNum\1652 DCP_1331.jpg

1/10/2021

366,284

Road Upgrading **Photo #** 1611
9/2/03
Map Pt 1467 **Road** 80.4 **Mi.** 1.58
Bridge - Perm **Old** 60" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

Bridge installation.

People in Photo:
Konrad Pehl Rick Loghry
Bob Neal

F:\GRI Photos\Small\BigNum\1611 DCP_1266.jpg

Road Upgrading **Photo #** 1651
10/6/03
Map Pt 1467 **Road** 80.4 **Mi.** 1.58
Bridge - Perm **Old** 60" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1651 DCP_1329.jpg

Road Upgrading **Photo #** 1495
6/16/03
Map Pt 0 **Road** 80.4046 **Mi.** 0
Old **New**
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

Scott is using a cliniometer and a eye hight staff to make sure the dip reverses grade.

People in Photo:
Scott Giacomini

F:\GRI Photos\Small\BigNum\1495 DCP_2585.jpg

1/10/2021

366,285

Road Upgrading **Photo #** 1496
6/16/03
Map Pt 0 **Road** 80.4046 **Mi.** 0
Old **New**
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

Scott is using a cliniometer and a eye hight staff to make sure the road has the proper outslope.

People in Photo:
Scott Giacomini

F:\GRI Photos\Small\BigNum\1496 DCP_2586.jpg

Road Upgrading **Photo #** 1502
6/23/03
Map Pt 1488 **Road** 80.4046 **Mi.** 0.25
Other **Old** - **New** -
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1502 DCP_2614.jpg

Road Upgrading **Photo #** 1503
6/24/03
Map Pt 1488 **Road** 80.4046 **Mi.** 0.25
Other **Old** - **New** -
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

Stan has pulled away this site of the landing and is starting on the other side.

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1503 DCP_2616.jpg

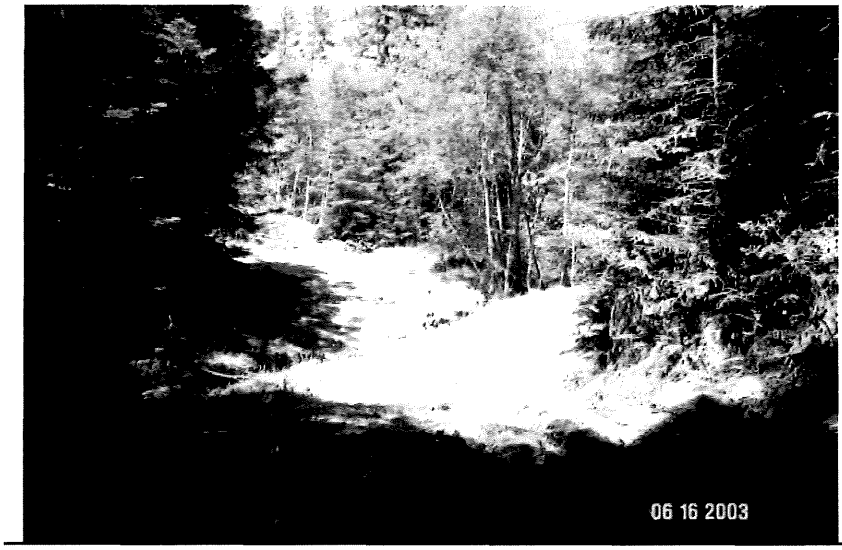
1/10/2021

366.286

Road Upgrading **Photo #** 1694
10/9/03
Map Pt 1488 **Road** 80.4046 **Mi.** 0.25
Other **Old** - **New** -
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1694 DCP_1402.jpg



Road Upgrading **Photo #** 1494
6/16/03
Map Pt 1488 **Road** 80.4046 **Mi.** 0.25
Other **Old** - **New** -
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Scott Giacomini

F:\GRI Photos\Small\BigNum\1494 DCP_2583.jpg

Road Upgrading **Photo #** 1519
7/20/03
Map Pt 1488 **Road** 80.4046 **Mi.** 0.25
Other **Old** - **New** -
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Kathleen Morgan

F:\GRI Photos\Small\BigNum\1519 DCP_1184.jpg

1/10/2021 366,287

Road Upgrading **Photo #** 1695
10/9/03
Map Pt 1488 **Road** 80.4046 **Mi.** 0.25
Other **Old** - **New** -
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1695 DCP_1403.jpg

Road Upgrading **Photo #** 1493
6/16/03
Map Pt 1488 **Road** 80.4046 **Mi.** 0.25
Other **Old** - **New** -
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Scott Giacomini

F:\GRI Photos\Small\BigNum\1493 DCP_2582.jpg

Road Upgrading **Photo #** 1520
7/20/03
Map Pt 1488 **Road** 80.4046 **Mi.** 0.25
Other **Old** - **New** -
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Kathleen Morgan Danny Hagans
Scott Monday

F:\GRI Photos\Small\BigNum\1520 DCP_1182.jpg

PART OF PLAN

1/10/2021

366,288

Road Upgrading **Photo #** 1696
10/9/03
Map Pt 1488 **Road** 80.4046 **Mi.** 0.25
Other **Old** - **New** -
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1696 DCP_1404.jpg

Road Upgrading **Photo #** 1525
7/23/03
Map Pt 1660 **Road** 80.404652 **Mi.** 0.04
Other **Old** - **New** -
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Signal Ridge site 103 and fill that was pulled back

People in Photo:

F:\GRI Photos\Small\BigNum\1525 DCP_1191.jpg

Road Upgrading **Photo #** 1526
7/23/03
Map Pt 1660 **Road** 80.404652 **Mi.** 0.04
Other **Old** - **New** -
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Signal Ridge site 103 and fill that was pulled back

People in Photo:

F:\GRI Photos\Small\BigNum\1526 DCP_1192.jpg

1/10/2021

366,289

Road Upgrading **Photo #** 1523
7/23/03
Map Pt 1482 **Road** 80.404652 **Mi.** 0.13
Other **Old** - **New** -
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Signal Ridge site 102

People in Photo:

F:\GRI Photos\Small\BigNum\1523 DCP_1189.jpg

Road Upgrading **Photo #** 1524
7/23/03
Map Pt 1482 **Road** 80.404652 **Mi.** 0.13
Other **Old** - **New** -
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Signal Ridge site 102

People in Photo:

F:\GRI Photos\Small\BigNum\1524 DCP_1190.jpg

Road Upgrading **Photo #** 1522
7/23/03
Map Pt 1446 **Road** 80.404652 **Mi.** 0.29
Other **Old** - **New** -
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Signal Ridge site 101

People in Photo:

F:\GRI Photos\Small\BigNum\1522 DCP_1188.jpg

PART OF PLAN

1/10/2021

366,290

Road Upgrading **Photo #** 1614
9/2/03
Map Pt 1501 **Road** 80.4051 **Mi.** 1.310
Other **Old** 36" **New** Pull
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
This is the inlet to the upper culvert

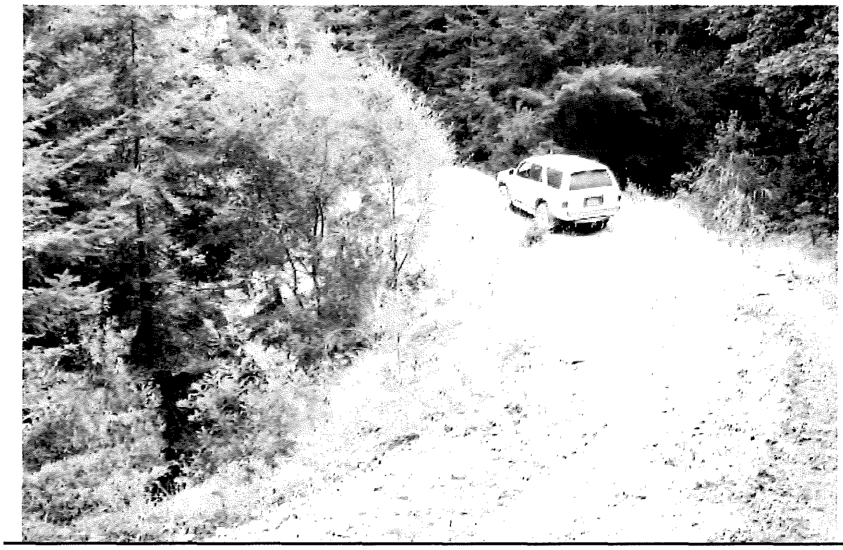
People in Photo:

F:\GRI Photos\Small\BigNum\1614 DCP_1276.jpg

Road Upgrading **Photo #** 1640
9/23/03
Map Pt 1501 **Road** 80.4051 **Mi.** 1.310
Other **Old** 36" **New** Pull
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1640 DCP_1313.jpg



Road Upgrading **Photo #** 1613
9/2/03
Map Pt 1501 **Road** 80.4051 **Mi.** 1.310
Other **Old** 36" **New** Pull
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Note the two culvets. The lower one is buried.

People in Photo:

F:\GRI Photos\Small\BigNum\1613 DCP_1275.jpg

1/10/2021 366,291

Road Upgrading **Photo #** 1639
9/23/03
Map Pt 1501 **Road** 80.4051 **Mi.** 1.310
Other **Old** 36" **New** Pull
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1639 DCP_1311.jpg

Road Upgrading **Photo #** 1438
6/2/03
Map Pt 1461 **Road** 80.4071 **Mi.** 1.15
Other **Old** - **New** -
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Vic Spurgeon

F:\GRI Photos\Small\BigNum\1438 DCP_2516.jpg

Road Upgrading **Photo #** 1439
6/2/03
Map Pt 1461 **Road** 80.4071 **Mi.** 1.15
Other **Old** - **New** -
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1439 DCP_2517.jpg

1/10/2021

366.292

Road Upgrading **Photo #** 1440
6/2/03
Map Pt 1461 **Road** 80.4071 **Mi.** 1.15
Other **Old** - **New** -
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1440 DCP_2518.jpg

Road Upgrading **Photo #** 1442
6/2/03
Map Pt 1657 **Road** 80.4071 **Mi.** 1.25
Other **Old** 24" **New** 24"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

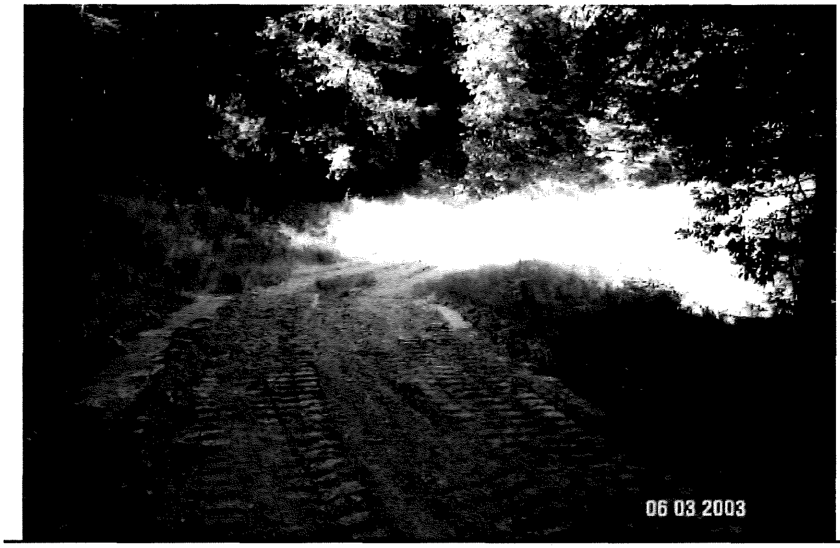
F:\GRI Photos\Small\BigNum\1442 DCP_2520.jpg

Road Upgrading **Photo #** 1740
10/22/03
Map Pt 1657 **Road** 80.4071 **Mi.** 1.25
Other **Old** 24" **New** 24"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1740 DCP_1508.jpg

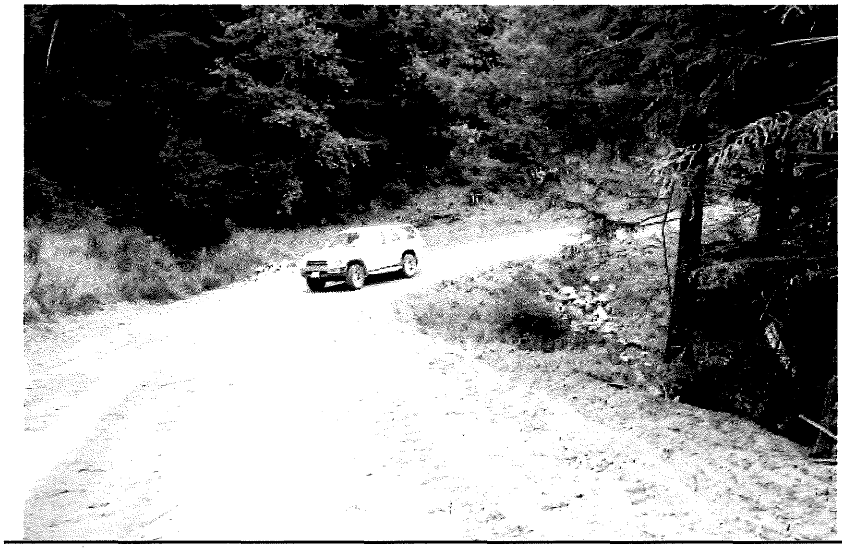
1/10/2021 366,292a



Road Upgrading **Photo #** 1441
6/2/03
Map Pt 1657 **Road** 80.4071 **Mi.** 1.25
Other **Old** 24" **New** 24"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1441 DCP_2519.jpg



Road Upgrading **Photo #** 1742
10/22/03
Map Pt 1657 **Road** 80.4071 **Mi.** 1.25
Other **Old** 24" **New** 24"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1742 DCP_1510.jpg

Road Upgrading **Photo #** 1443
6/2/03
Map Pt 1657 **Road** 80.4071 **Mi.** 1.25
Other **Old** 24" **New** 24"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1443 DCP_2521.jpg

1/10/2021 366.292b

Road Upgrading **Photo #** 1741
10/22/03
Map Pt 1657 **Road** 80.4071 **Mi.** 1.25
Other **Old** 24" **New** 24"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1741 DCP_1509.jpg

Road Upgrading **Photo #** 1447
6/2/03
Map Pt 1462 **Road** 80.4071 **Mi.** 1.310
Other **Old** 24" **New** 30"
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1447 DCP_2525.jpg

Road Upgrading **Photo #** 1448
6/2/03
Map Pt 1462 **Road** 80.4071 **Mi.** 1.310
Other **Old** 24" **New** 30"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1448 DCP_2526.jpg

1/10/2021 366,293

Road Upgrading **Photo #** 1743
10/22/03
Map Pt 1462 **Road** 80.4071 **Mi.** 1.310
Other **Old** 24" **New** 30"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1743 DCP_1511.jpg

Road Upgrading **Photo #** 1444
6/2/03
Map Pt 1462 **Road** 80.4071 **Mi.** 1.310
Other **Old** 24" **New** 30"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1444 DCP_2522.jpg

Road Upgrading **Photo #** 1445
6/2/03
Map Pt 1462 **Road** 80.4071 **Mi.** 1.310
Other **Old** 24" **New** 30"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1445 DCP_2523.jpg

1/10/2021

366,294

Road Upgrading **Photo #** 1446
6/2/03
Map Pt 1462 **Road** 80.4071 **Mi.** 1.310
Other **Old** 24" **New** 30"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1446 DCP_2524.jpg

Road Upgrading **Photo #** 1744
10/22/03
Map Pt 1462 **Road** 80.4071 **Mi.** 1.310
Other **Old** 24" **New** 30"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1744 DCP_1512.jpg

Road Upgrading **Photo #** 1745
10/22/03
Map Pt 1462 **Road** 80.4071 **Mi.** 1.310
Other **Old** 24" **New** 30"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1745 DCP_1513.jpg

1/10/2021

366,295

Road Upgrading **Photo #** 1488
6/16/03
Map Pt 1463 **Road** 80.4071 **Mi.** 1.370
Other **Old** 18" **New** 24"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1488 DCP_2590.jpg

Road Upgrading **Photo #** 1500
6/24/03
Map Pt 1463 **Road** 80.4071 **Mi.** 1.370
Other **Old** 18" **New** 24"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1500 DCP_2609.jpg

Road Upgrading **Photo #** 1747
10/22/03
Map Pt 1463 **Road** 80.4071 **Mi.** 1.370
Other **Old** 18" **New** 24"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1747 DCP_1516.jpg

PART OF PLAN

1/10/2021

366,296

Road Upgrading **Photo #** 1450
6/2/03
Map Pt 1463 **Road** 80.4071 **Mi.** 1.370
Other **Old** 18" **New** 24"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

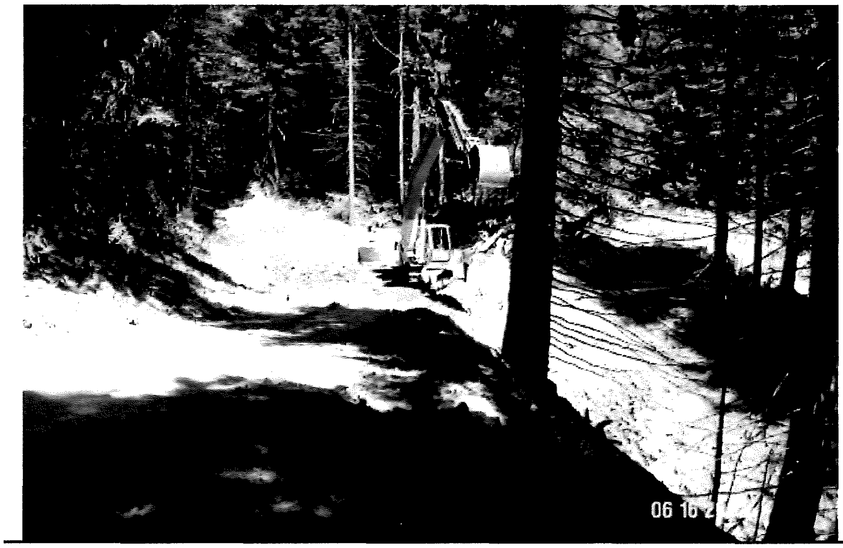
People in Photo:

F:\GRI Photos\Small\BigNum\1450 DCP_2528.jpg

Road Upgrading **Photo #** 1485
6/16/03
Map Pt 1463 **Road** 80.4071 **Mi.** 1.370
Other **Old** 18" **New** 24"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Rick is digging our a large old Humboldt.

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1485 DCP_2587.jpg



Road Upgrading **Photo #** 1486
6/16/03
Map Pt 1463 **Road** 80.4071 **Mi.** 1.370
Other **Old** 18" **New** 24"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Rick is digging our a large old Humboldt.

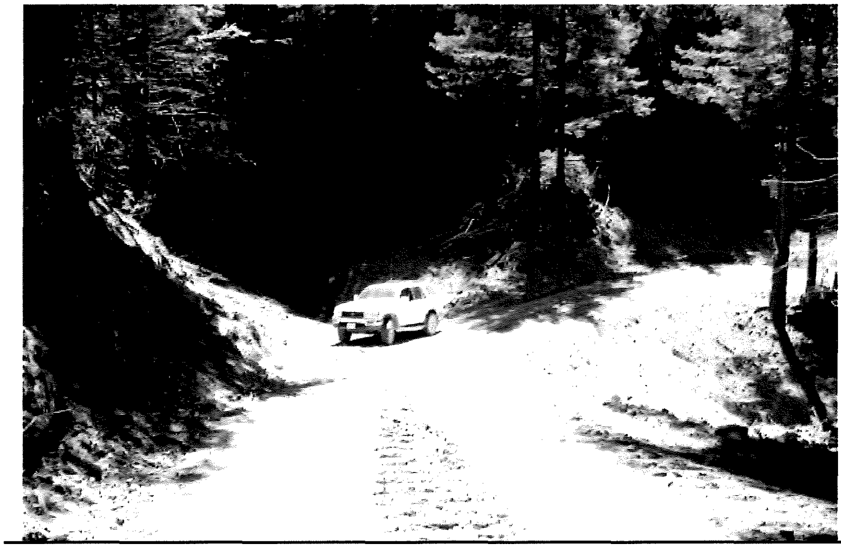
People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1486 DCP_2588.jpg

PART OF PLAN

1/10/2021

366,297



Road Upgrading **Photo #** 1498
6/24/03
Map Pt 1463 **Road** 80.4071 **Mi.** 1.370
Other **Old** 18" **New** 24"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1498 DCP_2604.jpg

Road Upgrading **Photo #** 1748
10/22/03
Map Pt 1463 **Road** 80.4071 **Mi.** 1.370
Other **Old** 18" **New** 24"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

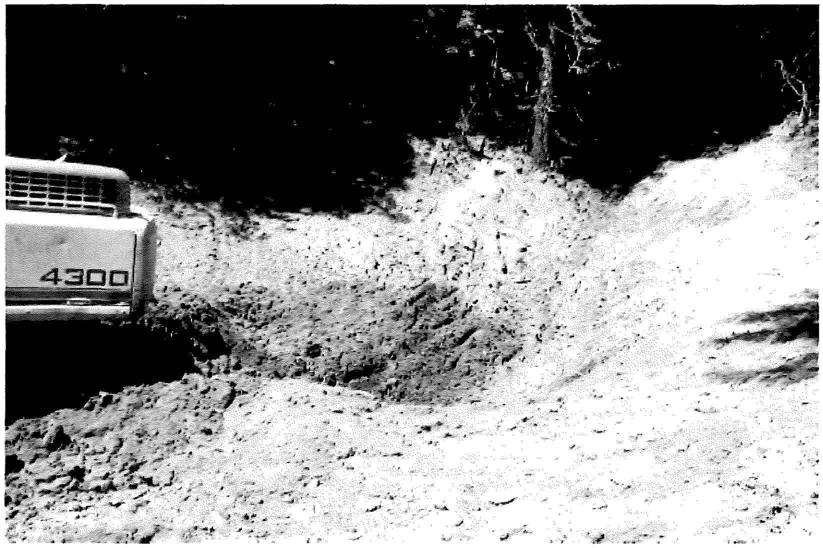
F:\GRI Photos\Small\BigNum\1748 DCP_1517.jpg

Road Upgrading **Photo #** 1449
6/2/03
Map Pt 1463 **Road** 80.4071 **Mi.** 1.370
Other **Old** 18" **New** 24"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1449 DCP_2527.jpg

1/10/2021 366,298



Road Upgrading **Photo #** 1487
6/16/03
Map Pt 1463 **Road** 80.4071 **Mi.** 1.370
Other **Old** 18" **New** 24"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

Rick is digging our a large old Humboldt. The dark color is the decayed organics from the Humboldt and lets us know we are down to the original channel

People in Photo:

F:\GRI Photos\Small\BigNum\1487 DCP_2589.jpg

Road Upgrading **Photo #** 1489
6/16/03
Map Pt 1463 **Road** 80.4071 **Mi.** 1.370
Other **Old** 18" **New** 24"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1489 DCP_2591.jpg

Road Upgrading **Photo #** 1490
6/16/03
Map Pt 1463 **Road** 80.4071 **Mi.** 1.370
Other **Old** 18" **New** 24"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1490 DCP_2592.jpg

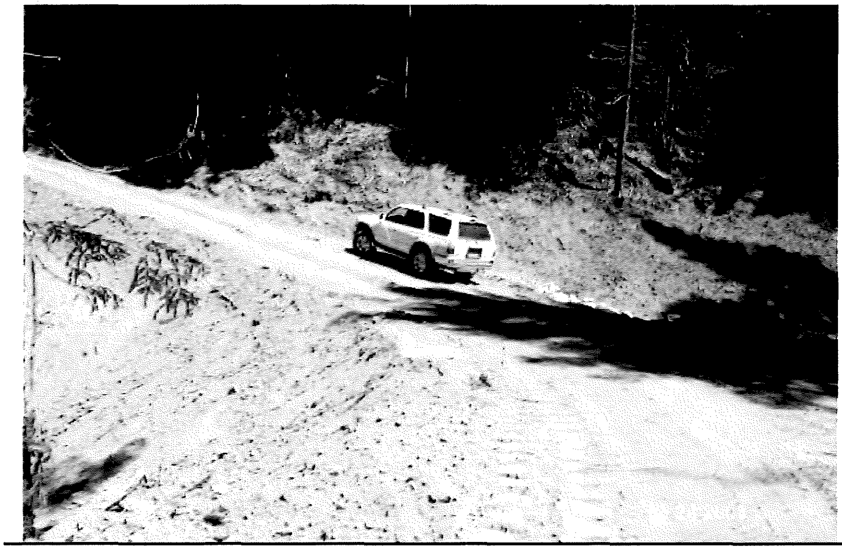
1/10/2021

366,299

Road Upgrading **Photo #** 1491
6/16/03
Map Pt 1463 **Road** 80.4071 **Mi.** 1.370
Other **Old** 18" **New** 24"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1491 DCP_2594.jpg



Road Upgrading **Photo #** 1499
6/24/03
Map Pt 1463 **Road** 80.4071 **Mi.** 1.370
Other **Old** 18" **New** 24"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1499 DCP_2606.jpg

Road Upgrading **Photo #** 1746
10/22/03
Map Pt 1463 **Road** 80.4071 **Mi.** 1.370
Other **Old** 18" **New** 24"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1746 DCP_1515.jpg

1/10/2021 366.300

Road Upgrading **Photo #** 1481
6/11/03
Map Pt 0 **Road** 80.4071 **Mi.** 2
Old **New**
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

Knocking off small berm and smoothing the road.

People in Photo:
Vic Spurgeon

F:\GRI Photos\Small\BigNum\1481 DCP_2573.jpg

Road Upgrading **Photo #** 1482
6/11/03
Map Pt 0 **Road** 80.4071 **Mi.** 2
Old **New**
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

Knocking off small berm and smoothing the road.

People in Photo:
Vic Spurgeon

F:\GRI Photos\Small\BigNum\1482 DCP_2578.jpg

Road Upgrading **Photo #** 1483
6/11/03
Map Pt 0 **Road** 80.4071 **Mi.** 2
Old **New**
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

Knocking off small berm and smoothing the road.

People in Photo:
Vic Spurgeon

F:\GRI Photos\Small\BigNum\1483 DCP_2581.jpg

1/10/2021 366,301

Road Upgrading **Photo #** 1518
7/21/03
Map Pt 1476 **Road** 80.4071 **Mi.** 2.3
Other **Old** - **New** 36"
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1518 DCP_1186.jpg

Road Upgrading **Photo #** 1501
6/23/03
Map Pt 1476 **Road** 80.4071 **Mi.** 2.3
Other **Old** - **New** 36"
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Vic Spurgeon Rick Loghry

F:\GRI Photos\Small\BigNum\1501 DCP_2612.jpg

Road Upgrading **Photo #** 1662
10/6/03
Map Pt 1477 **Road** 80.4071 **Mi.** 2.420
Other **Old** - **New** -
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1662 DCP_1346.jpg

1/10/2021

366,302