Tree Blowdown Aerial Survey

Dates Flown: March 6-7, 2008

Washington Coast

WASHINGTON STATE DEPARTMENT OF
Natural Resources

Forest Health Program

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Introduction

During the period of December 1-3, 2007, an extratropical cyclone of unusual magnitude struck areas of coastal Oregon and Washington. Over a period of three days, two separate storms impacted the coast with hurricane-force gusts and heavy rain. The region between approximately Newport, OR, and Hoquiam, WA, received the strongest winds since the great Columbus Day Storm of 1962, with some areas of southwest Washington possibly receiving even stronger winds (Fig. 1).

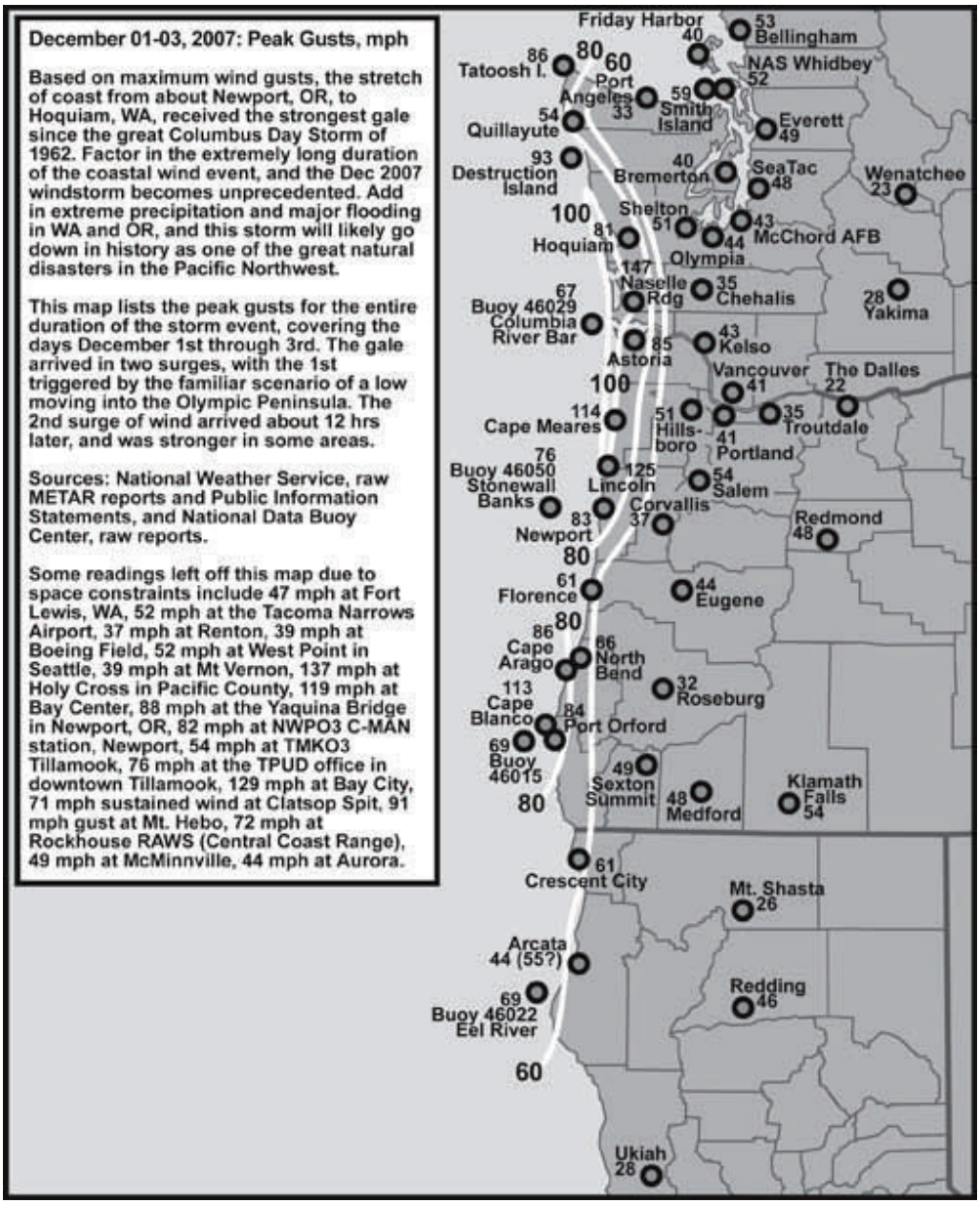

Figure 1. Peak wind gusts (mph) along the Washington and Oregon coasts. Figure by Wolf Read and available at Oregon Climate Service webpage, The Great Coastal Gale, http://www.ocs.oregonstate.edu/index.html.

The storm was believed to have caused significant tree windthrow along the coast in a 30-mile wide strip, with the more intense disturbance occurring south of Grays Harbor. Landowners were concerned about recovering value and restoring stands affected by the storms. Large amounts of downed wood have potential to contribute to insect infestations and may also pose a wildfire threat. The Washington Department of Natural Resources, small landowners, and forestry consultants expressed interest in a comprehensive damage map of the area.

On March 6th and 7th, 2008, an aerial survey was conducted to map the tree blowdown. Wind damage across the area surveyed was variable. There was a greater amount of blown down trees south of Grays Harbor, as expected, when compared to the blowdown north of Grays Harbor (Fig. 2).

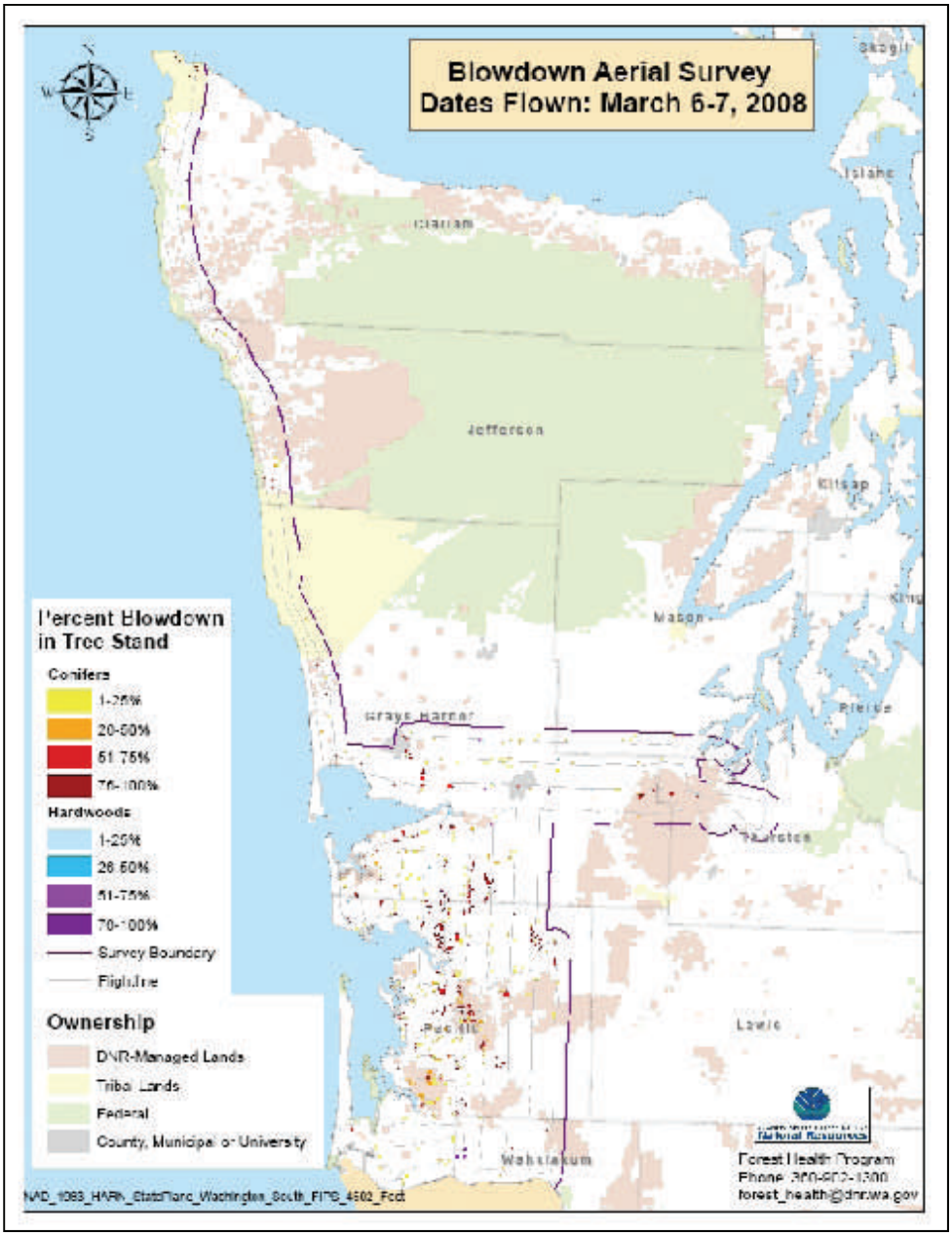

Figure 2. Overview map of blowdown aerial survey.

Methods

On March 6 and 7, 2008, the tree blowdown aerial survey was flown in western Washington. The aerial survey was flown at a speed of 90-120 mph and at a height of approximately 1,500 feet above ground level. Two observers (one on each side of the plane) looked out over a 1.5 mile swath of forestland and marked on a digital touch screen computer areas with wind thrown trees. Percentage of stand affected was assigned to each recorded digital polygon, as well as whether the trees were conifers or hardwoods. A third surveyor was in the plane on March 6th, taking photographs of the wind thrown trees.

It can be challenging to accurately identify and record damage observations. Errors may occur. The mark may be off target, the percentage assigned may not be exact, and some windblown trees may be missed. Satellite imagery showing recent management activity was used as background imagery on the digital touch screen computers, increasing the accuracy of marking polygons. ArcView 9.0 was used to make all maps and conduct analyses of data. Land ownership data was obtained as ArcInfo coverage GIS layers from Washington Department of Natural Resources (DNR). ROPA.NDMPL was used for all Washington state non-DNR major public lands and CADASTRE.PARCEL was used for DNR lands.

Results

Approximately 1.5 million acres (2,300 square miles) were surveyed for tree blowdown in western Washington. Scattered blowdown was mapped throughout the survey area, with the greatest amount, in acreage and intensity (percent trees blown down in particular area), being located in the survey area south of Grays Harbor (Figure 4). (More detailed maps of the aerial survey results can be seen in Appendix A or they can be downloaded at http://www.dnr.wa.gov/ResearchScience/Topics/ForestHealthEcology/Pages/rp_foresthealth.aspx in the "Related Links" section of the page).

Figure 3. High intensity area of a tree blowdown.

In the area surveyed, approximately 29,000 acres of tree blowdown was mapped. 27,000 acres were wind thrown conifers and approximately 2,000 acres were hardwoods. While the species of the blown down trees was not recorded on maps during the survey, Douglas-fir was observed to be the dominant conifer species affected by the wind and alder the dominant hardwood.

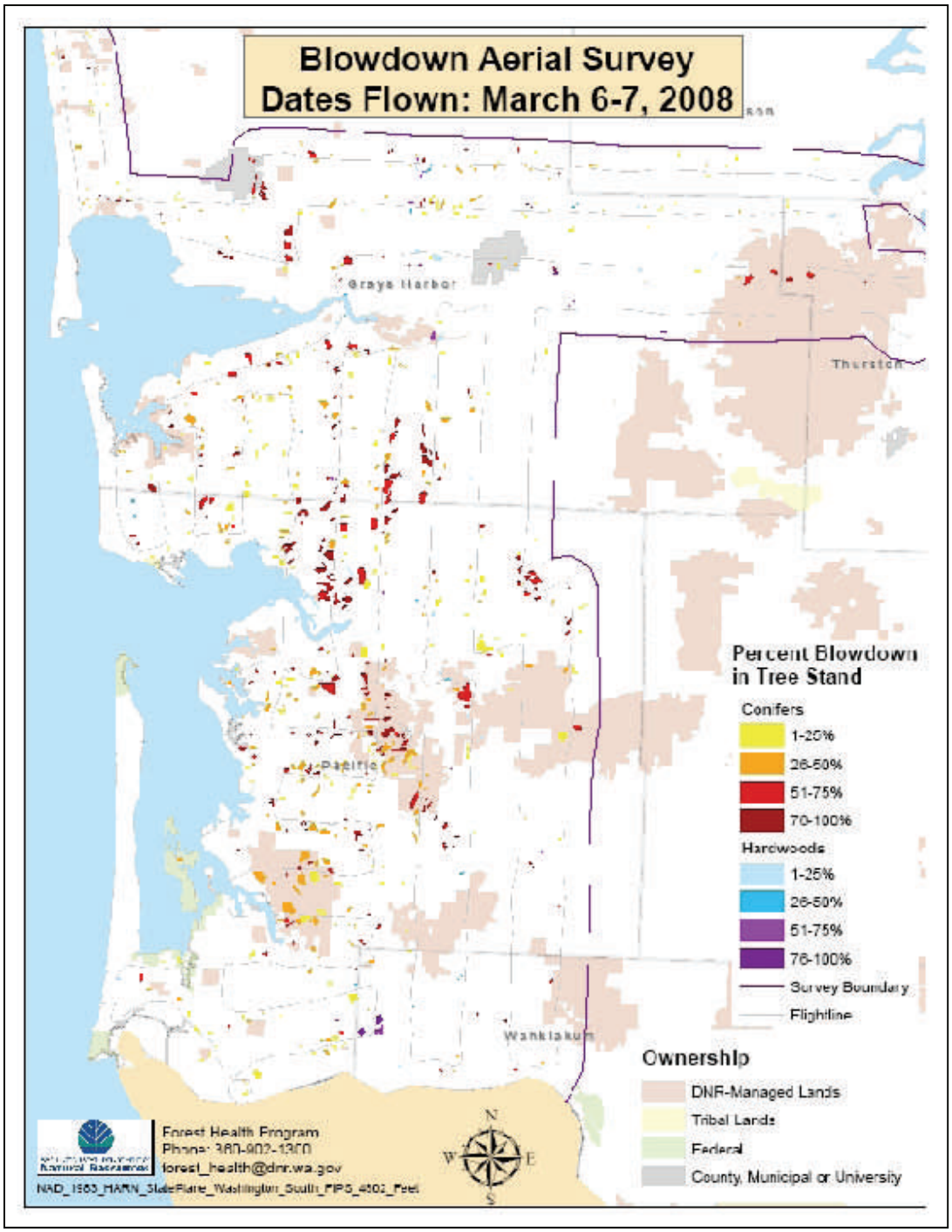

Figure 4. Blowdown aerial survey map of southern portion of Washington coast.

The aerial survey was conducted primarily over private lands, followed by state, county, federal and tribal lands (Fig. 5). Private lands had the greatest number of acres with wind thrown trees (Figures 6 and 7).

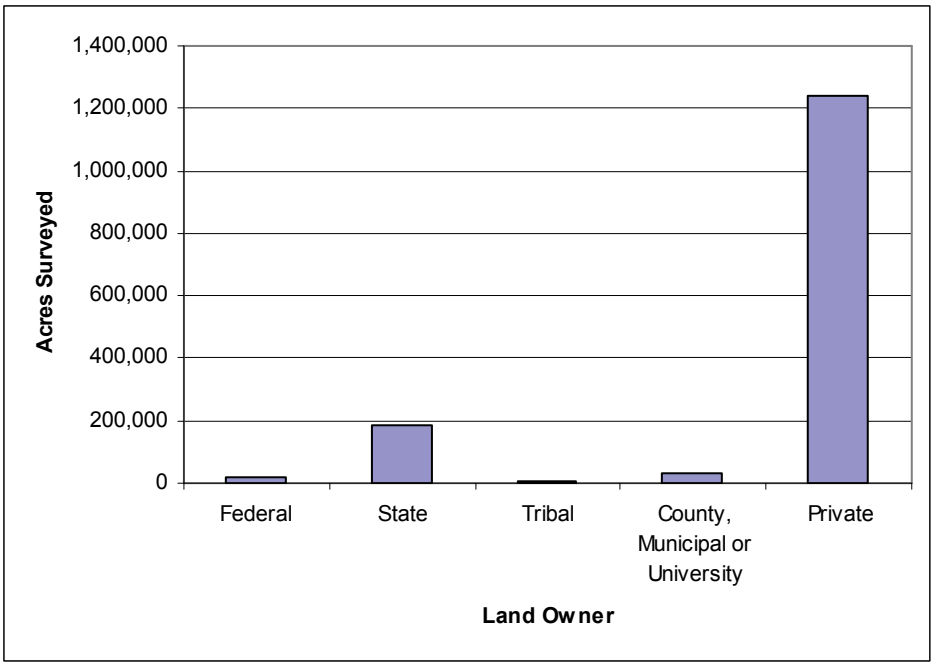

Figure 5. Acres of area surveyed, by land ownership.

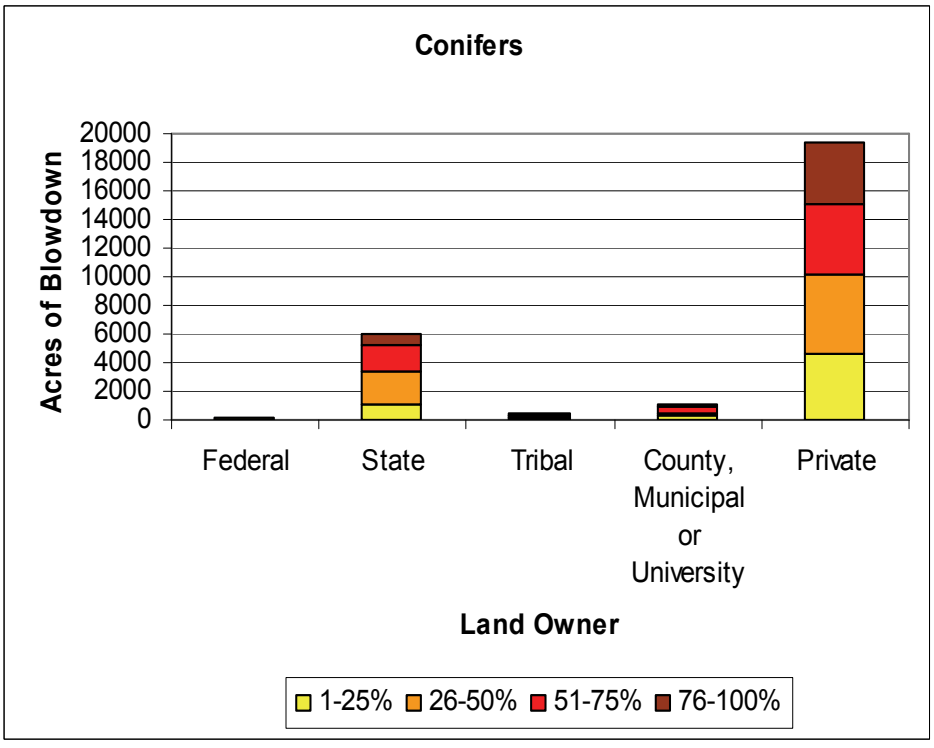

Figure 6. Acres of conifer tree blowdown, by intensity (percentage of stand) and land owner.

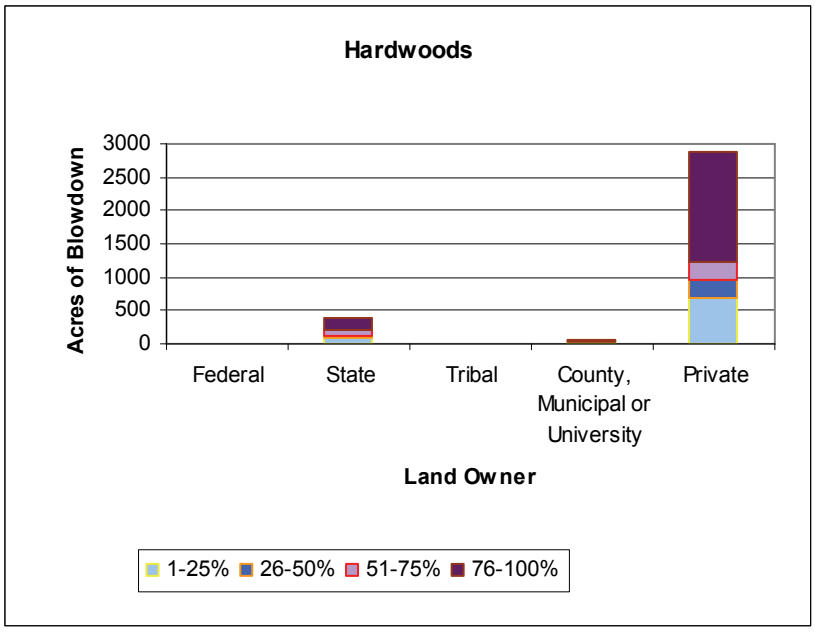

Figure 7. Acres of hardwood tree blowdown, by intensity (percentage of stand) and land owner.

Most of the blowdown recorded during the aerial survey was located on private lands. However, after normalizing the data and looking at the percentage of land with blowdown, organized by land owner, the data have a different pattern (Figures 8 - 10). The percentage of land surveyed with blowdown on the landscape is greatest on tribal lands, followed by county, state, private and federal lands. In other words, although relatively little tribal land was included in the survey area, nearly 6% of tribal land included in the aerial survey had blowdown recorded. In contrast, less than 2% of the private land included in the survey area had blowdown recorded.

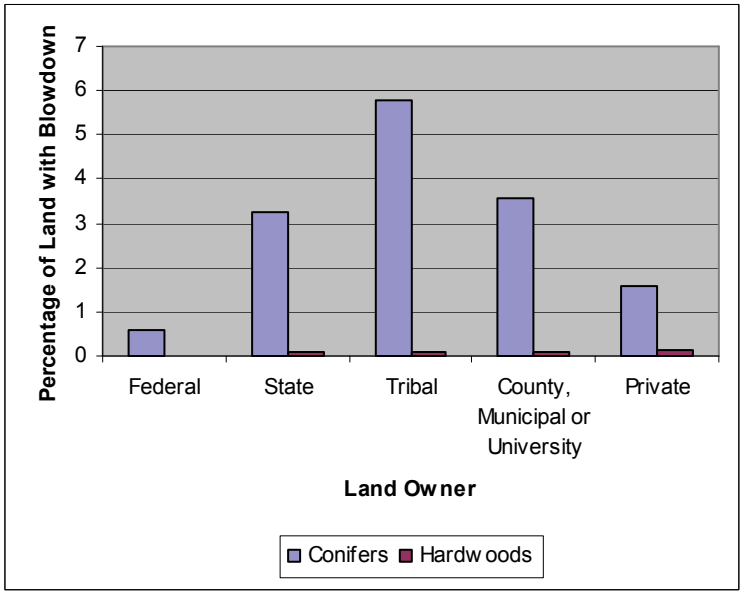

Figure 8. Percentage of land with blowdown, by land ownership.

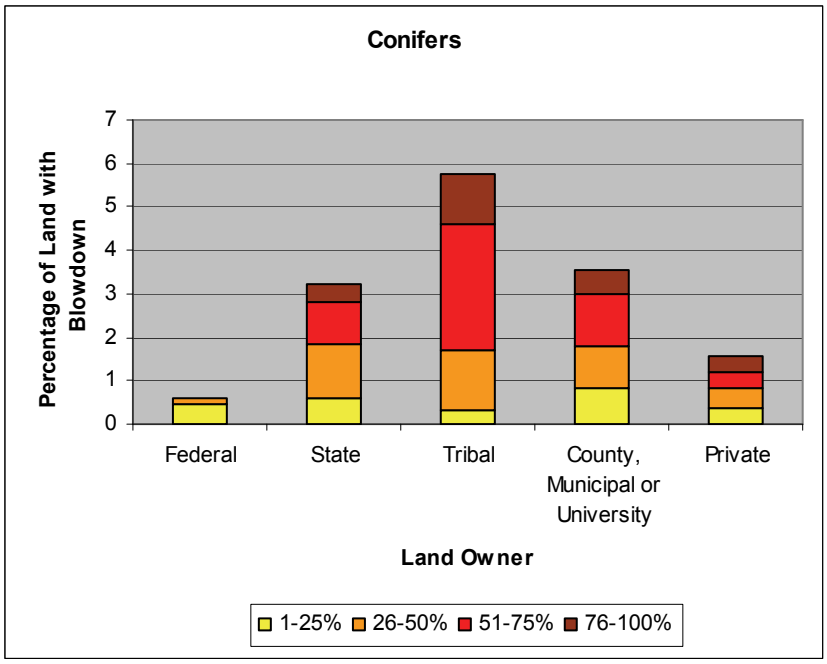

Figure 9. Percentage of land with conifer blowdown, by land ownership and intensity (percentage of stand).

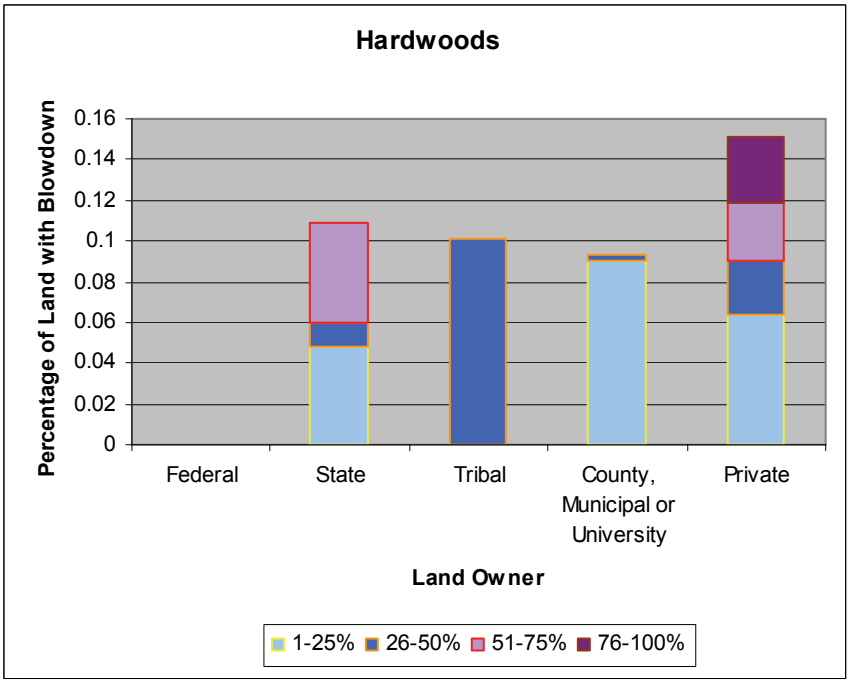

Figure 10. Percentage of land with hardwood blowdown, by land ownership and intensity (percentage of stand).

Acknowledgements

This aerial survey was conducted by Jeff Hubert, Amy Ramsey and Dan Omdal of the Washington Department of Natural Resources, Forest Health program. Carolyn Barkley of the Washington Department of Natural Resources provided contract advice. Thanks also to our pilot, Paul Etchemendy, as well as our federal cooperators Keith Sprengel, Ben Smith and Julie Johnson.

Data and Services

The maps from this survey are available for downloading and printing at:

http://www.dnr.wa.gov/ResearchScience/Topics/ForestHealthEcology/Pages/rp_foresthealth.aspx in the "Related Links" section on the lower right-hand area of the page

For cartographers and GIS users, the aerial survey data set is available electronically. Please just contact the Forest Health program (contact information on following page) and we can get the information to you.

Maps from our annual state-wide aerial survey are available for downloading and printing at:

http://www.fs.fed.us/r6/nr/fid/as/quad07/index.shtml

Additional forestry-related GIS data is available for download at:

http://www.dnr.wa.gov/businesspermits/topics/data/pages/gis_data_center.aspx

- aquatic resources
- land ownership
- climate
- geology
- soils
- elevation
- forest practices
- habitat
- hydrography
- natural heritage
- transportation
- wildfire and prevention

In addition, our annual forest health highlights reports are available on-line at:

http://www.dnr.wa.gov/ResearchScience/Topics/ForestHealthEcology/Pages/rp_foresthealth.aspx

This site will be updated annually with the latest information on exotic pest problems, insect and disease outbreaks and recent trend information for Washington. Major insect and disease identification and management information, damage illustrations, and graphical trend analysis of Washington's various forest health issues are also included.

Contacts and Additional Information

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Appendix A. USGS 15min Quad Maps of Blowdown Aerial Survey

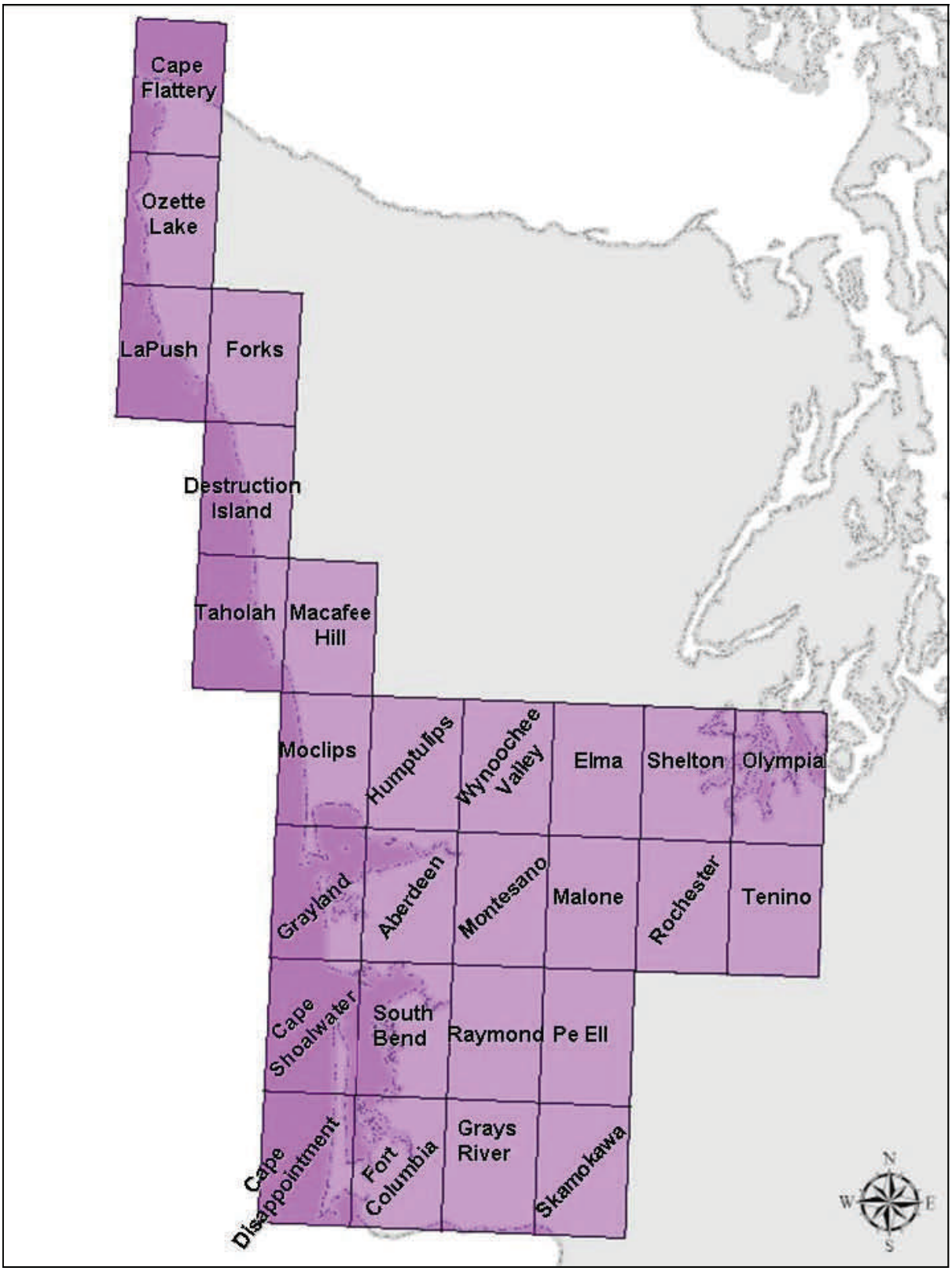


Figure A1. Quad map names of blowdown aerial survey area.

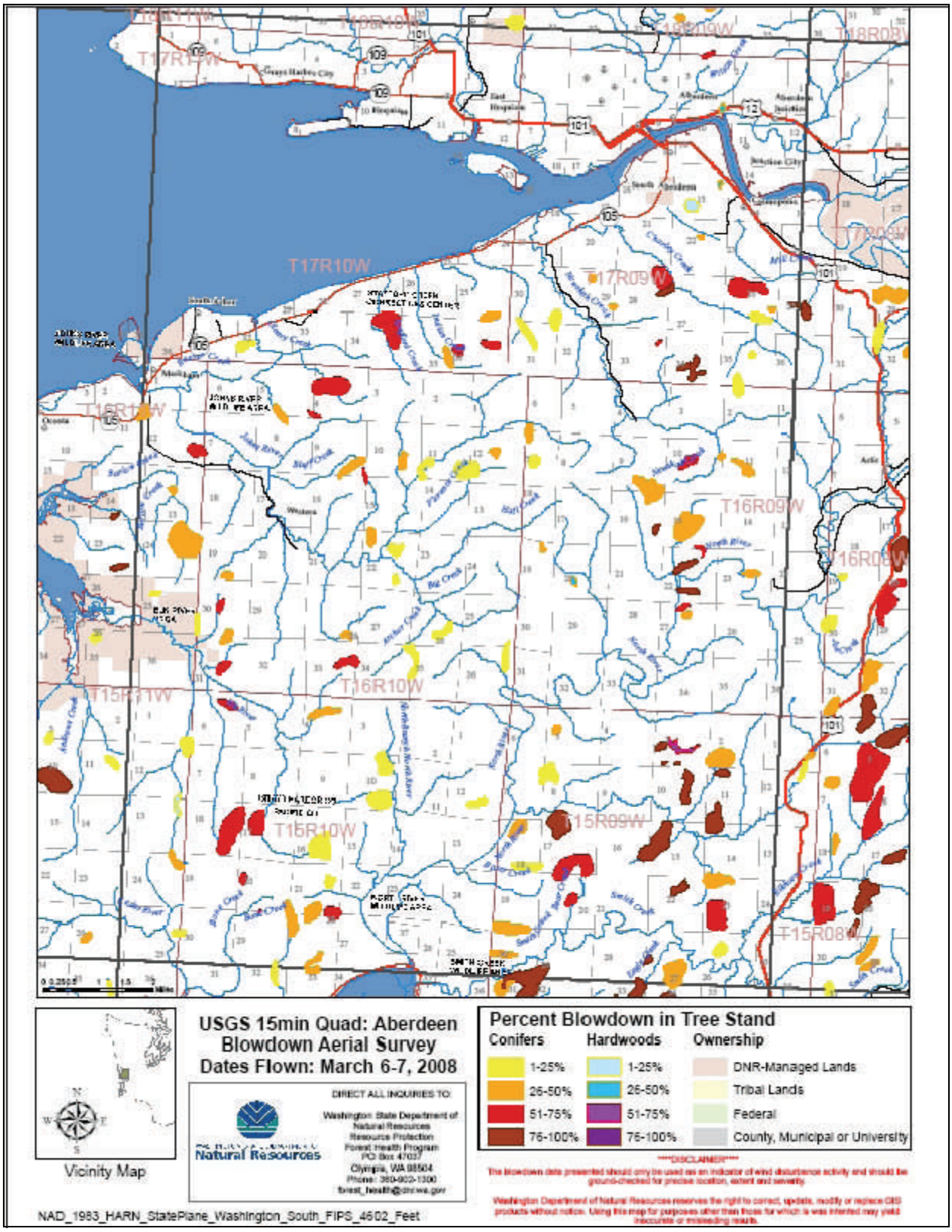


Figure A2. Aberdeen USGS 15min quad map, Washington coast blowdown aerial survey.

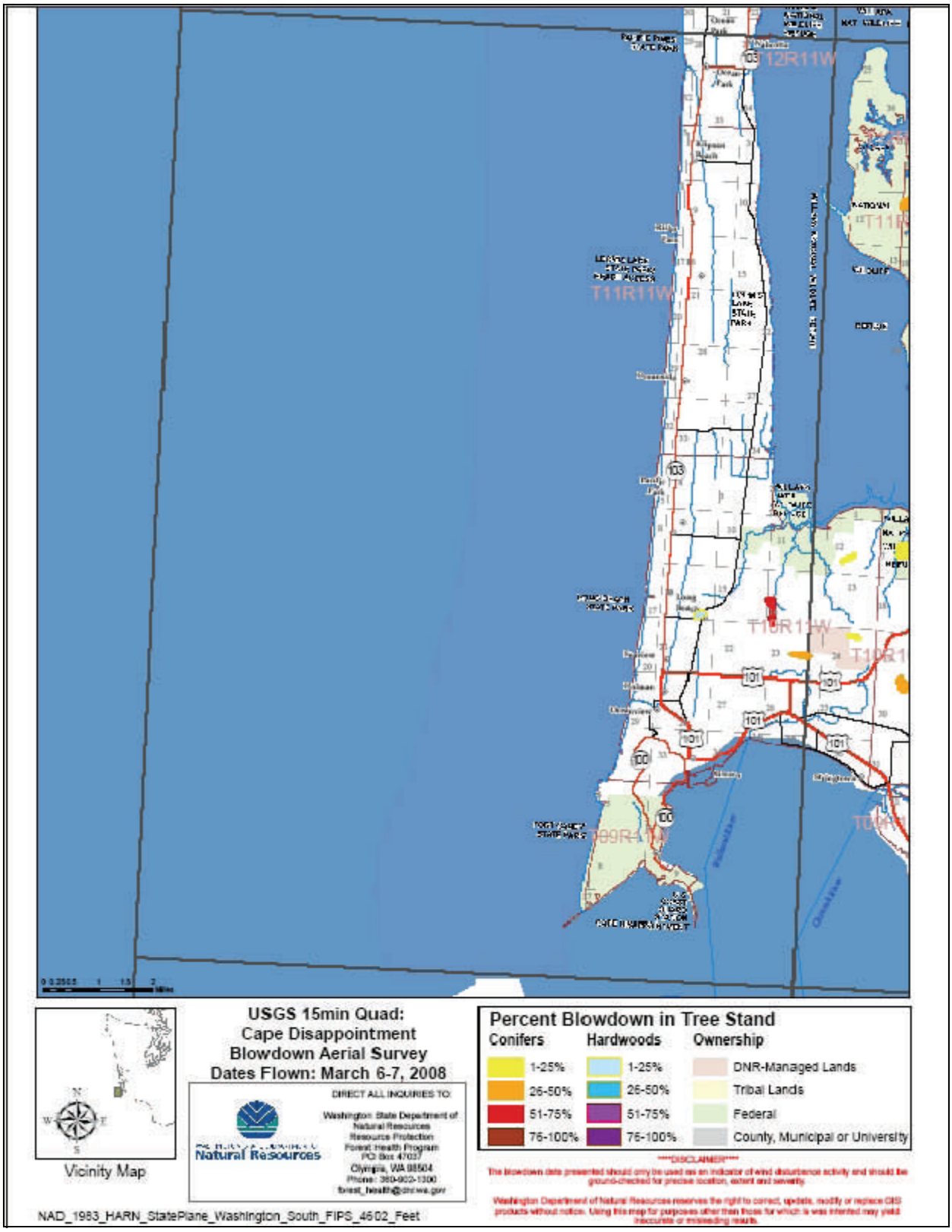


Figure A3. Cape Disappointment USGS 15min quad map, Washington coast blowdown aerial survey.

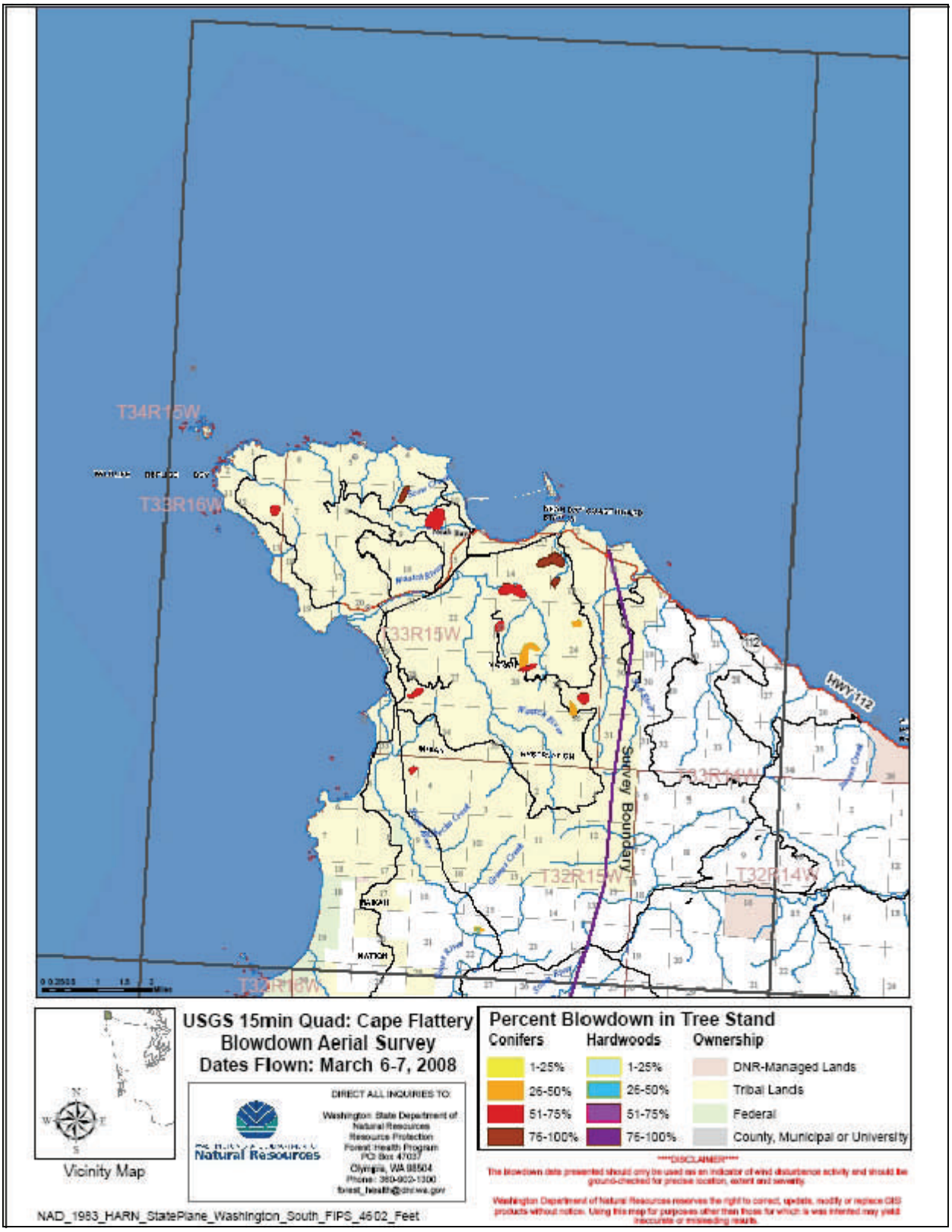


Figure A4. Cape Flattery USGS 15min quad map, Washington coast blowdown aerial survey.

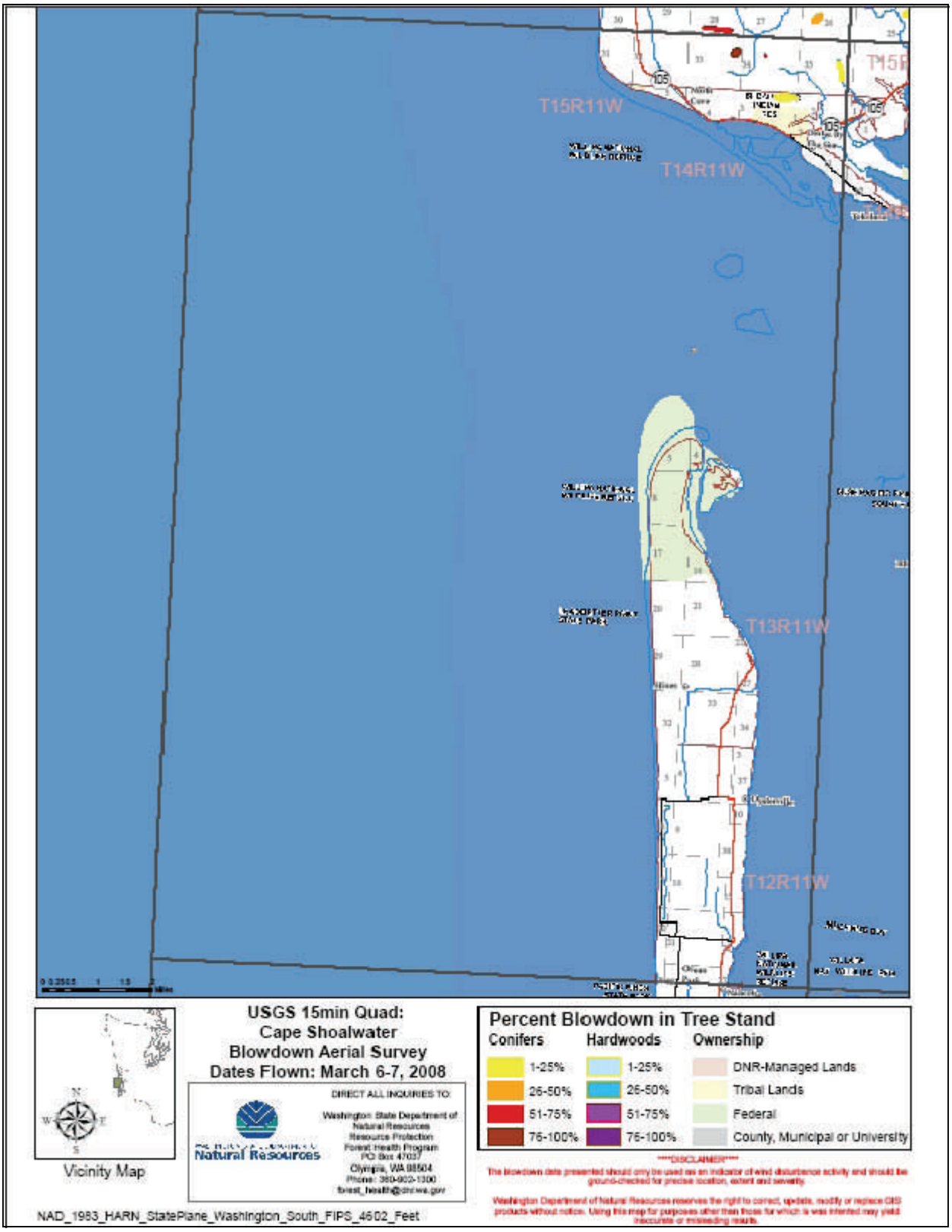


Figure A5. Cape Shoalwater USGS 15min quad map, Washington coast blowdown aerial survey.

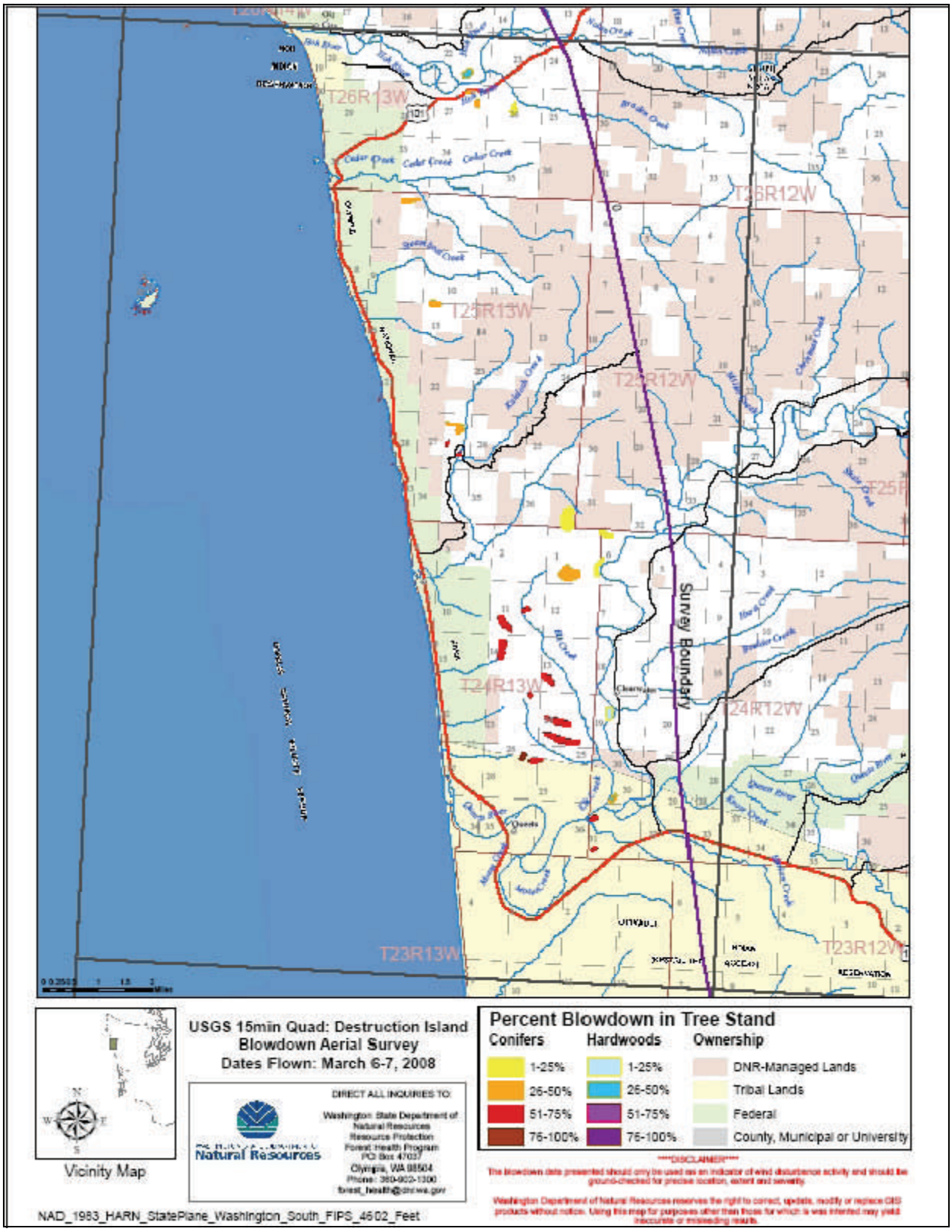


Figure A6. Destruction Island USGS 15min quad map, Washington coast blowdown aerial survey.

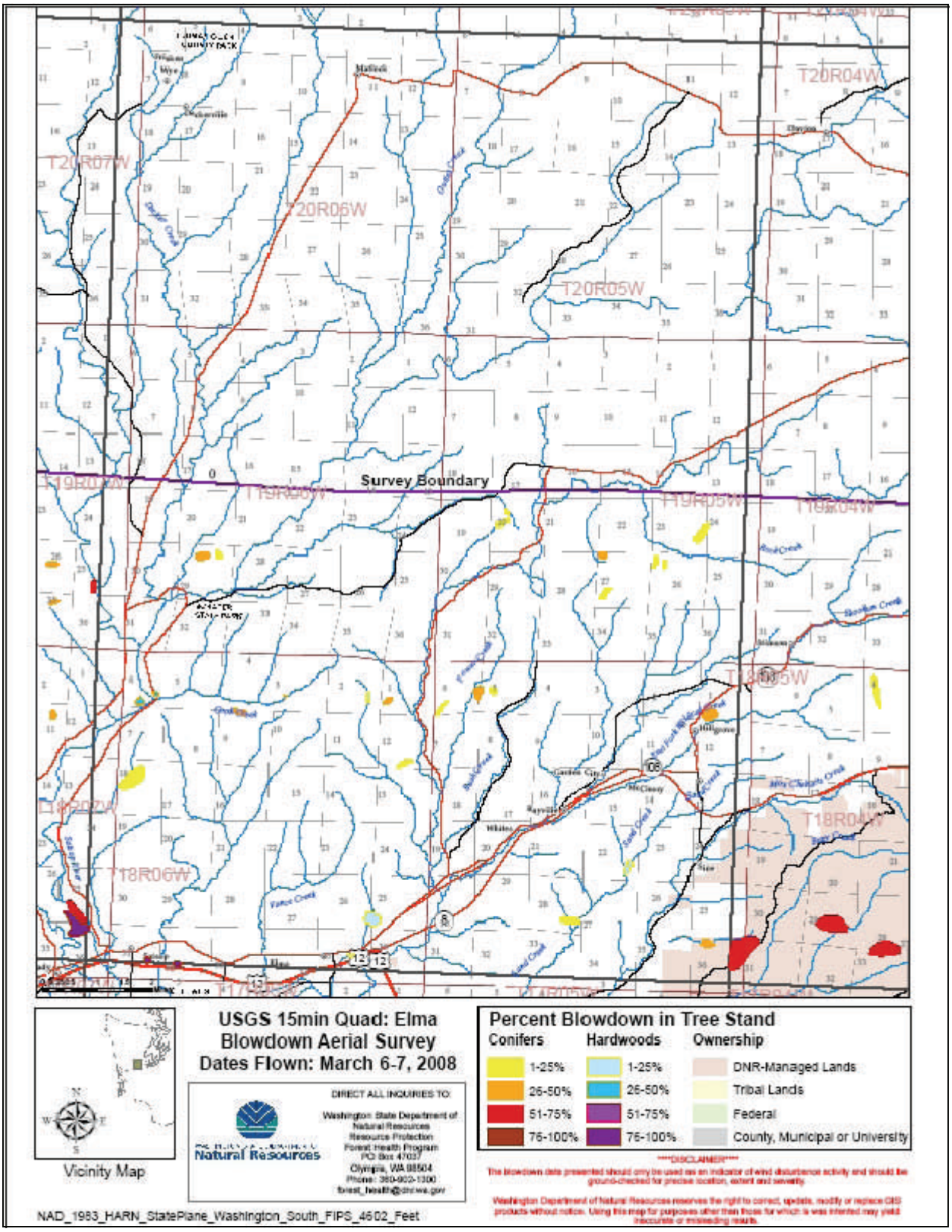


Figure A7. Elma USGS 15min quad map, Washington coast blowdown aerial survey.

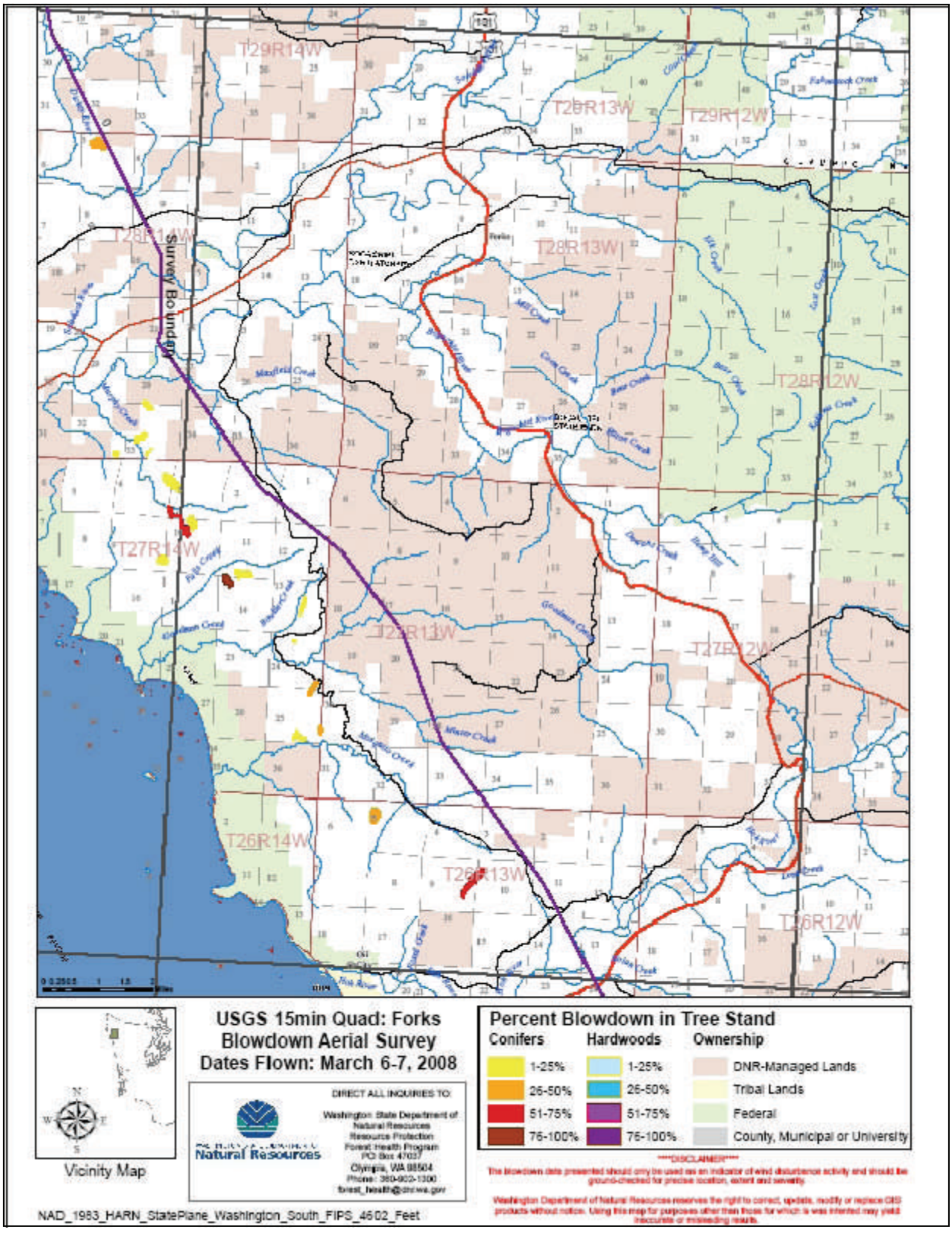


Figure A8. Forks USGS 15min quad map, Washington coast blowdown aerial survey.

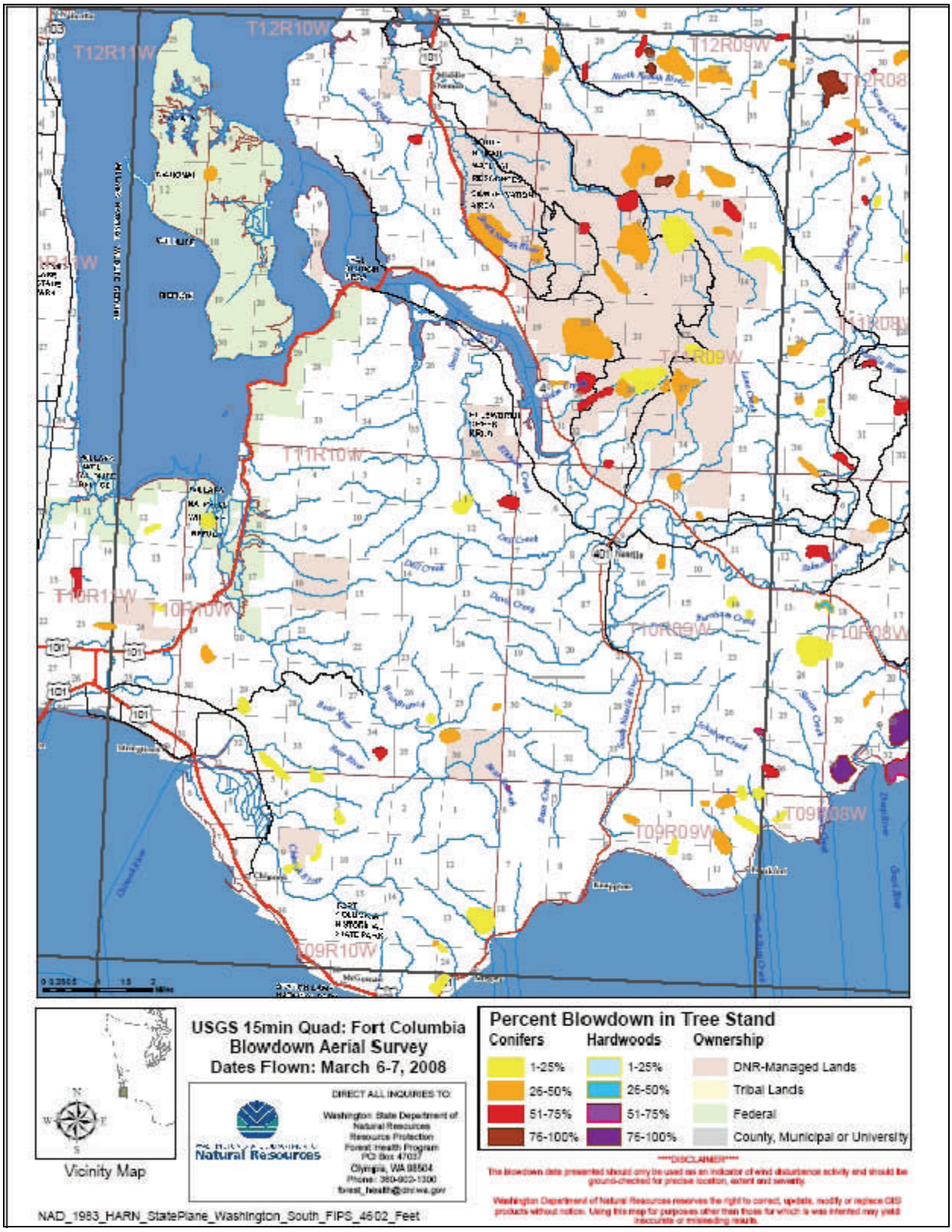


Figure A9. Fort Columbia USGS 15min quad map, Washington coast blowdown aerial survey.

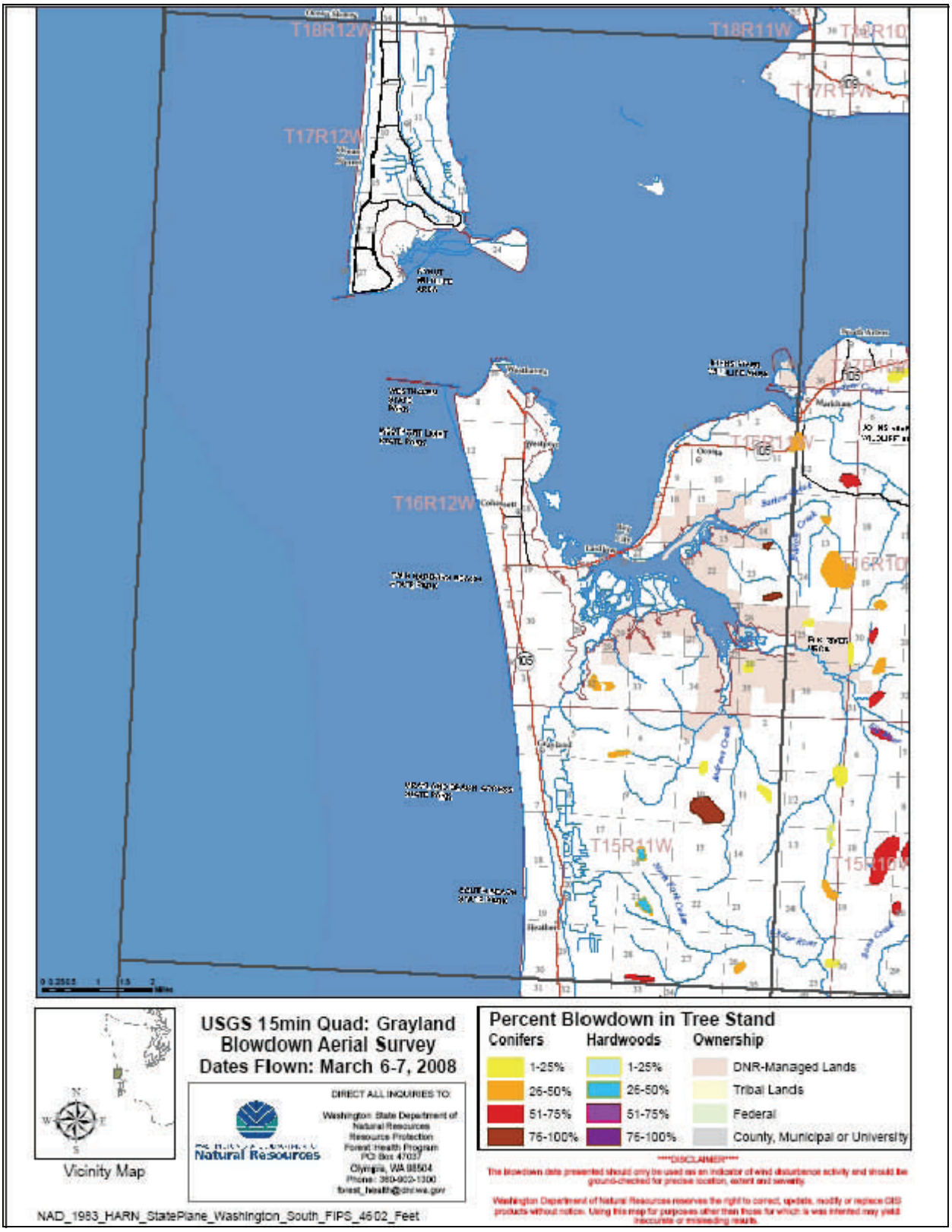


Figure A10. Grayland USGS 15min quad map, Washington coast blowdown aerial survey.

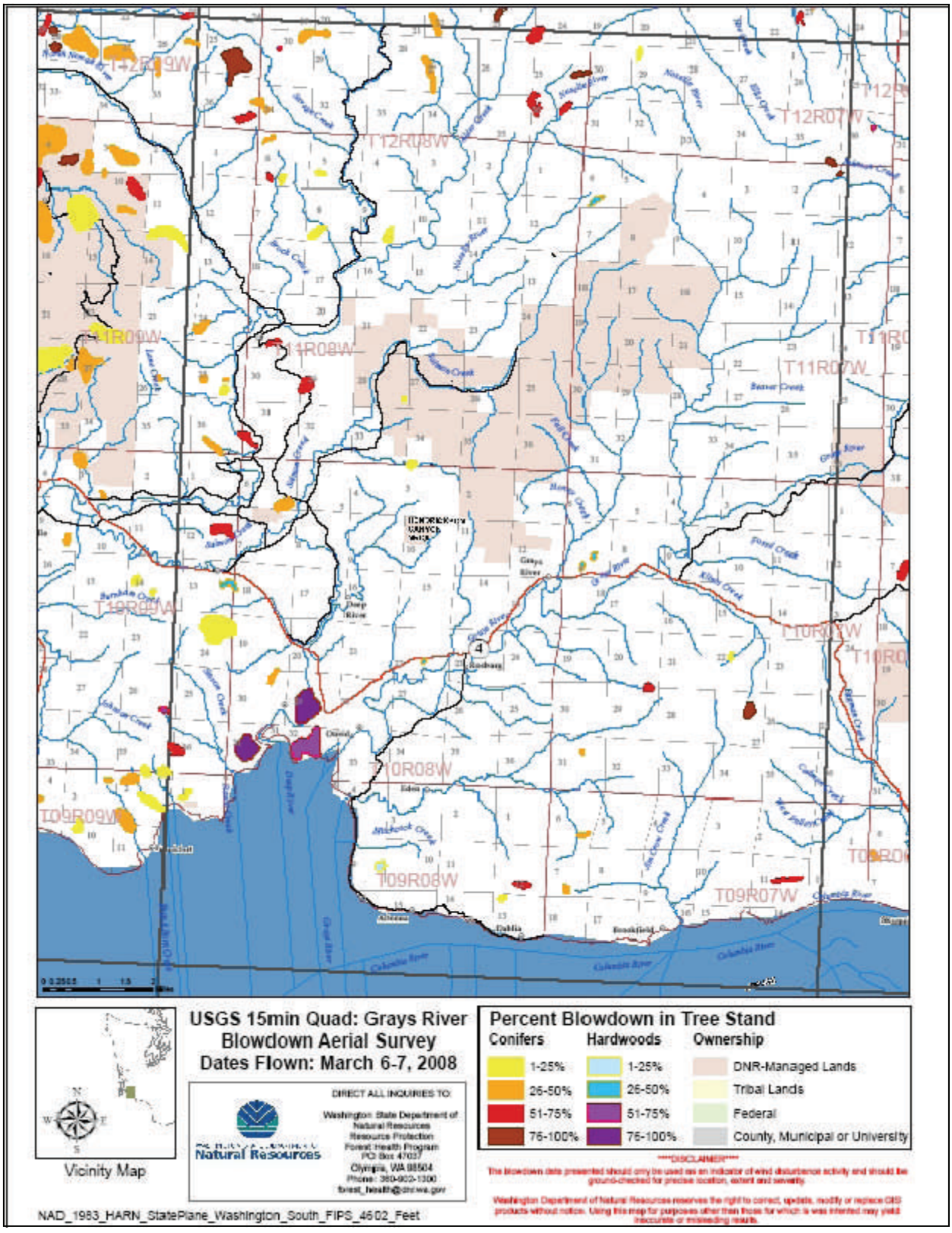
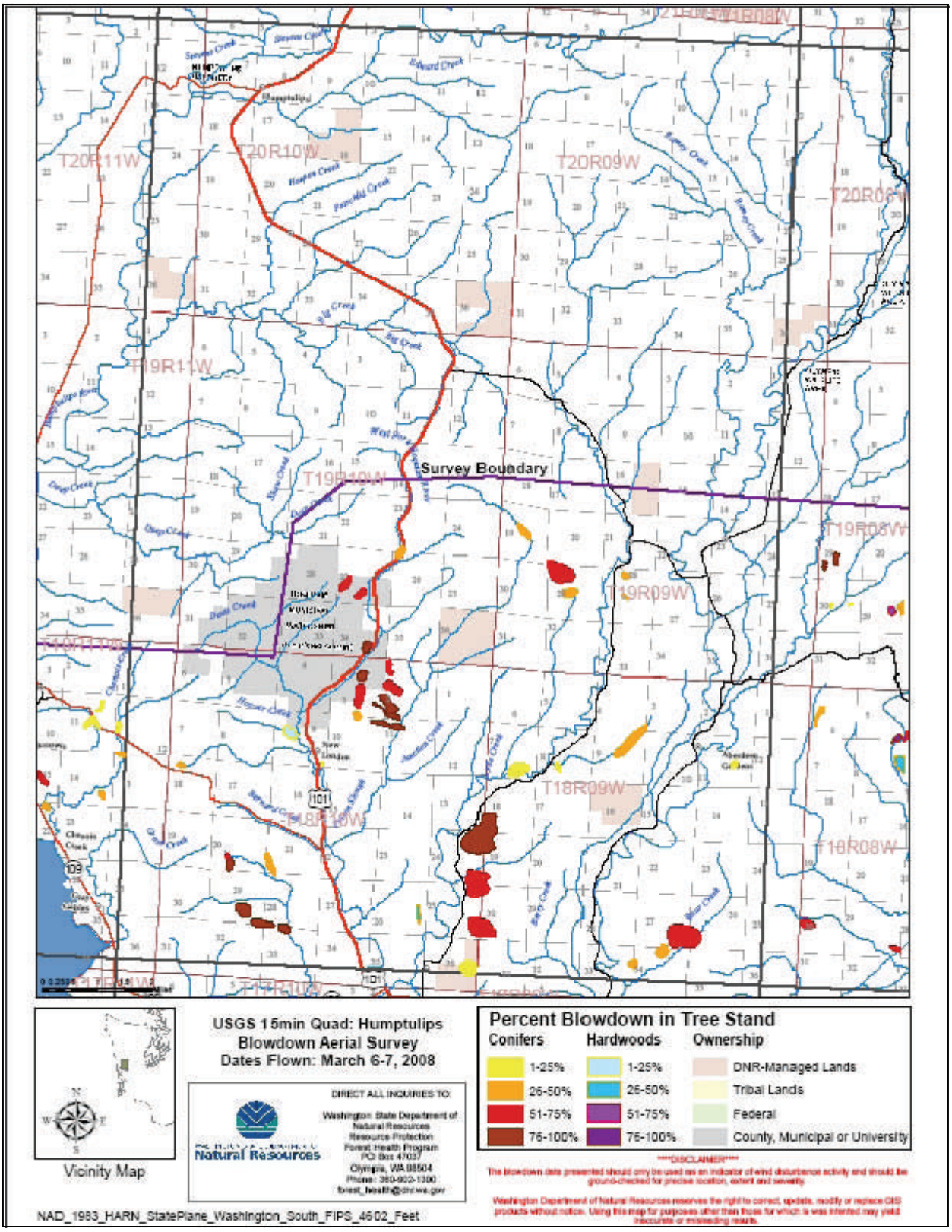


Figure A11. Grays River USGS 15min quad map, Washington coast blowdown aerial survey.



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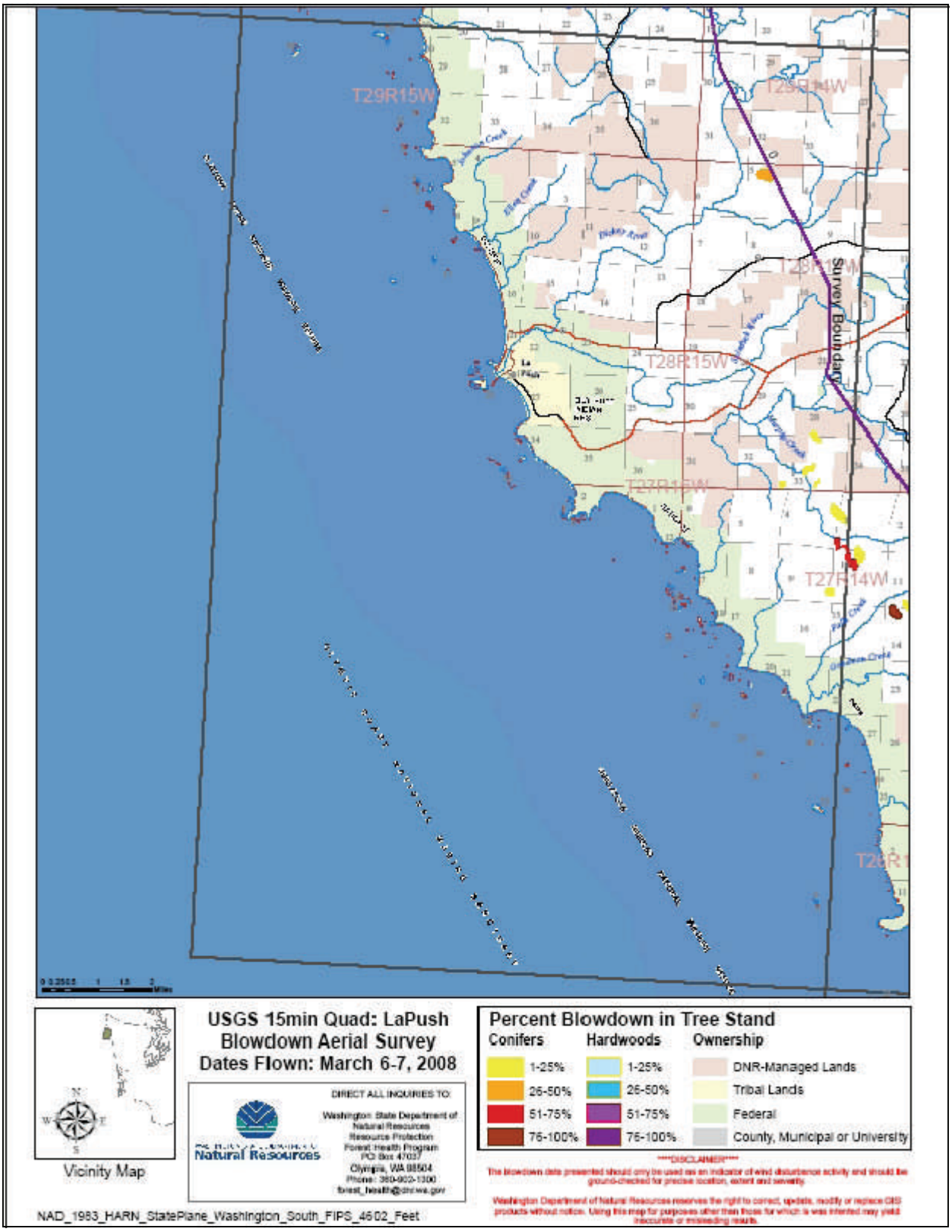
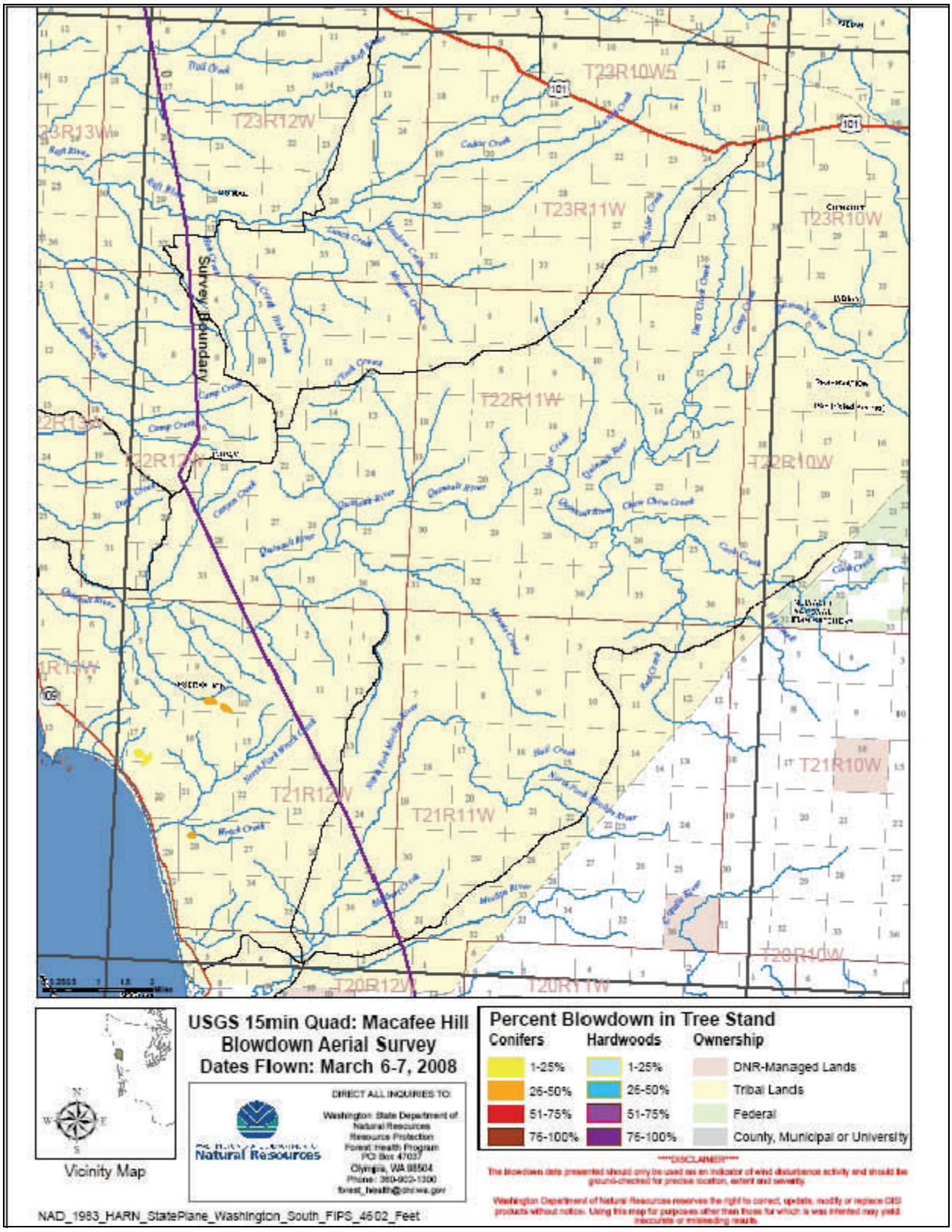


Figure A13. LaPush USGS 15min quad map, Washington coast blowdown aerial survey.



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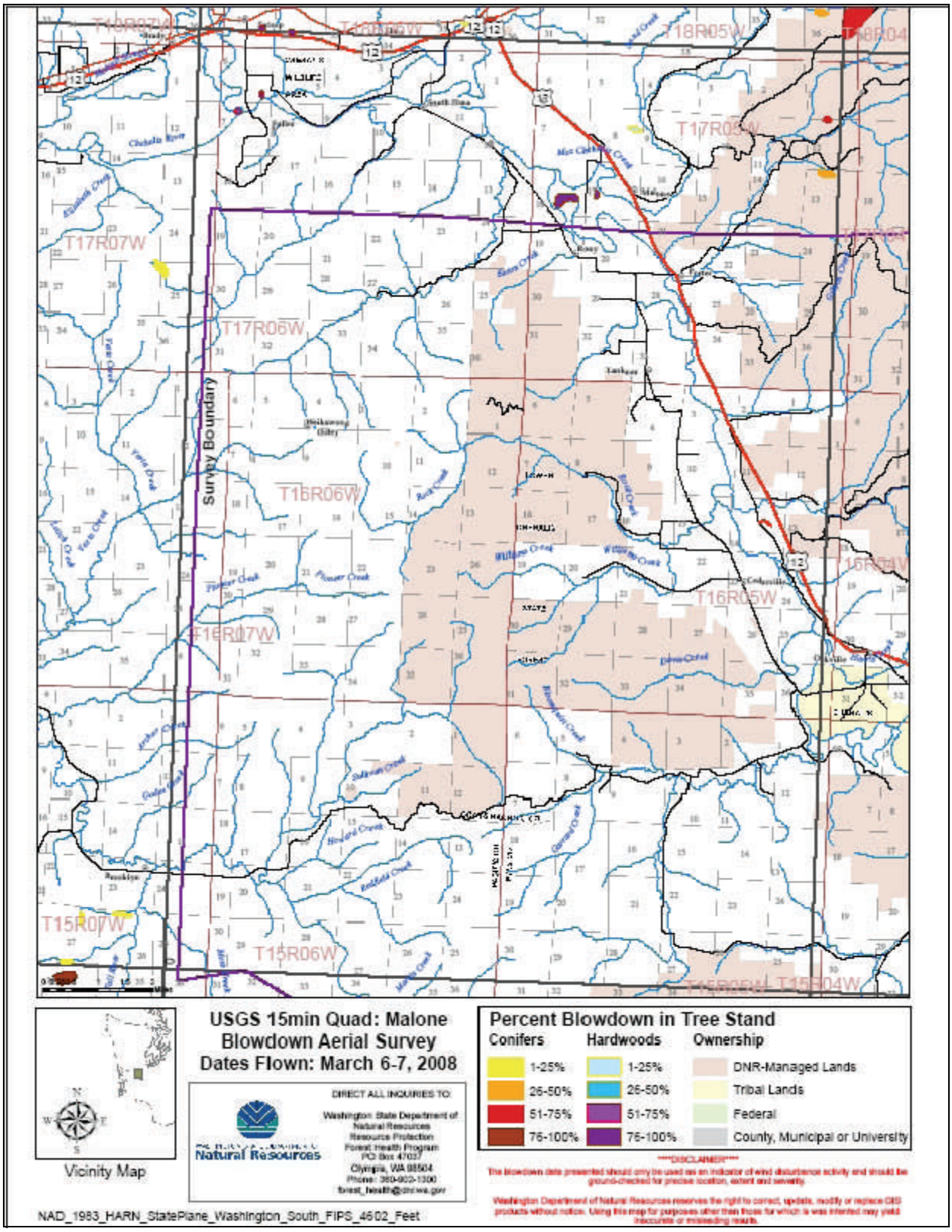


Figure A15. Malone USGS 15min quad map, Washington coast blowdown aerial survey.

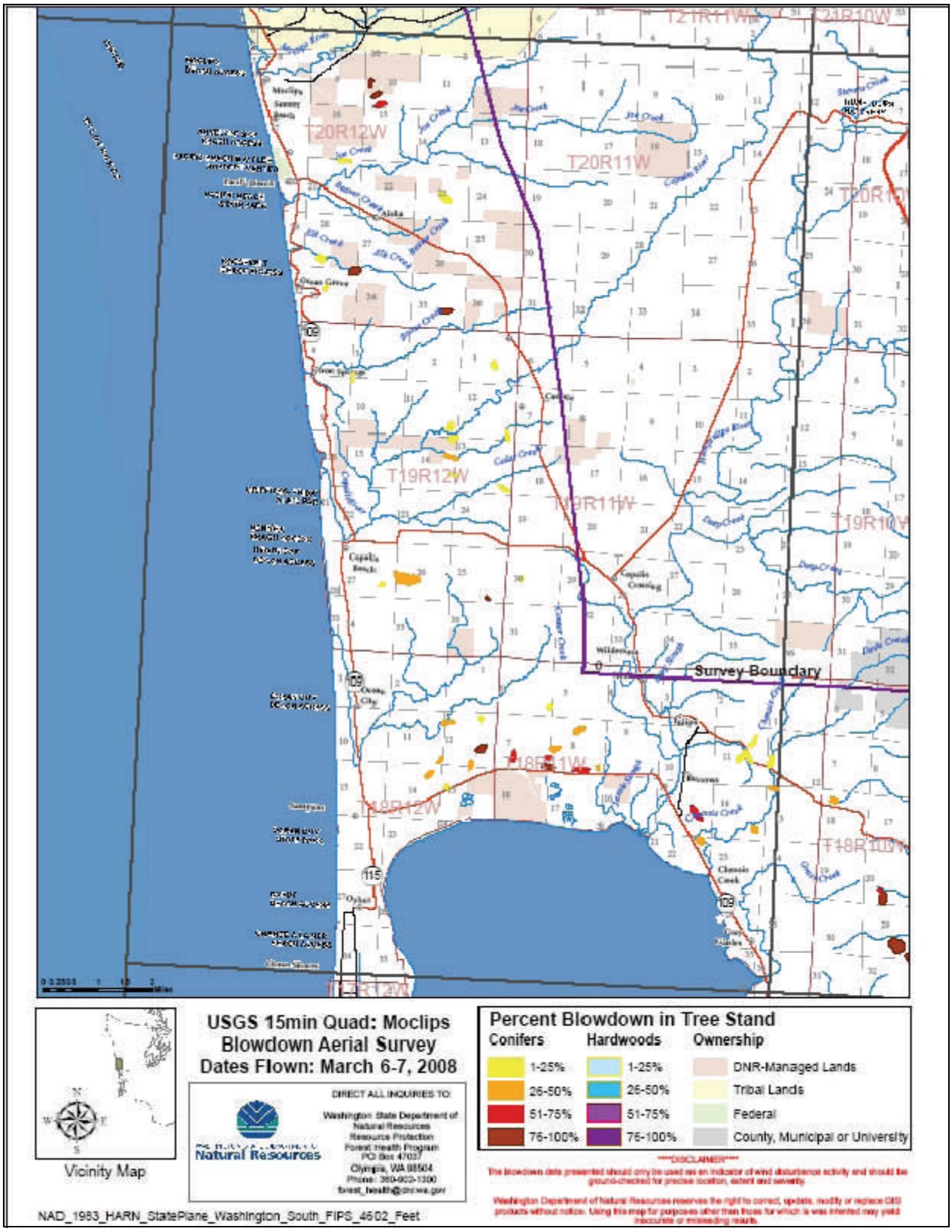


Figure A16. Moclips USGS 15min quad map, Washington coast blowdown aerial survey.

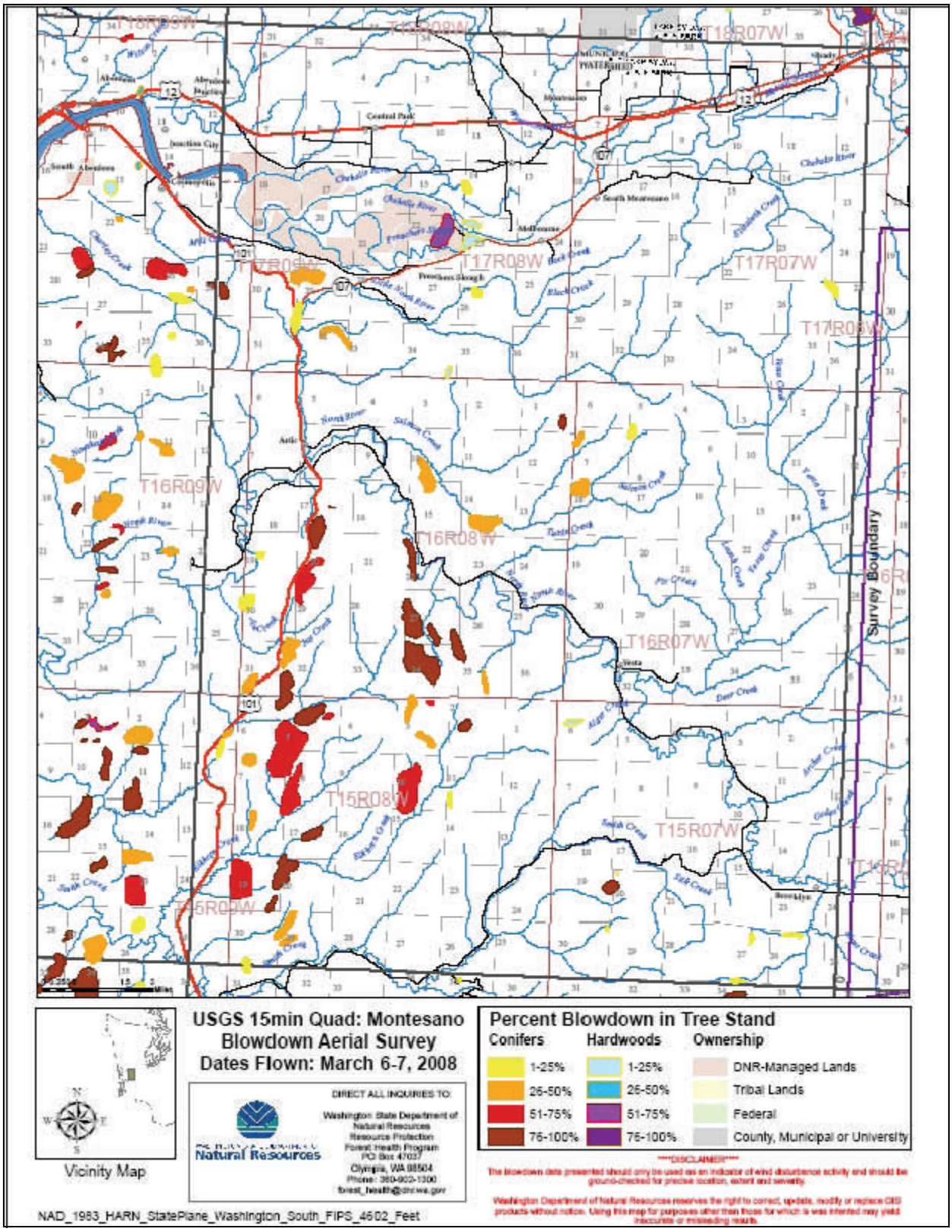


Figure A17. Montesano USGS 15min quad map, Washington coast blowdown aerial survey.

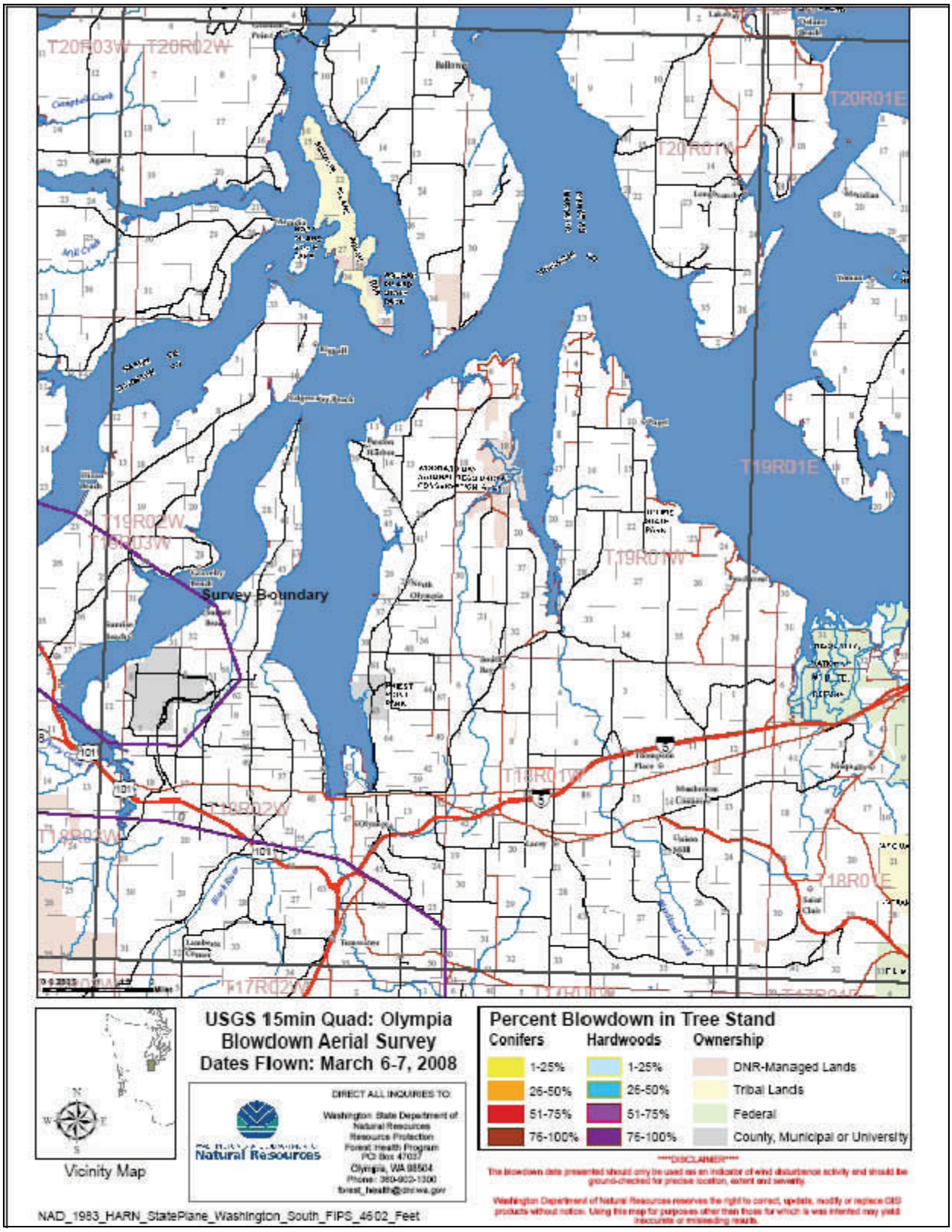
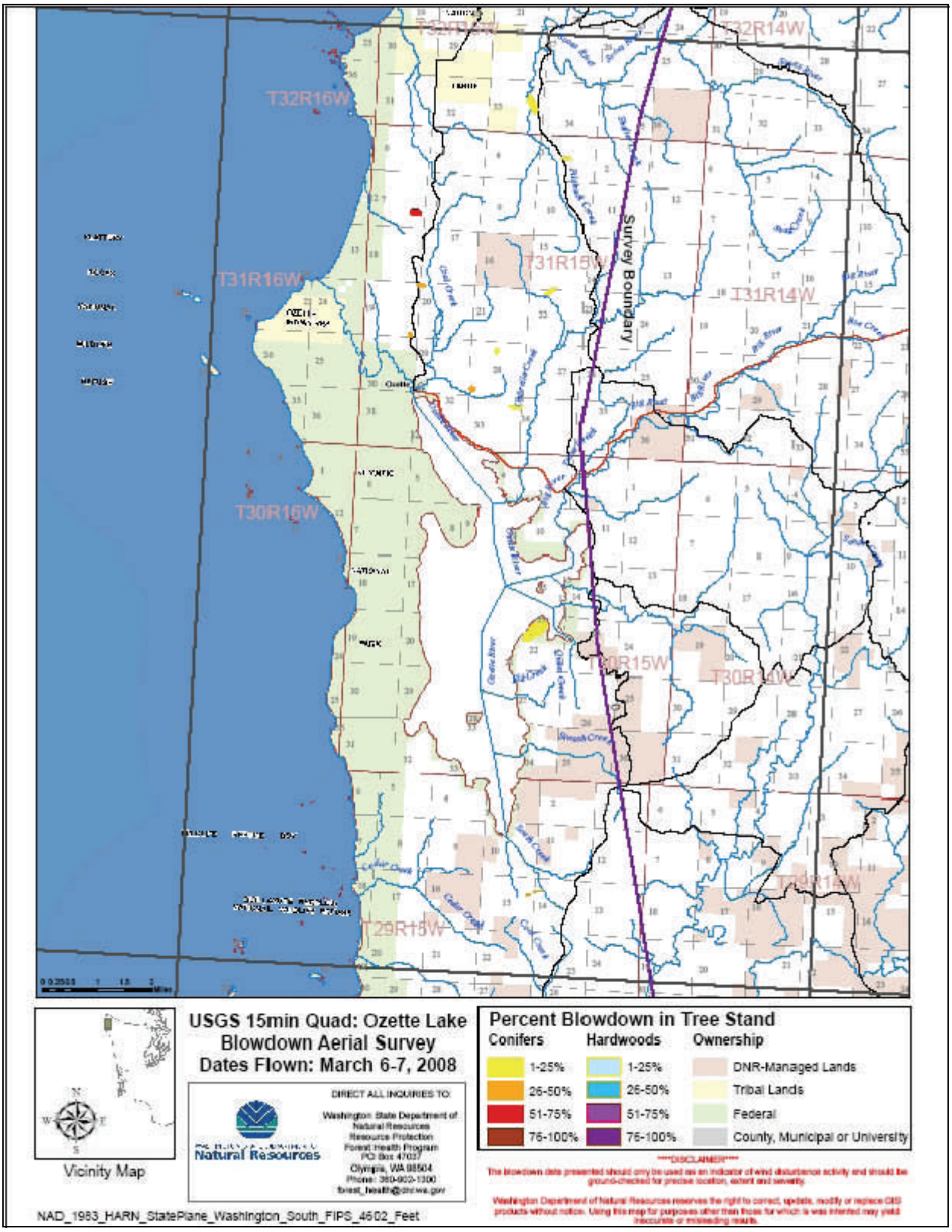


Figure A18. Olympia USGS 15min quad map, Washington coast blowdown aerial survey.



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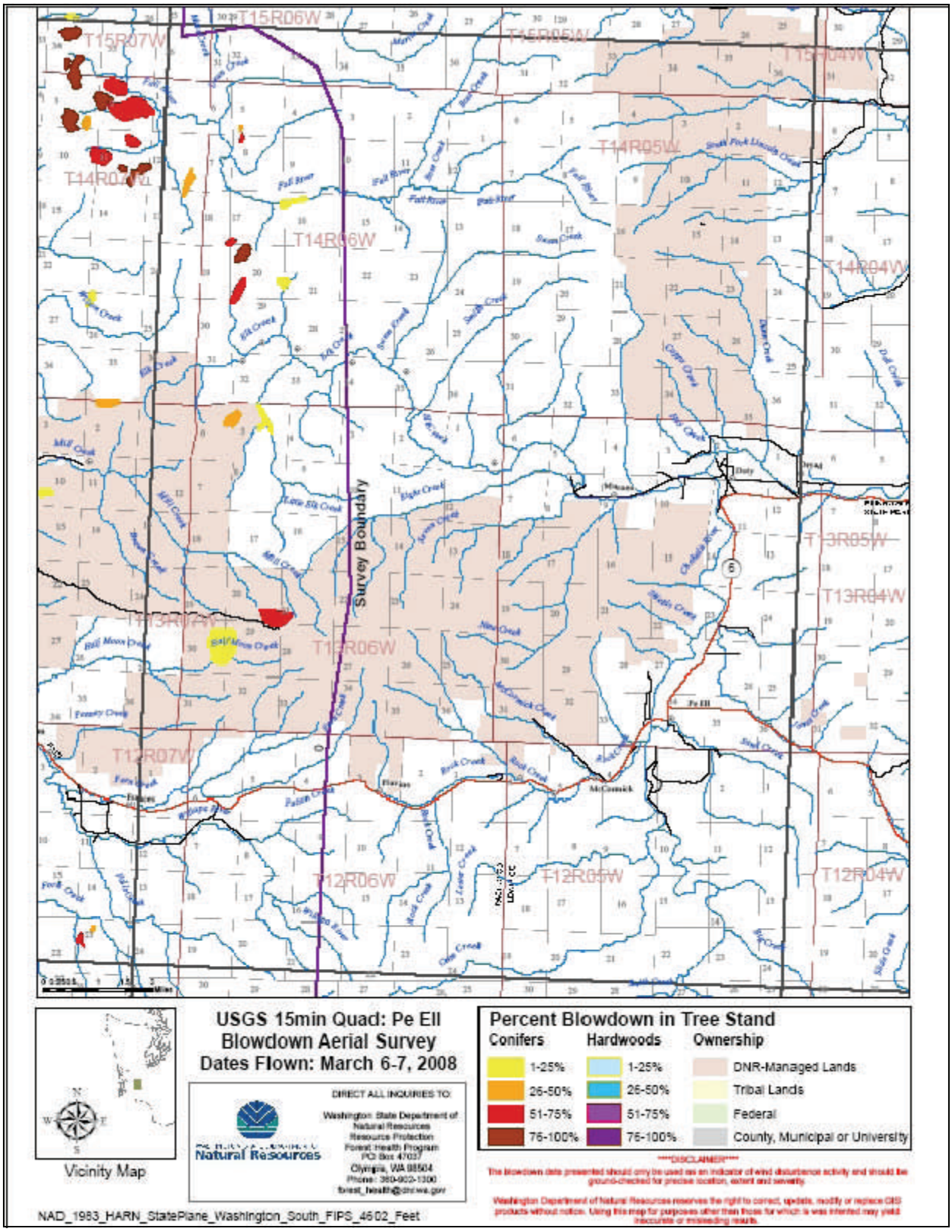


Figure A20. Pe Ell USGS 15min quad map, Washington coast blowdown aerial survey.

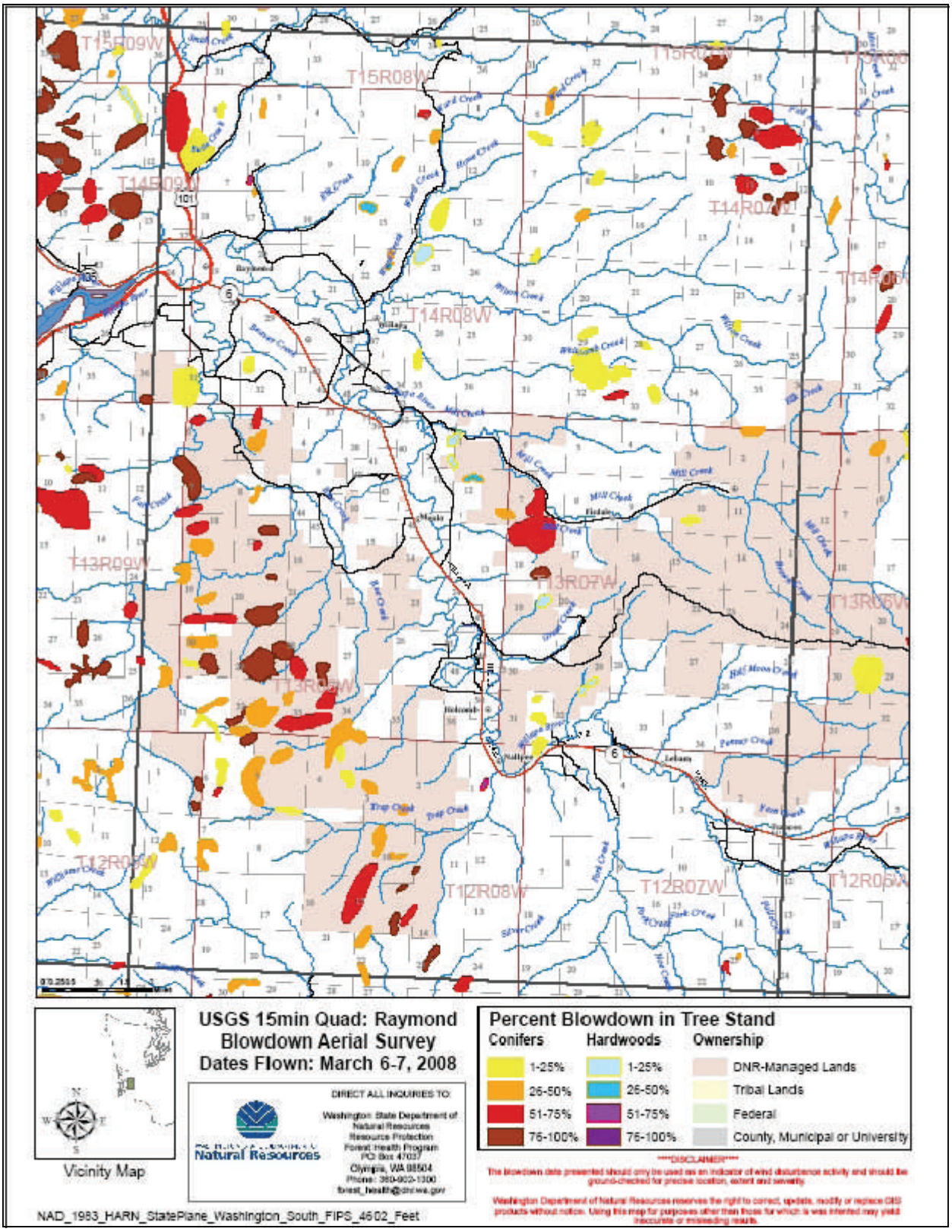
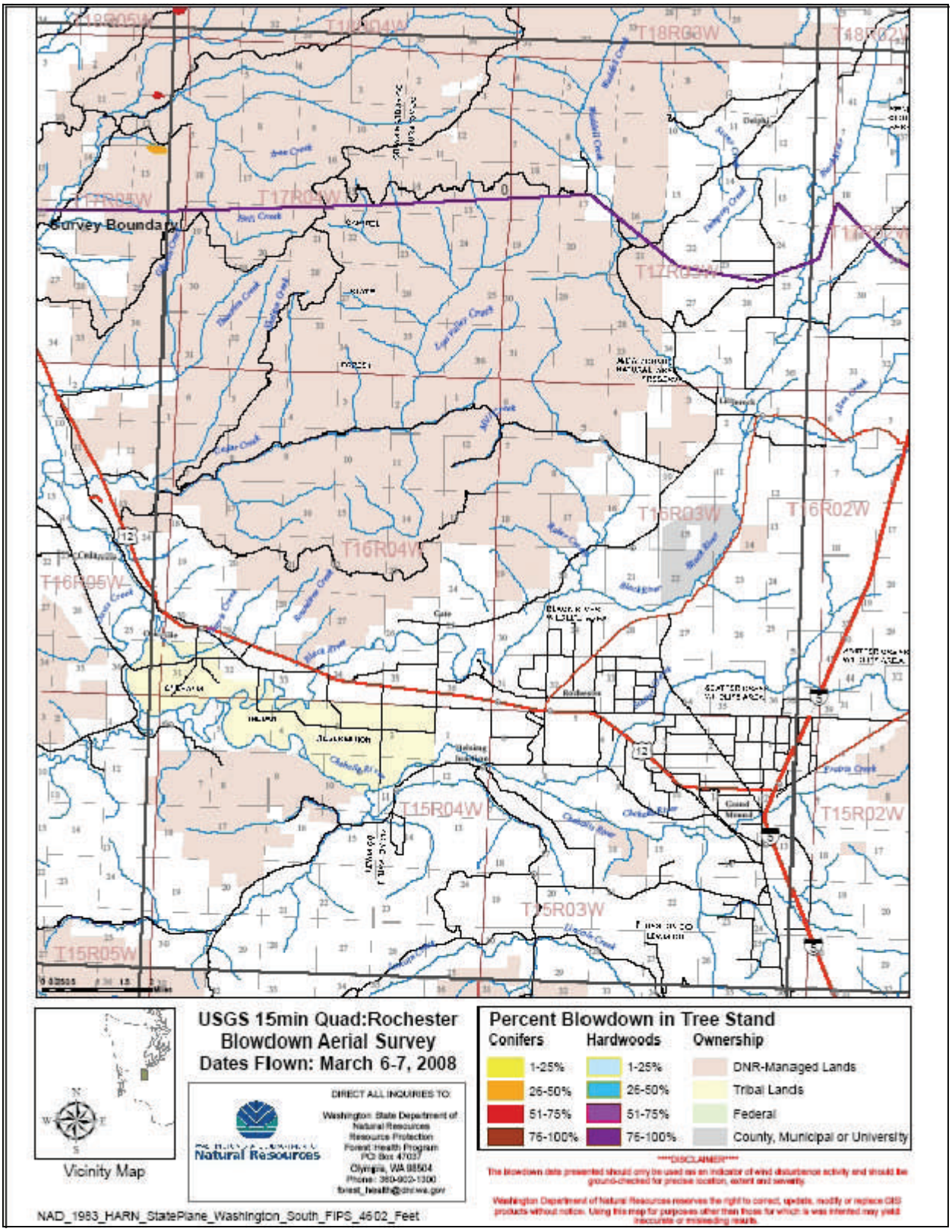


Figure A21. Raymond USGS 15min quad map, Washington coast blowdown aerial survey.



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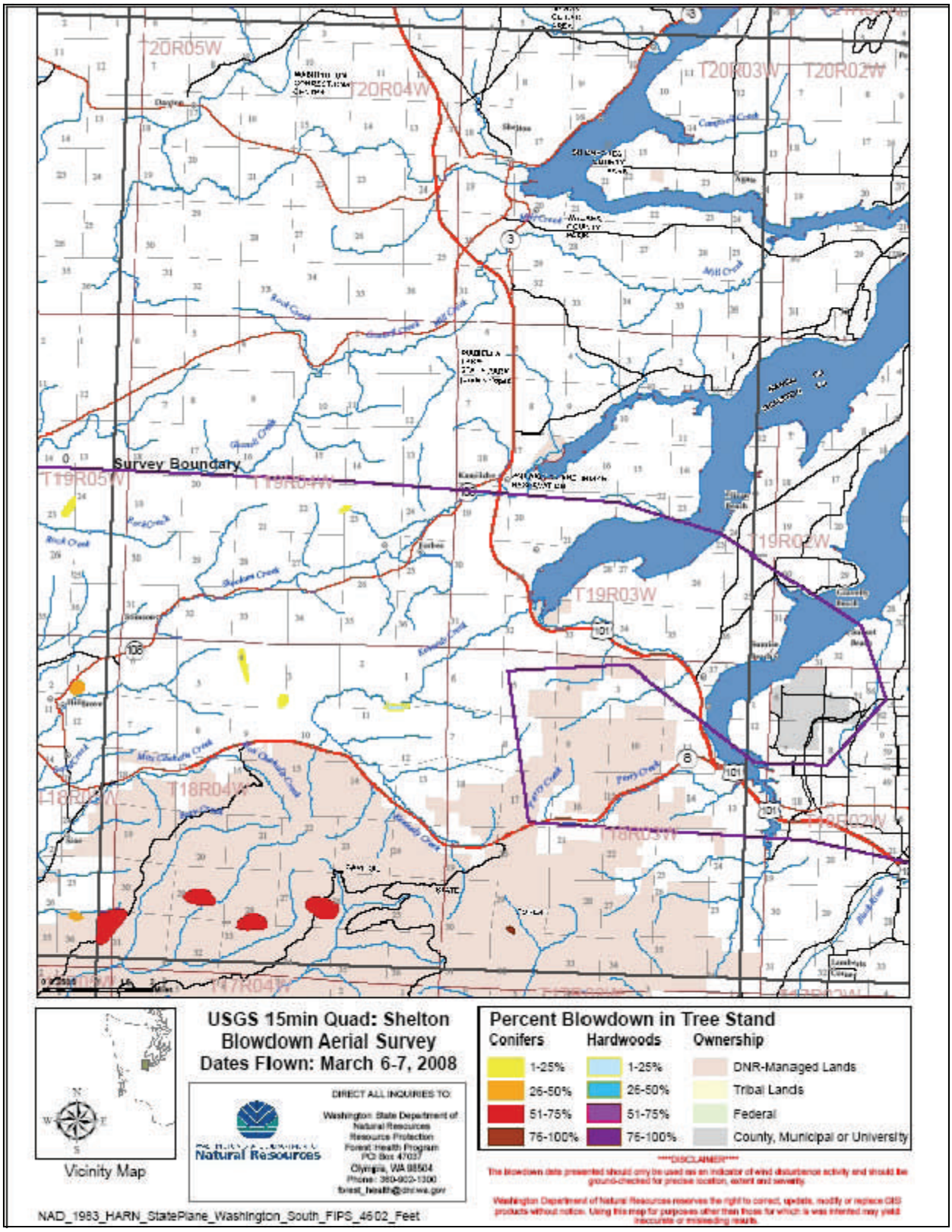

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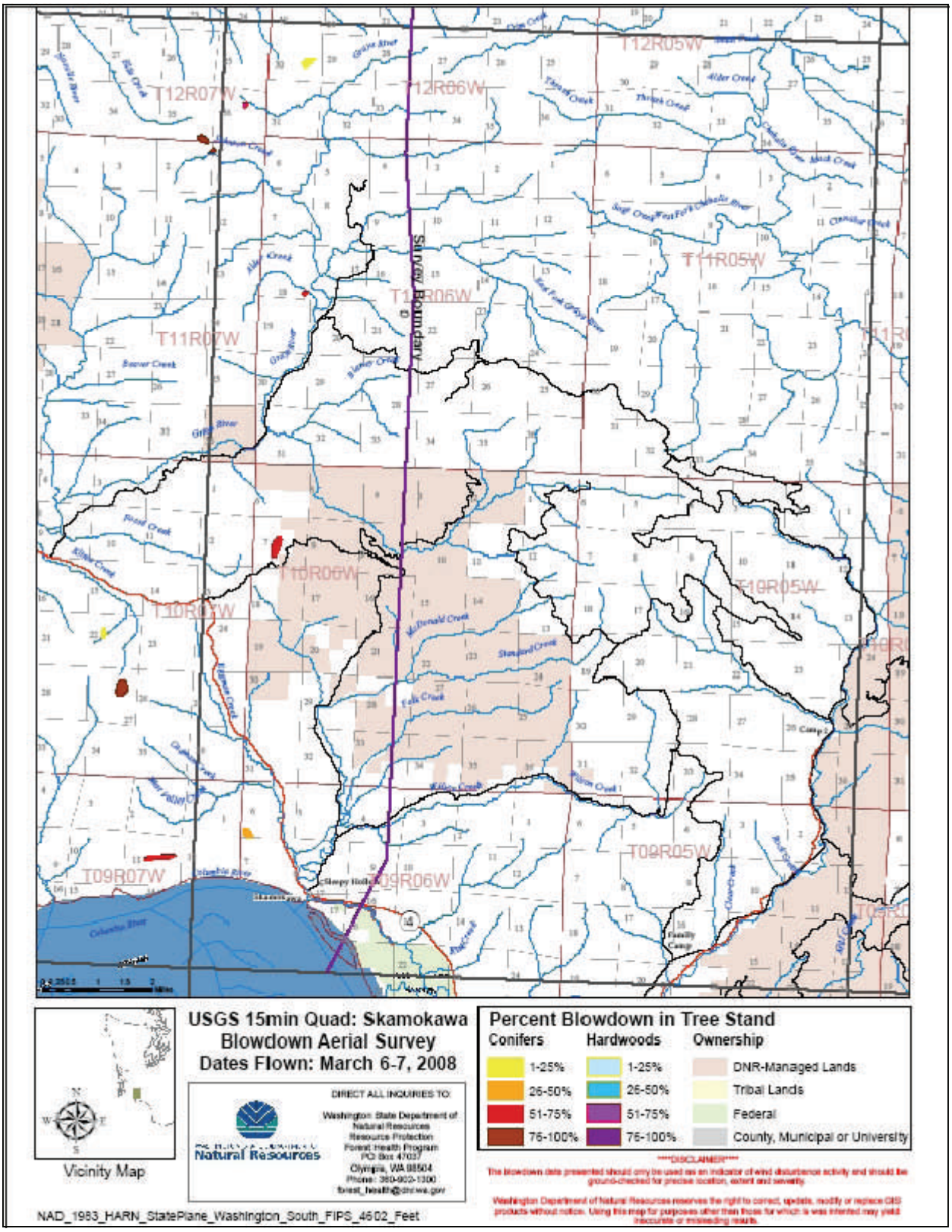

Figure A24. Skamokawa USGS 15min quad map, Washington coast blowdown aerial survey.

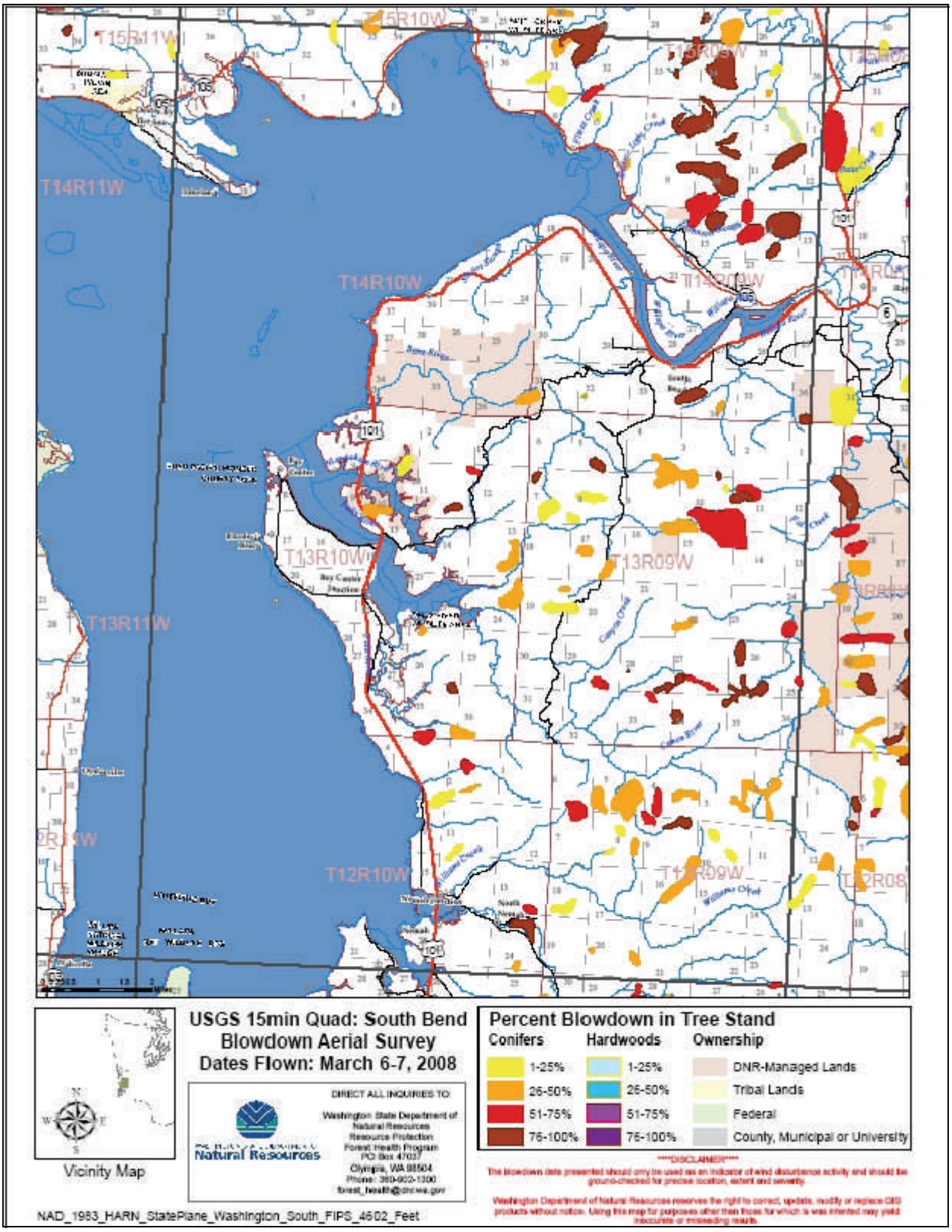

Figure A25. South Bend USGS 15min quad map, Washington coast blowdown aerial survey.

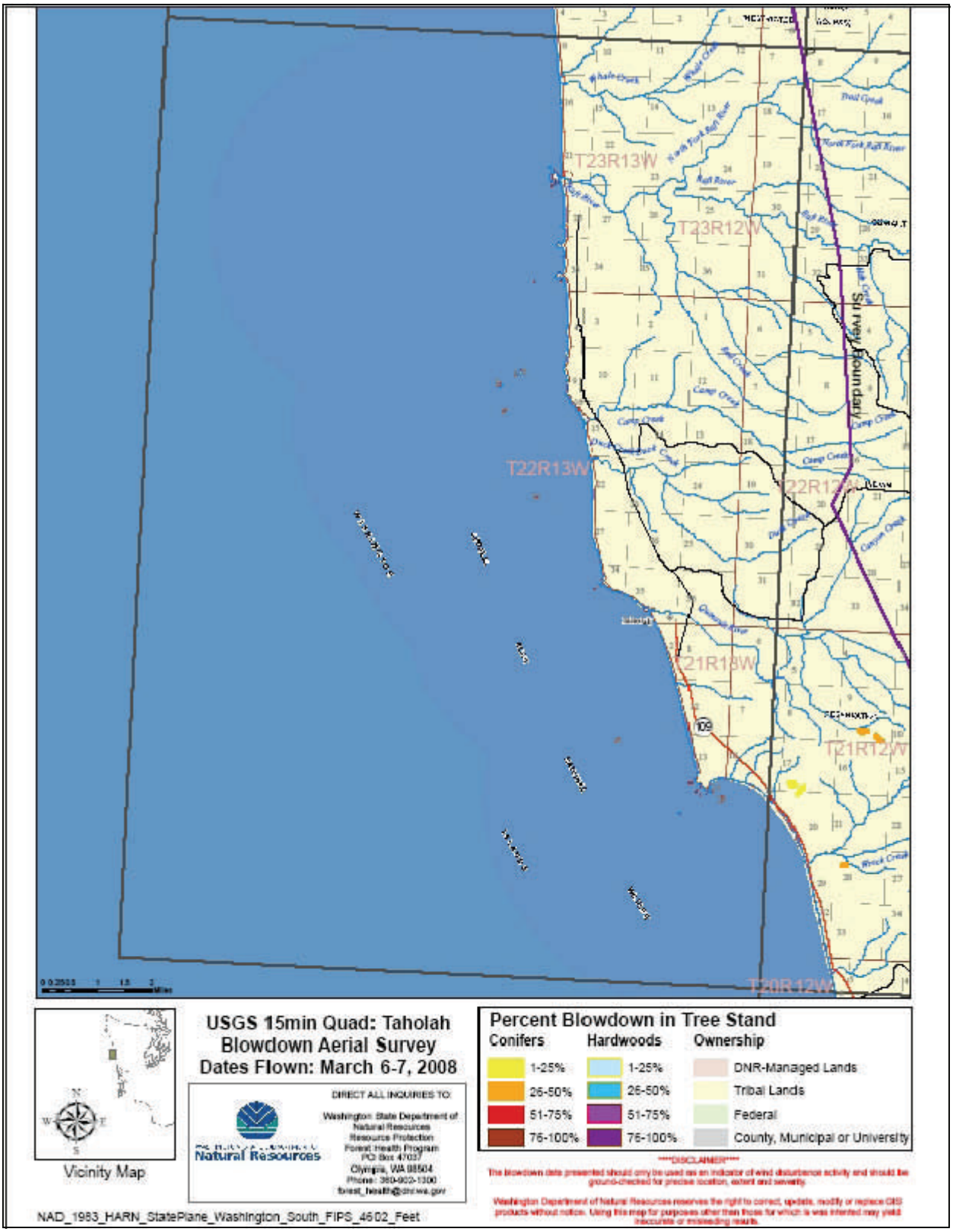

Figure A26. Taholah USGS 15min quad map, Washington coast blowdown aerial survey.

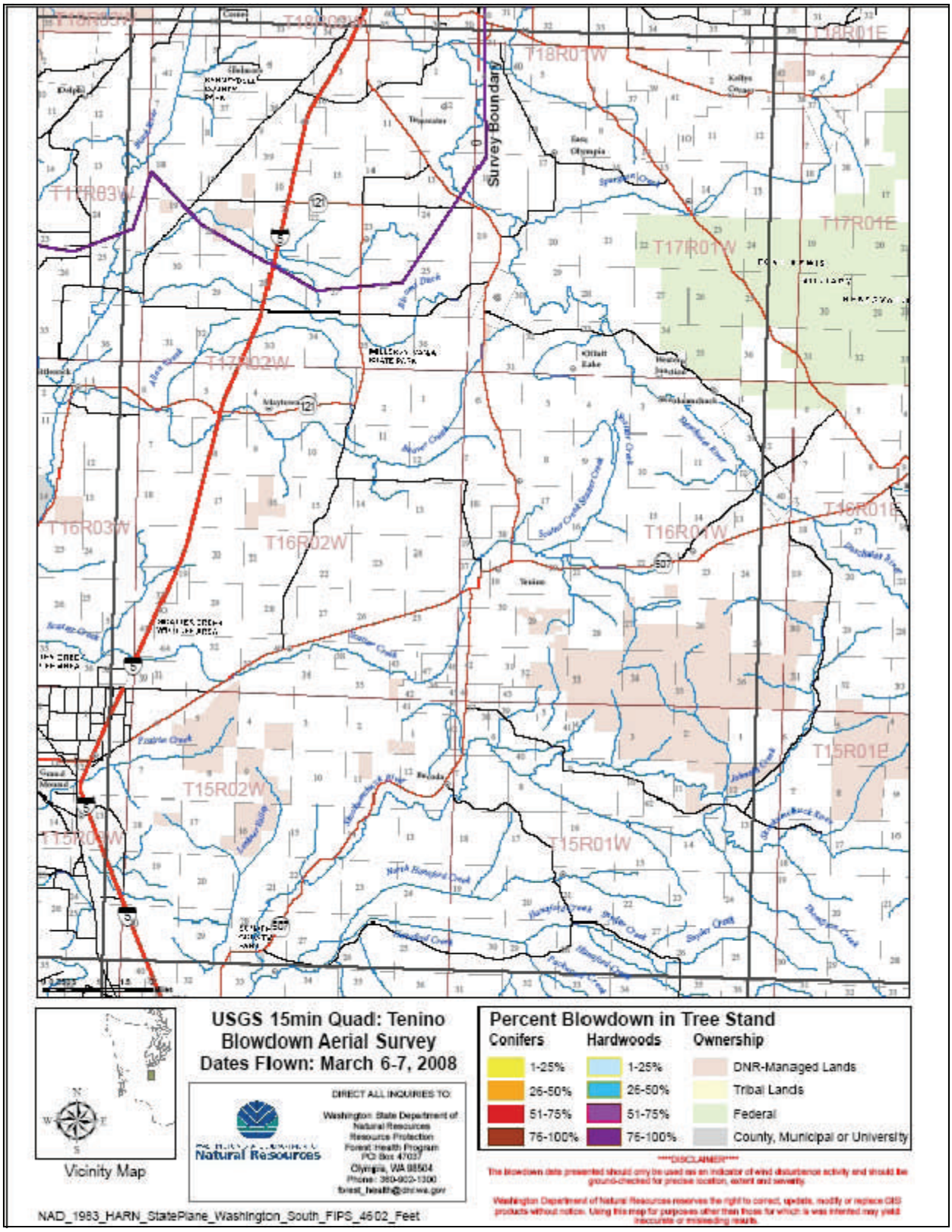

Figure A27. Tenino USGS 15min quad map, Washington coast blowdown aerial survey.

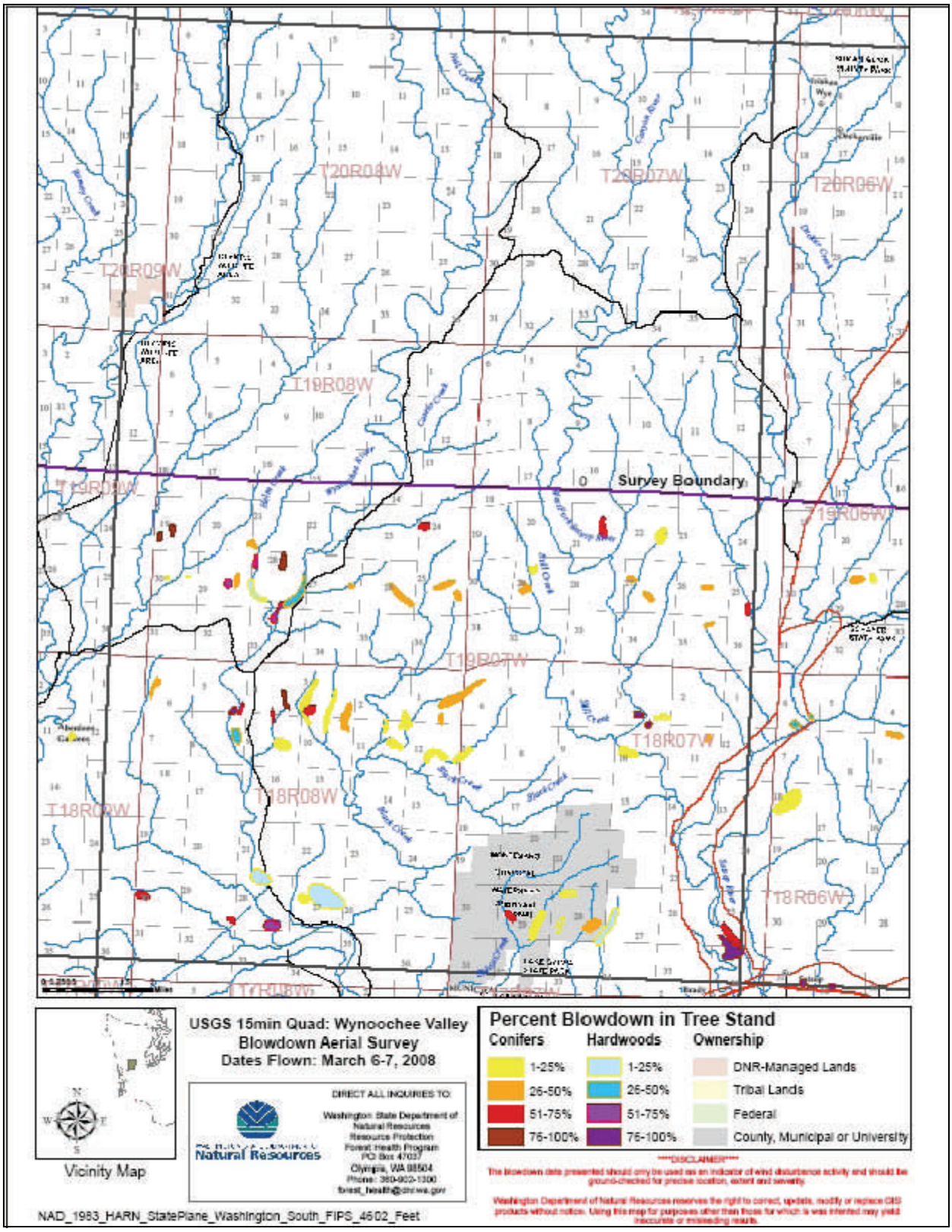

Figure A28. Wynoochee Valley USGS 15min quad map, Washington coast blowdown aerial survey.