Washington Department of Natural Resources

# Forest Practices Compliance Monitoring 2014-2015 Biennial Report Results and ISPR Recommendations

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# 2014 Program Redesign
## (Chapter 4.4, pg. 21)
## *WAC 222-08-160(4): Are Forest Practices conducted in compliance with the rules*

- Prior program design

  - Sampled as either compliant or non-compliant
    - Wide confidence intervals
    - Limited information on specific rule non-compliance

- Objectives of new design

  - Increase statistical precision
  - More quantitative estimate of compliance
  - Better determine specific rule noncompliance
  - Flexibility to add, remove, or combine prescription types

# 2014 Program Redesign Continued

- **Changes to the methodology of data analysis by prescription, <u>not</u> to data collection methods**

- **Estimate average compliance by prescription**

  - **Mean Compliance (prescription)**$= \dfrac{\text{\# rules compliant}}{\text{\# total rules sampled}}$

- **Sample size is set to control error rate on mean compliance by prescription**

  - **Variance (2010-2014)**

  - **Cluster size (average number rules evaluated by prescription)**

  - **Prescription population size**

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# Prescriptions
## (Chapter 4.1, pg. 11)

- **Forest Practices Applications are sets of rule applications (prescriptions)**

    - **FPAs reflect how Landowners apply the Forest Practices rules to conduct forest practices activities. FPAs are clusters of rule groupings (prescriptions).**

    - **Prescriptions sampled: Desired Future Condition (option 1), Desired Future Condition (option 2), No Inner Zone Harvest, Non-fish bearing Perennial streams, Non-fish bearing Seasonal streams, Type A & B Wetland Management Zones, Forested Wetland Management Zones, Roads, and Haul Routes**

# 2014-2015 Sample Overview

- **40% of Biennial sample completed in 2014**

    - **Remaining 60% of sample completed 2015**

- **No emphasis sample**

- **2010-2015 Trend analysis project**

- **Independent Scientific Peer Review**

# Prescription Sample and Population Sizes
## (Chapter 4.1, pg. 15)

| Geographic Region | Prescription Type | Sample Count | Estimated Population Size of FPAs by Prescription |
|---|---|---|---|
| Statewide | Road Construction and Abandonment | 13 | 1405 |
| | Haul Routes | 67.4 miles | n/a* |
| | RMZ — Type Ns Prescriptions | 35 | 1018 |
| | RMZ — Type Np Prescriptions | 35 | 929 |
| | Type A&B Wetlands | 35 | 237 |
| | Forested Wetlands | 23 | 322 |
| | RMZ — Type S or F No Inner Zone Harvest | 25 | 737 |
| Western WA | RMZ — Type S or F Inner Zone Harvest DFC1 | 20 | 55 |
| | RMZ — Type S or F Inner Zone Harvest DFC2 | 14 | 157 |

# Water Typing
## (Chapter 5.1, pg. 28)

- **Underclassified — Physical characteristics indicate that the water should have been typed on the FPA and protected on the ground at a higher level of the hierarchical water typing system.**

- **Overclassified — Physical characteristics indicate that the water should have been typed on the FPA and protected on the ground at a lower level of the hierarchical water typing continuum.**

- **Indeterminate — Waters for which the compliance monitoring field team determines there is not enough information to make a water typing determination.**

| Water Type on FPA | # Waters in Standard Sample | # Waters with Typing Disparity | # Waters Underclassified | # Waters Overclassified | # Waters Indeterminate |
|---|---|---|---|---|---|
| F or S | 59 | 1 | * | 0 | 0 |
| Ns | 35 | 8 | 2 | 5 | 1 |
| Np | 35 | 5 | 3 | 0 | 2 |
| Type A Wetlands | 17 | 8 | 4 | 2 | 2 |
| Type B Wetlands | 18 | 5 | 1 | 3 | 1 |
| Forested Wetlands | 23 | 1 | 1 | 0 | 0 |
| Total | 187 | 28 | 11 | 10 | 6 |

*Compliance Monitoring field protocols stipulate that F or S waters are not to be evaluated for underclassification, as there is no higher order water.

# 2014-15 Compliance with Forest Practices Rules for Riparian and Wetland Harvest Prescriptions
## (Chapter 5.2 pg. 30)

| Status of Compliance | Western Washington | | Statewide | | | | | |
|---|---|---|---|---|---|---|---|---|
| | DFC1 | DFC2 | No Inner Zone Harvest | Np Activities | Ns Activities | Type A & B Wetlands | Forested Wetland | Roads |
| # Rules Compliant[1] | 131 | 98 | 116 | 128 | 59 | 120 | 38 | 81.7 |
| # Rules with Deviation[1] | 8 | 2 | 8 | 8 | 2 | 7 | 1 | 1.3 |
| # Total Rules Sampled | 139 | 100 | 124 | 136 | 61 | 127 | 39 | 83 |
| % of Sample Compliant | **94%** | **98%** | **94%** | **94%** | **97%** | **94%** | **97%** | **98%** |
| 95% Confidence Interval | (91%, 97%) | (95%, 100%) | (87%, 100%) | (89%, 99%) | (92%, 100%) | (89%, 100%) | (92%, 100%) | (95%, 100%) |
| Prescriptions Assessed | 20 | 14 | 25 | 35 | 35 | 35 | 23 | 13 |
| Exceeds Rule Requirements | 13 (9.9%) | 22 (22.4%) | 10 (8.6%) | 0 | 0 | 6 (5.0%) | 3 (7.9%) | Na |
| Low Severity Deviation | 7 (5.0%) | 2 (2.0%) | 5 (4.0%) | 4 (2.9%) | 0 | 3 (2.4%) | 0 | Na |
| Moderate Severity Deviation | 1 (0.1%) | 0 | 0 | 2 (1.5%) | 0 | 0 | 0 | Na |
| High Severity Deviation | 0 | 0 | 2 (1.6%) | 0 | 0 | 1 (0.8%) | 1 (2.6%) | Na |
| Indeterminate | 0 | 0 | 0 | 0 | 0 | 1 (0.8%) | 0 | Na |

[1]Roads rules can be partially compliant if multiple applications of the same rule are applied on the same FPA, so these are not whole number counts for the road prescriptions

# 2014-2015 Results (Rule Compliance)

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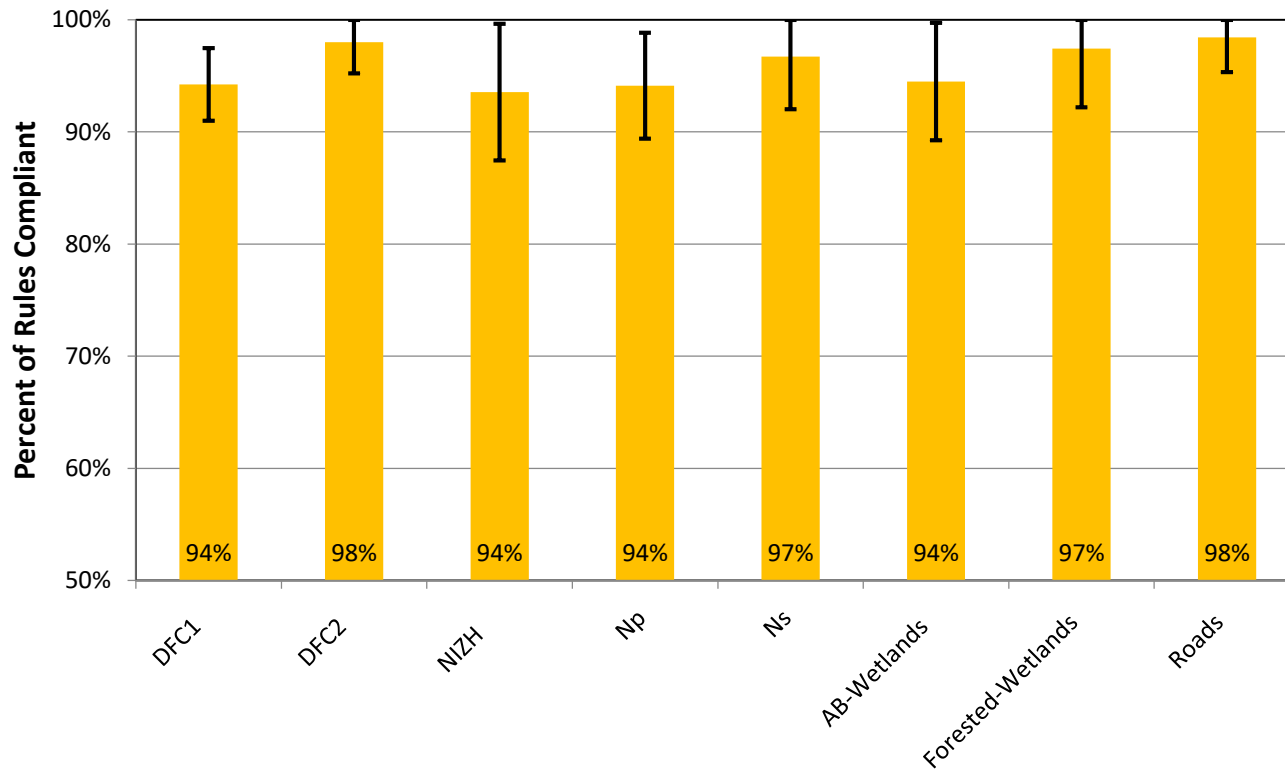
# Haul Routes
## (Chapter 6, pg. 49)

| | |
|---|---|
| Assessed mileage | 67.4 |
| % Mean compliant | 90% |
| No delivery | 86% |
| De Minimis | 4.7% |
| % Non-compliant | 9% |
| 95% Confidence Interval | (82%, 98%) |
| Exceeds rule requirements | 0 |
| Low severity deviation | 3.9% |
| Moderate severity deviation | 5.6% |
| High severity deviation | 0.1% |
| Indeterminate | 0 |

| Primary Cause | % Deviation for Primary Cause |
|---|---|
| Inadequate water crossing structures | 10%* |
| Contaminated ditchwater | 3% |
| Other (described in comments) | 17% |
| Faulty cross drainage | 14% |
| Spring Intercepted | 5% |
| Road fill failure | 2% |
| Sediment from stream adjacent parallel road | 44% |
| Obstructed or bermed ditch line | 2% |
| Water channeled to eroding slopes | 2% |

# 2014-2015 Results
# (FPA Compliance)
## (Chapter 8, pg. 59)
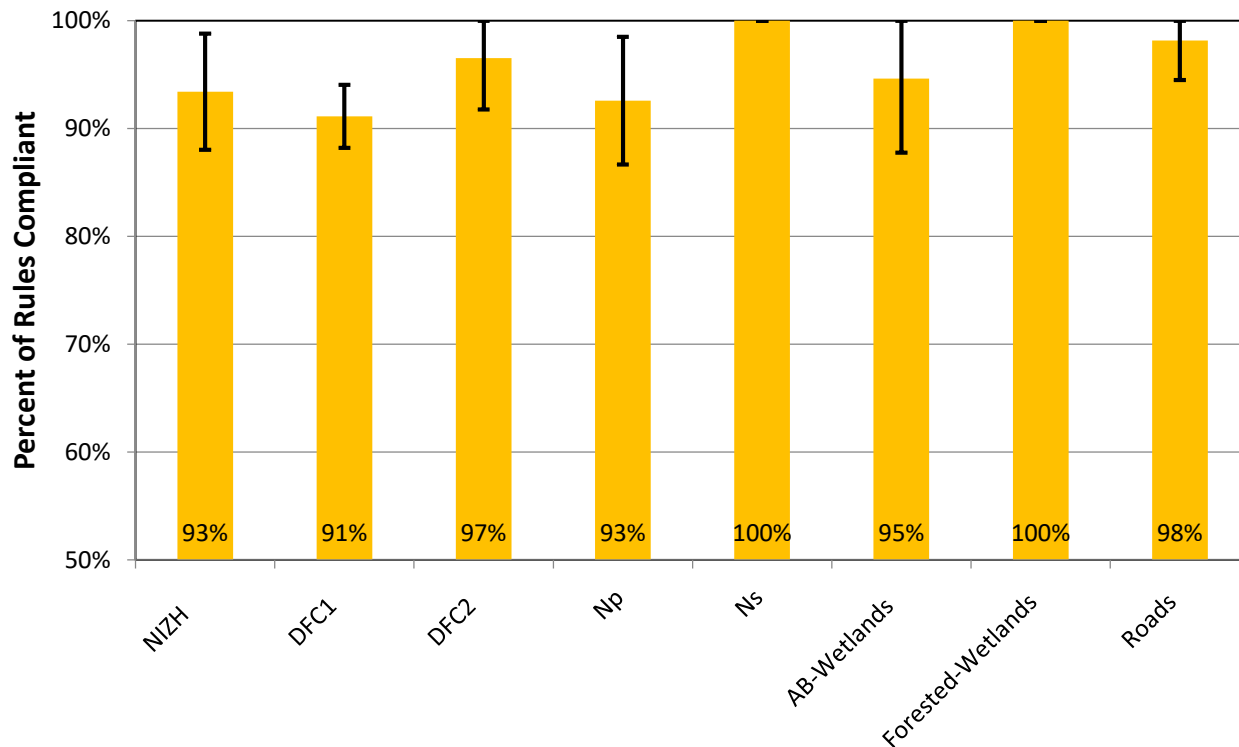
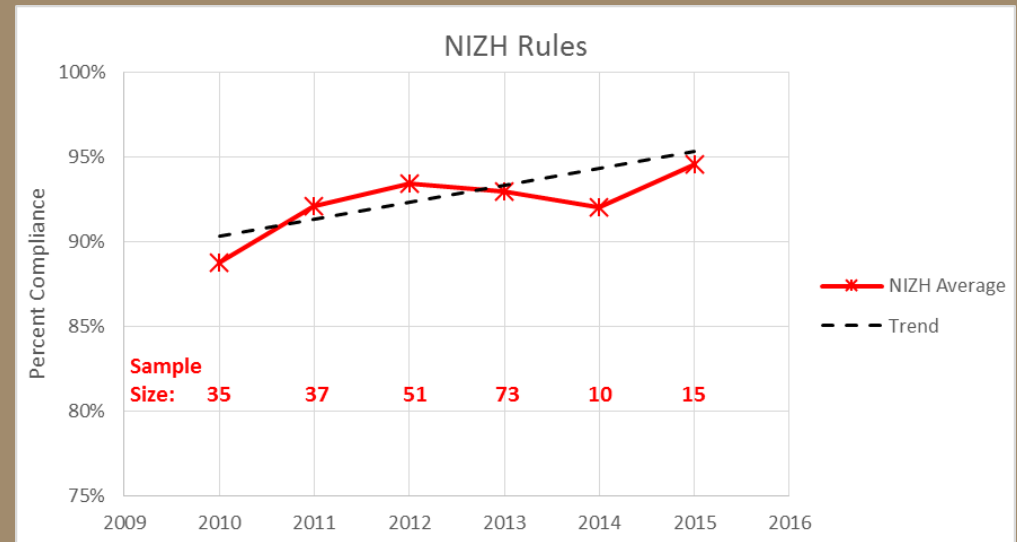# Trend Analysis
**(Chapter 7, pg. 50)**

- **2010-2015 data**
- **Linear regression**
- **Observation of trends improves over time**
- **No Haul Routes**
- **No observable trends**
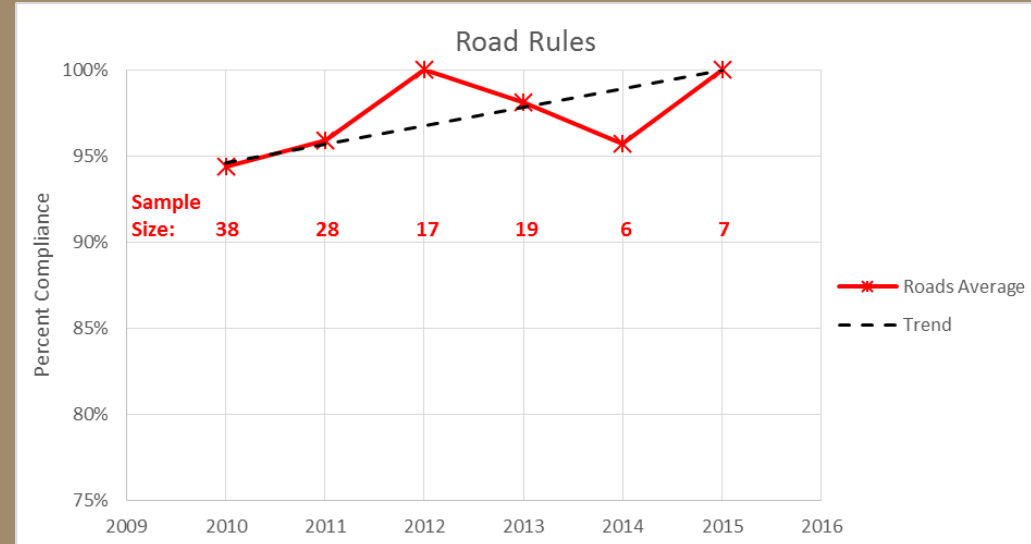  - **DFC1, DFC2, Np, Ns, Type A&B WMZs, and Forested WMZs**

# NIZH
## (pg. 53)

- **Compliance rates varied from 89%-94%**

- **Weighted *p=0.07***

- **Year over year increase of 1%**

# Roads
## (pg. 58)

- **Compliance rates 94%-100%**

- **Weighted *p=0.035***

- **Year over year increase of 1.4%**



Road Rules chart showing Percent Compliance (75%-100%) from 2009-2016. Sample Size: 38, 28, 17, 19, 6, 7. Legend: Roads Average (red), Trend (dashed black).

# Questions

# Independent Scientific Peer Review

- **2014/2015 Biennial report had a peer review conducted through Independent Scientific Peer Review Committee (ISPR) of the University of Washington (UW).**

# ISPR Open Review

- **The Review Team met with the Managing Editor and DNR personnel in December 2016, and again April 2017 to obtain further information and clarification**

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# Submitted Questions

**The List of Review Questions**

Each reviewer was asked to specifically address the following twelve peer-review questions from CMER:

1. Are rigorous, transparent and sound research and statistical methods followed?
   a. Is the estimator used to estimate average compliance a proper statistical estimator?
   b. If the answer to a) is no, what estimator would you propose as an alternative estimate of average compliance for a prescription?
2. Is the statistical design (using the described estimator) a sound method for method for determining compliance with forest practices rules?
3. Is there sufficient detail in the document to reproduce the study?
4. Were data reasonably interpreted?
5. Do the literature citations include the latest applicable information and represent the current state of scientific understanding on this topic?
6. Are uncertainties and limitations of the work stated and described adequately?
7. Are assumptions stated and described adequately?
8. Is the information presented in an accurate, clear, complete, and unbiased manner and in a proper context?
9. Currently, there are several rules included in compliance calculations that are based on the proper classification of a site rather than on compliance with the rules specific to a particular classification. Thus, if an FPA is non-compliant for site class, the other rules are not applicable, so the FPA cluster has size one, with compliance = 0%. Because these FPAs have only one rule applied, they are not given high weight in the ratio estimate of average compliance. Specific questions:
   a. Does this amount to a bias in the estimate of average compliance for a prescription?
   b. If the answer to a) is yes, what would be the best way to remove this bias:
      i. Separate the compliance estimates into classification versus operational rules for those affected prescriptions
      ii. Change the method for estimating average compliance
10. Should compliance be calculated separately for administrative (site characteristics) versus layout and operational (on the ground) rule applications?
11. Recognizing there is a relationship between cost and sampling precision objectives, do you have suggestions for narrowing sampling statistic confidence intervals without significantly increasing the biennial sample size in order to improve the ability to discern trends over time?
12. What suggestions do you have for improving the clarity of the report narrative for an audience with general understanding of natural resources management: (1) the results of the report's two-year data; and (2) the description of trends?

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# ISPR Results

- "The statistical approach regarding the sampling procedure and construction of the ratio estimator for compliance is generally sound"

- Two major recommendations for improvement.

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# Recommendations

- **The Review Team recommended a comprehensive Appendix A containing the technical details of the sample selection procedure be included**

- **It was recommended use of a "jackknifed" form of the ratio estimator be considered.**

- **Additional minor recommendations cover syntax and grammatical anomalies**

# Program Response

- **Jackknife Analysis-jackknife ratio estimates will be compared to original ratio estimates to determine the sample size**
    - Write an R script to do both the standard ratio estimation.

- **Appendix A to be re-written to improve the reproducibility of the study**
    - Linear approach (from population development to compliance estimate)
    - Incorporate explanation along with used formulas and processes

# Questions