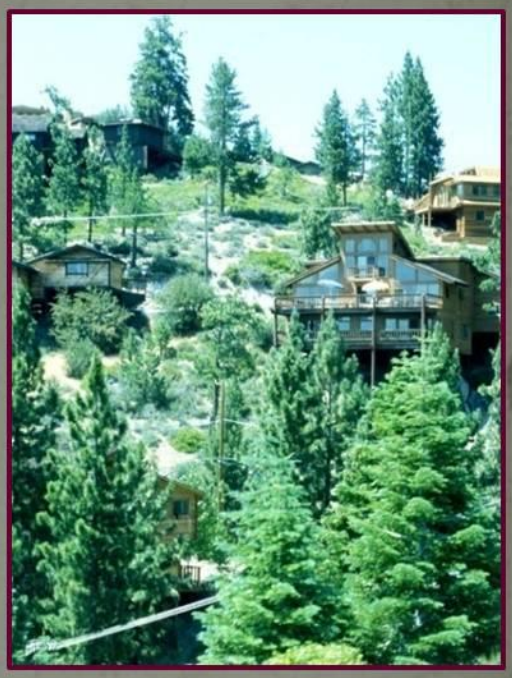
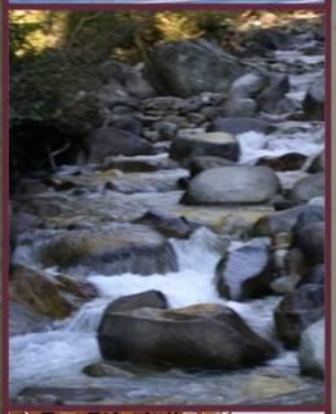
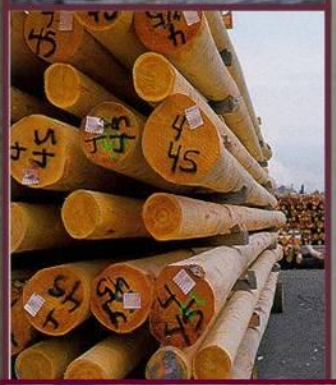
Idaho State Assessment of Forest Resources (SAFR)





Issues, Discussion, Data, Methodologies, and Maps



October 1, 2009

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  (Models are proprietary and used in the assessment with the permission of the Idaho Department of Lands.)

For additional information, visit the **Idaho State Assessment of Forest Resources website at: http://www.idl.idaho.gov/bureau/ForestAssist/safr_index.html**

Acknowledgements

We greatly appreciate the support and assistance provided by the Stakeholders who met regularly to inform, discuss and guide this process; the members of the Core Assessment Team who rolled up their sleeves and helped refine the issues, find the best available data and provide advice on putting it all together; and to the many folks who gave us helpful and constructive comments.

Member of the Core Assessment Team are:

- Ara Andrea – Idaho Department of Lands, Service & Regulatory Program Manager; NRCS; State Technical Committee Representative
- Mike Bowman – Idaho Community Forestry Advisory Council & Idaho Resource Conservation and Development Councils
- Andy Brunelle – US Forest Service Region 4
- Mike DeArmond – US Bureau of Land Management
- Frank Gariglio – Natural Resource Conservation Service
- Craig Glazer – Idaho Panhandle National Forest/ USFS Region 1
- Bob Helmer – Idaho Department of Lands
- Kurt Mettler – Coeur d'Alene Tribe
- Carol Randall – Idaho Panhandle National Forest
- Greg Servheen—Idaho Department of Fish and Game
- Bob Unnasch – The Nature Conservancy
- Ed Warner – Idaho Department of Lands; Idaho Forest Legacy Program Manager
- Steve Winward – US Forest Service Region 4
- Steve Kimball – Idaho Department of Lands (co-lead); National Fire Plan Coordinator
- David Stephenson – Idaho Department of Lands (co-lead); Urban Interface/Planning Program Manager

Special thanks to our GIS Staff for all their help and expertise—Ed DeYoung, Andrew Mock and Meghan Lonneker.

Principle Authors: David Stephenson
Steve Kimball

This project was funded in part through grants from the U.S. Department of Agriculture Forest Service and National Association of State Foresters and the Western Forestry Leadership Coalition. The U.S. Department of The USD A prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or family status. To file a complaint call (202) 720-5964.

About the Statewide Assessment of Forest Resources

The Statewide Assessment of Forest Resources was developed by the Idaho Department of Lands in partnership with many other agencies and organizations. This assessment is a key element in the redesign of the USDA Forest Service's State and Private Forestry, and is a requirement within the 2008 Farm Bill for states receiving funding through the US Forest Service for State and Private Forestry programs. Its purpose is to ensure that federal and state resources are focused on landscape areas with the greatest opportunity to address shared priorities and achieve measurable outcomes.

The Statewide Assessment provides a geospatial analysis of conditions and trends for all forested lands in Idaho. It delineates rural and urban forest areas that are the highest priority for projects and investments administered through State and Private Forestry programs. Threats to and benefits from forest resources were identified and form the foundation of the analysis. A companion Statewide Forest Resource Strategy will be developed to address the issues and priority areas identified in this assessment. The Resource Strategy will identify activities and approaches for protection, restoration and enhancement of forest resources in priority landscapes.

For more information on the Statewide Assessment of Forest Resources and the Resource Strategy, see the national guidance from the Forest Service:
http://www.fs.fed.us/spf/redesign/state_assess_strategies.pdf

Who is working on the Idaho Statewide Assessment?

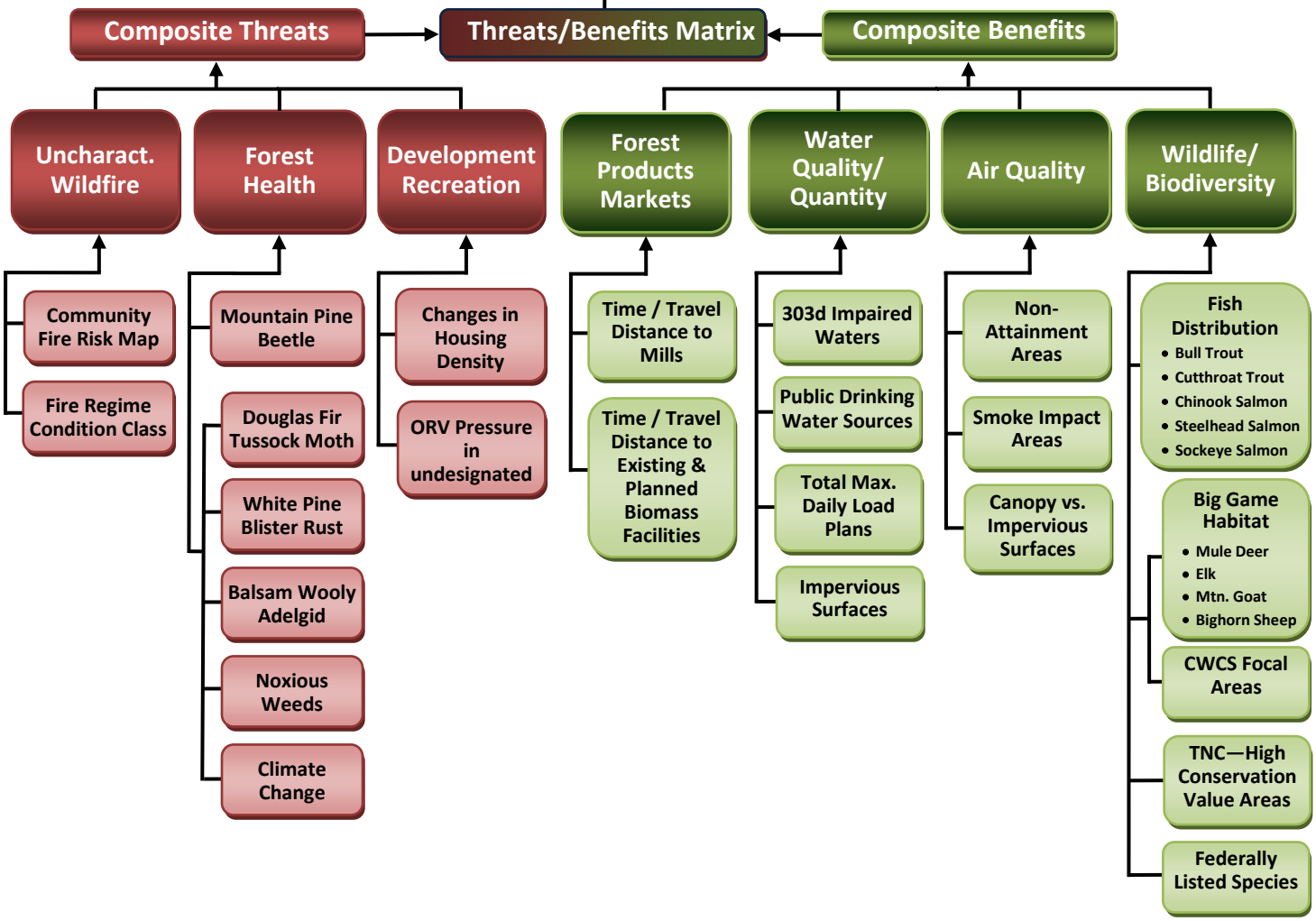
Idaho Department of Lands is the Lead Agency. A diverse group of partners is participating, including:

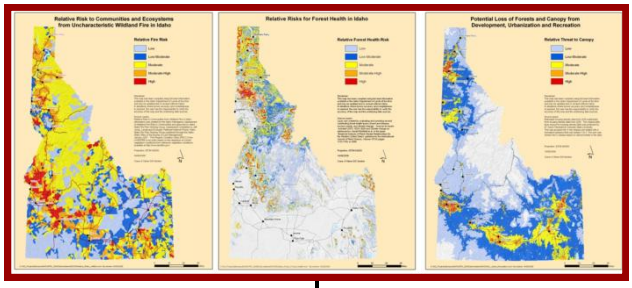
- Idaho Department of Environmental Quality
- Idaho Departments of Fish & Game,
- Idaho Department of Parks & Recreation
- Idaho Community Forestry Advisory Council
- Idaho Forest Stewardship Advisory Committee
- Idaho State Fire Plan Working Group
- Idaho Technical Committee
- Idaho Forest Owners Association
- Intermountain Forest Association
- Coeur d'Alene Tribe
- Nez Perce Tribe
- The Nature Conservancy
- University of Idaho
- USDA Forest Service
- USDA Natural Resource Conservation Service
- USDI Bureau of Land Management

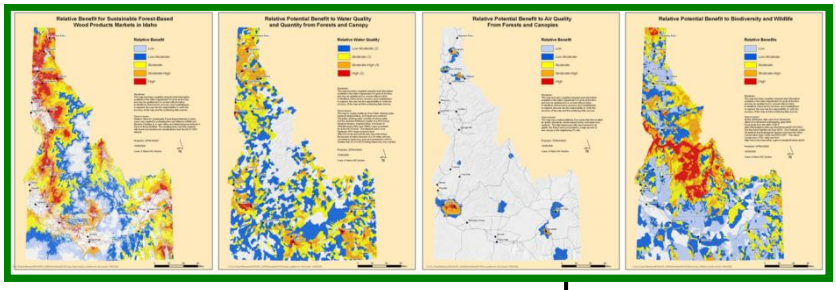
Timeline:

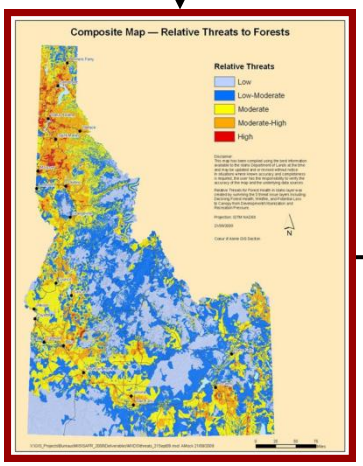
1. Identify Issues ..... January 2009
2. Determine best data, methodology and modeling ..... March – June 2009
3. Feedback/refinement and final SAFR report ..... July – October 2009
4. Begin work on the Response Plan / Strategy..... October 2009
5. Develop framework for developing Strategies..... December – January, 2010
6. Regional meetings on Goals and Strategies ..... January – March 2010
7. Feedback/refinement and final Response Strategy ..... March – June 2010

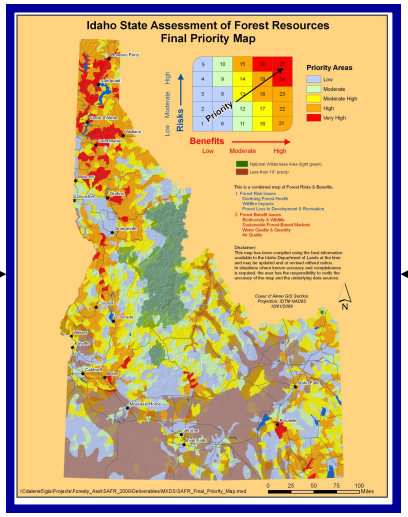
Idaho State Assessment of Forest Resources—Priority Areas

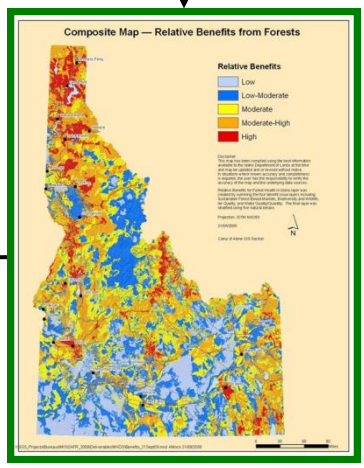












Progress as of September 30, 2009:

June 26, 2008—*Hosted a Multi-Agency Group (MAG) meeting to identify key forestry related issues in Idaho and potential projects that could address these. Project ideas were used to put together five applications for State and Private Forestry Competitive Grants. The process was effective and results successful—three of these applications were selected for funding.*

November 21, 2008—*Hosted the first State Assessment of Forest Resources (SAFR) Stakeholders meeting, Representatives from a wide array of Federal, State, Local and non-governmental agencies and organizations were invited to attend. The SAFR was introduced, including what it is intended to do and what it is not intended for. Stakeholders provided input on benefits of the SAFR, methodology and, building off the list of issues identified at the June meeting, brainstormed a list of critical forestry related issues in the State. A "Core Development Team" was selected to work with IDL on further refining and grouping issues, determining data and models that best inform these issues, and developing a draft State Assessment for review by full Stakeholder committee.*

January, March and April, 2009— *The Core Guidance Team meets three times to refine issues, consider best available data to inform issues, how best to model each issue. Information posted to web for comment after each meeting. E-mails sent to full Stakeholder committee and all three IDL Advisory committees after each posting.*

Early June, 2009—*Draft 1 of Issues maps posted to web and sent to stakeholders for comment/input. Modifications made.*

July 14, 2009—*2nd Stakeholder meeting held. Draft 1 SAFR was presented, feedback provided and modifications suggested.*

Early August, 2009*—Changes made and Draft 2 of the assessment is released for comment.*

August 24, 2009*—Video Conference held with National Forest System Supervisors to explain the state assessment, present the second draft and gain insights and comments from the NFS perspective.*

August 26, 2009*—3rd Stakeholder meeting held to review draft 2. Changes were outlined, and a robust discussion took place on many of the issues and the methodology used. A better understanding of what each is providing was gained and additional changes and modifications were recommended. Stakeholders discussed the best way to transition to development of Response Strategy and how best to move forward.*

September 30, 2009*—Draft 3 of the assessment released on web*

February 15, 2010*—Final draft of the assessment completed*

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Issue: Relative Threats to Forest Health

The intent of this issue is to:

- Identify areas where invasive plants threaten forest health
- Identify areas where damaging insects threaten forest health
- Identify areas where disease threatens forest health
- Identify areas where climate change may increase stress to forests

Discussion: Forests and tree canopy face many different kinds of threats. The purpose of this issue is to identify the most significant biological threats. These include forest insects and diseases that result in tree mortality, noxious (invasive) species which can compromise the health and composition of forest stands, and climate change, which may modify current ranges of forest species, adding additional stresses to forests. Not only do stresses to forests from these factors damage forests, they have an ecological, social and economic impact as well. They impact markets, recreation, wildlife habitat and can exacerbate uncharacteristic wildfire. The areas identified within this issue are where these problems currently exist or are likely to exist in the near future, and where management activities can minimize these threats. Other issues within the State Assessment of Forest Resources (SAFR) address areas where forests and tree canopy can help mitigate the causes of some of these threats.

Data Used:

Data used for this issue were divided into four main categories as follows:

1. **Mountain Pine Beetle**, using 1990 – 2008 Forest Service aerial survey data (http://www.fs.fed.us/r1-r4/spf/fhp/aerial/gisdata.html) and selecting out Mountain Pine Beetle (MPB) on lodgepole pine

   The polygons of MPB mortality on lodgepole pine for the years 1990 through 2008 were examined to see if direction and distances could be detected from one year to the next. While direction proved elusive, a mean spread distance of 2,314 meters was calculated. The polygons of MPB mortality for the above years were merged and dissolved into mortality centers, and buffered four times using the mean spread distance as the buffer. Then, the first buffer ring and the base polygon were removed as these comprise areas where the MPB has killed the suitable trees or where damage is likely done, but not yet visible. The resulting layer was converted to 30 m raster grid cells and reclassified. The data was further refined by applying a mask so that only areas of predicted infestation in lodgepole pine are shown. Since the areas represent probability of infestation, the closer they are to the original infestation, the greater the likelihood of infestation. ***The***

three remaining buffered rings around each polygon were given values of five, four and three as they radiated outward from the infestation.

2. **Other Forest Health Issues:**
   a. **Other Forest Inspect Pests and Diseases,** comprised of:
      i. **Balsam Wooly Adelgid**, using joint USDA Forest Service and Idaho Department of Lands joint Balsam Wooly Adelgid (BWA) ground survey data, and **Hydrologic Unit code (HUC) 6th level** (watersheds) (http://inside.uidaho.edu/)

      BWA can be a serious pest of subalpine fir, especially in areas where this is the primary forest species providing shade for streams. Loss of canopy in these areas can impact water quality and fish populations downstream. Due to the slow spread of BWA and the relatively small size of infestations, how best to express this issue was challenging. An annual rate of spread was determined, but it was small enough that affected areas would not have any real impact on the forest health risk issue. Instead, we took the location of infestations (point data) from on-the-ground joint Forest Service/IDL BWA delimiting surveys (years 1990,1991,1997, 1998, 2006 and 2007), and identified the 166 watersheds (6th order Hydrologic Unit Codes) in which they fell. These watersheds were converted to a 30 m raster grid and ***reclassified with a value of one if BWA is present, and zero if not***. This serves more as an indicator that BWA is something to be aware of in these watersheds, but the value is low as it does not indicate the actual size and extent of infestations.

      ii. **White Pine Blister Rust**

      This layer was developed from 1) a potential vegetation layer and 2) a table delineating likelihood of Western White Pine. The U.S. Forest Service's Idaho Panhandle National Forest provided both datasets. The table was joined to the layer and the data reclassified into three classes. Per recommendation by Carol Randall, U.S. Forest Service Entomologist and Tom Eckberg, Idaho Department of Lands Forest Health Resource Specialist, ***excellent likelihood was assigned a value of five, good likelihood a value three, and poor or fair were assigned a value of zero***. The objective of the layer is to identify probable areas of concern for Blister Rust, which parallels western white pine habitat. This layer will also serve as a proxy for root disease concerns. Areas that have been affected by blister rust and no longer have white pine now support grand fir and Douglas-fir, which are the most susceptible to root disease.

      iii. **Tussock moths** were identified as the most serious insect and disease threats to forest health on state and private forestlands. The most critical areas were

identified using 1990 – 2008 Forest Service aerial survey data and historical refinements. (http://www.fs.fed.us/r1-r4/spf/fhp/aerial/gisdata.html)

Tussock moth populations tend to be cyclic, building to significant levels in predictable locations every 8-12 years. Currently, we are in a population growth phase, and expect increased damage over the coming years. This Tussock Moth layer was developed by identifying the 6th level Hydrologic Unit Code (HUC) watersheds with tussock moth presence from aerial detection surveys and then rating them based on severity suggested by an entomologist team consisting of Carl Jorgensen (USFS), Tom Eckberg (IDL), and Carol Randall (USFS). Watersheds were converted to a 30 m raster grid and reclassified with one (low threat), three (moderate threat), and five (high threat)

b. Terrestrial noxious weeds, consisting of:

i. Idaho State Department of Agriculture (ISDA) listed **terrestrial noxious weeds** from March 2009 (http://inside.uidaho.edu/)

ii. **Weed presence** in Idaho from the Bureau of Land Management (BLM) consolidated dataset from December 2005 (http://inside.uidaho.edu/)

Includes data from the BLM Boise, Twin Falls, Idaho Falls and Coeur d'Alene Districts and the Idaho Department of Agriculture

iii. **Hydrologic Unit code (HUC) 6th level** (watersheds)

Process: The 2009 ISDA layer was combined with the 2005 BLM consolidated dataset to **develop** statewide coverage of noxious weeds in Idaho. All plants and weeds not listed on Idaho states 57 noxious weed list were removed from the list. A list of the 57 noxious weeds is located at: (http://www.idahoag.us/Categories/PlantsInsects/NoxiousWeeds/watchlist.php) . This new dataset was converted into a 30 m resolution raster grid. Percent coverage of the noxious weeds within each 6th Level HUC were obtained taking the total count of noxious weed pixels, converting these pixels into area and dividing by total area of HUC. Percent coverage was then reclassified using natural breaks into 3 classes, with values from zero to three.

c. Climate change, consisting of:

i. **Current range (2000) and predicted habitat range in 2030 for Ponderosa Pine**

ii. **Current range (2000) and predicted habitat range in 2030 for Lodgepole Pine**

iii. **Current range (2000) and predicted habitat range in 2030 for Douglas Fir**

The three keystone indicator species were selected for this sub-issue by a subset of the Core Development Team working specifically on the Forest Health Risk issue. Climate shift data used for these three species was developed by Gerald

Rehfeldt et al. Processes and assumption used in the modeling are described in the paper "Empirical Analysis of Plant-Climate Relationships for the Western United States" published in the International Journal of Plant Science, Volume 167(6) pages 1123-1150, in 2006.

Process: We used current range of these three species and compared it with the predicted habitat range in 2030. For each species, where the habitat was the same in 2000 and 2030 a value of zero was given. Where the habitat changed from 2000 to 2030 a value of one was given. Habitat changes included both areas where the habitat moved into a new area that it did not occupy earlier and areas where the habitat would no longer occur. These areas represent potential areas of additional stress, but also identify areas where consideration of climate change impacts may help inform species selection when replanting is planned.

The habitat change values for the three tree species were added together giving a climate change layer with values of zero – three. A value of zero indicates areas where the current and predicted habitat ranges for the three species did not change. A value of one indicates areas where one of the three species had a change in habitat, two indicates areas where two species had a change in habitat, and three indicates areas where three species had a change in habitat. These data received a lower overall potential score due to uncertainty in the data.

Issue Process:

Stakeholders noted that the Mountain Pine Bark Beetle (MPB) is the most serious pest problem in Idaho. For this reason, MPB was considered equal in importance to the combination of all other forest health sub-issues.

These other datasets (sans MPB) were added together and stratified into five classes of relative risk (1-5) through natural breaks. The MPB data, classified as medium, high and very high risk (3-5) were then merged with this combination of the other datasets, with the highest value from either dataset used as the value for each cell (see table below). For example, an area that received a value of five for the combination of forest health risk threats OR a score of five from the MPB dataset received a score of five. This elevated the importance of MPB as on par with the combination of all others forest health threats. Forest Health professionals in FS Regions 1 & 4 and at the IDL concurred with this weighting, and felt the final map more closely reflected the National Forest Health Risk Map for Idaho.

The sub-issues, and the maximum points assigned to each are shown in the following table.

Balsam Wooly Adelgid .....1 points
White Pine Blister Rust / Root rot.....5 points
Tussock Moth.....5 points
Noxious weed presence.....3 points
Climate change.....3 points
TOTAL POSSIBLE..... 17 points

Priority

Low	Low-Moderate	Moderate	Moderate-High	High
1	2	3	4	5

Mountain Pine Beetle .....5 points

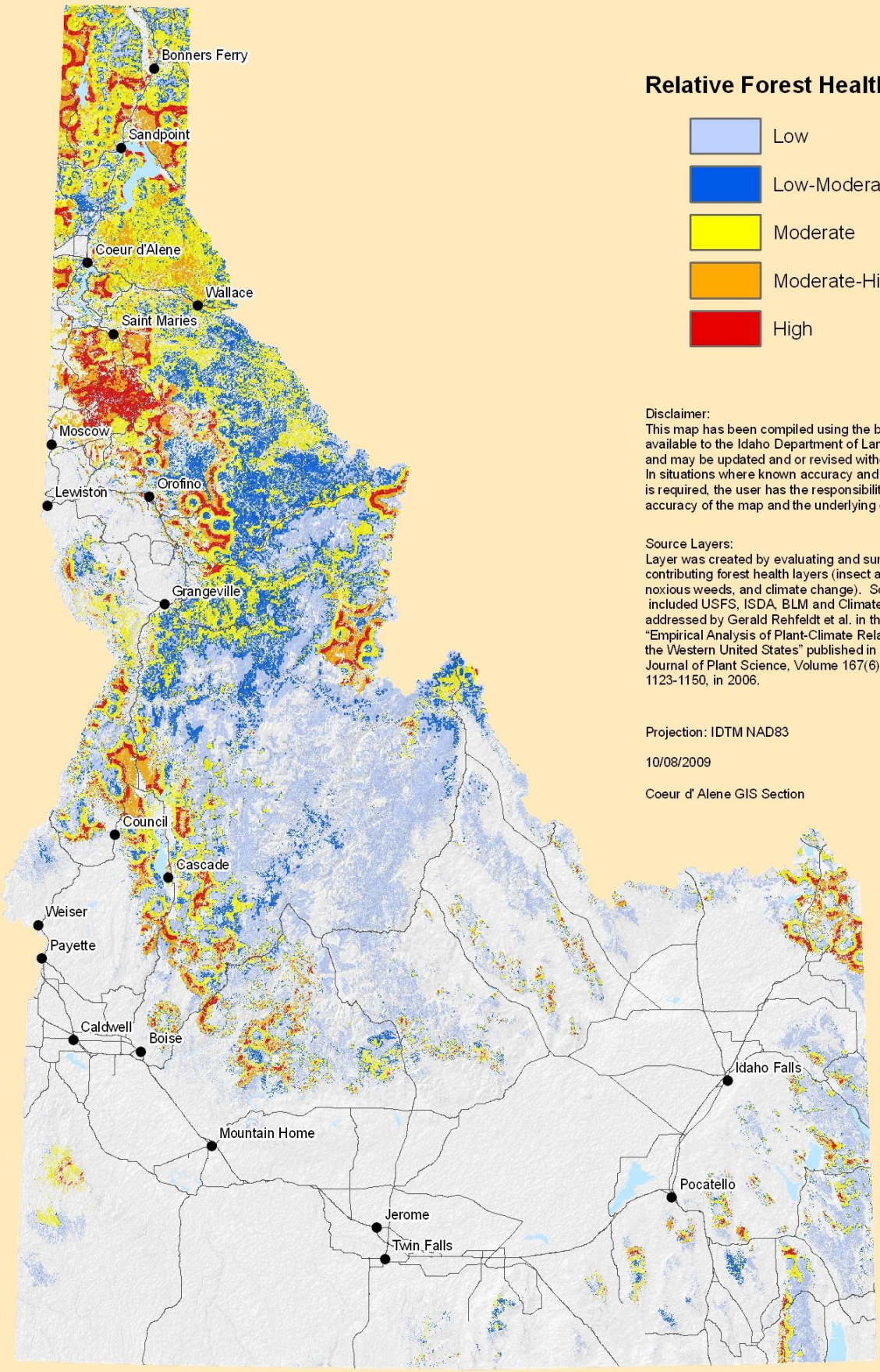
Low	Low-Moderate	Moderate	Moderate-High	High
		3	4	5

Data Considered, but not used:

The Core Development Team considered forest fragmentation within this issue, as forests fragmented by roads, developments or other land cover changes could increase spread of noxious weeks and, potentially, insects. The National Forest Fragmentation dataset recommended by the USDA Forest Service on their State Assessment website is at a scale of 1km raster grid, which is roughly 1,000 times more coarse than the 30 m resolution of this assessment. For this reason, these data were not used. The team also considered road density as a different way to measure fragmentation, but this was not felt to be a significant driver for this issue. It was also felt that development and recreation pressure informed addressed fragmentation within that issue.

The team also considered using the National Forest Insect and Disease Risk Map but, like the fragmentation dataset, it was at a 1km resolution, far too coarse for this assessment.

Relative Risks for Forest Health in Idaho



Relative Forest Health Risk

- Low
- Low-Moderate
- Moderate
- Moderate-High
- High

Disclaimer:
This map has been compiled using the best information available to the Idaho Department of Lands at the time and may be updated and or revised without notice.
In situations where known accuracy and completeness is required, the user has the responsibility to verify the accuracy of the map and the underlying data sources.

Source Layers:
Layer was created by evaluating and summing several contributing forest health layers (insect and disease, noxious weeds, and climate change). Sources for layers included USFS, ISDA, BLM and Climate change as addressed by Gerald Rehfeldt et al. in the paper "Empirical Analysis of Plant-Climate Relationships for the Western United States" published in the International Journal of Plant Science, Volume 167(6) pages 1123-1150, in 2006.

Projection: IDTM NAD83

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Issue: Relative Risk to Communities and Ecosystems from Uncharacteristic Wildland Fire

The intent of this issue is to:

- Identify where communities and their associated forestlands are at greatest risk from uncharacteristic wildfires;
- Identify areas where departure from historic fire regimes may lead to uncharacteristic wildland fires areas where damaging insects threaten forest health

Definition: Uncharacteristic Wildland Fire is defined as an increase in wildfire size, severity and resistance to control compared to that which occurred historically in the native system. The threat of these unnaturally intense wildfires has increased with the accumulations of fuels developed from decades of aggressive fire suppression.

The term is used in Idaho Roadless Area Conservation FEIS (2008) and is from a definition in the Forest Service Cohesive Strategy for Protecting People and Sustaining Resources in a Fire-Adapted Ecosystem (2000).

Discussion: Initially, the core guidance team chose to use only the first layer shown below. However, after significant discussion within the Idaho SAFR Core Team and at the July 14, 2009 Stakeholder Meeting, attendees felt that while community wildfire risk was important, so were areas where uncharacteristic wildfires could endanger larger ecosystems. Initially, the Fire Regime Condition Class—which quantifies changes in fuels from historic conditions—was considered but, after significant discussion by the core guidance team, not selected to be part of this issue analysis. The reasons reflected a concern that the data was not meant to be used at the scale used for this assessment. After further discussion at the July 14 stakeholder meeting there was consensus that this was nonetheless important, and that updates in the data may address concerns about scale. Additional investigation determined this to be the case, and it was added as part of this issue analysis.

Data Used:

1. The **Relative Risk to Communities from Wildland Fire in Idaho** model, developed by the Idaho Interagency Wildland Fire Plan Working Group. A complete description of this model is available for download at: http://www.idahofireplan.org/images/Assessment.pdf. The assessment was completed by Jeff Jones, Landscape Ecologist, Flathead National Forest, and others from the State Fire Plan Working Group. This model considers relative wildland fire risk (weather, ignition probability, rate of spread), relative wildland fire hazard (fuel hazard, expected

fuel moisture, slope effect on fire spread) and wildland urban interface (inhabited areas, communities at risk). This dataset identifies wildland urban communities from the Federal Register (66 Fed. Reg. 753, January 4, 2001). The SAFR Core Development Team felt this model best informed the issue of community risk to wildfire and is supported by the Interagency Fire Plan Working Group.

2. **Fire Regime Condition Classes (FRCC)**: This dataset shows changes in vegetation and fuels from historical conditions. From this map, inferences can be made to characterize forest lands with higher potential of uncharacteristic wildland fires (if ignitions were to occur). It is deemed the best indicator available of potential threat to forest systems from uncharacteristic fire. FRCC was used in the Idaho Roadless Rule to assess potential for uncharacteristic wildfires, and to evaluate the ability to treat fuels to reduce this potential. Information on this dataset can be found at: http://www.fs.fed.us/rm/pubs_other/rmrs_2004_menakis001.pdf.

Issue Process:

The Relative Risk to Communities from Wildland Fire in Idaho dataset was reclassified into five groups (1-5), from very low risk to very high risk, using natural breaks in the data. The FRCC data measures relative departure from historic fire regimes in three categories (1-3), from low departure to high. This data was first masked to include only forested areas, and then reclassified into three categories with values of 1, 3 and 5.

Instead of adding these two datasets together, they were merged such that the highest value from either dataset became the value for that cell. For example, if either the Relative Risk to Communities from Wildland fire or the FRCC had a value of five for a particular cell, that cell received a value of five.

Data Considered, but not used:

(1) Following the August 24, 2009 presentation to the Idaho Forest Supervisors and staff, we received comments that the increased wildfire risk from insect and disease mortality should be considered in this issue, and particularly that associated with mountain pine beetle infestations. We discussed this with fire ecologists, researchers, and fire managers and reviewed the research that was available on this topic. There is some agreement that there are two windows of concern: the first few years after the trees die when the needles are red, and then the 10-30 year period after mortality when trees begin to fall and contribute to surface fuel buildup. The extent to which the fire risk is increased in these windows appears to be variable and dependent on the amount and pattern of mortality, time since beetle outbreak, and other stand and site factors.

Empirical studies to quantify the relationship between beetle outbreaks, stand structure, fuel dynamics, and fire risk are limited.

(2) The data available on insect and disease mortality in Idaho is limited to an annual survey that includes mapped areas of mortality along with the average number of trees per acre that have been killed in each area. We could find no empirical data or analysis that we could link to the insect and disease mortality mapping and data to identify and describe increased fire risk. With some additional analysis, an assessment of the increased wildfire risk could be developed using the annual insect and disease mortality survey. This would require correlating wildfire risk factors to stand and site conditions (such as amounts and patterns of mortality, time since beetle-kill, etc). Such analysis was outside of the scope of the SAFR (which was limited to use of existing Statewide data). This increased risk of wildfire from insect and disease mortality will be flagged as an additional data need in the SAFR. It will also be considered further in the Resource Strategy.

(3) Wildland Urban Interface (WUI) boundaries identified by the Healthy Forest Restoration Act (HFRA- 2003): The Relative Risk to Communities mapping used for this issue includes a WUI mapping (2001) that predates the WUI boundary definitions identified in the Healthy Forest Restoration Act (2003). HFRA encourages communities to specify WUI boundaries that best identify local risk; or communities may use a standard definition outlined in HFRA. In Idaho, counties are the recognized "community" in the National Fire Plan implementation. The process each county used to identify the WUI is not the same, and the dataset is therefore inconsistent from county to county. While very useful at the local level, the Core Development Team decided not to use the county generated dataset because the process was not consistent across the state and making relative assumptions statewide may provide misleading results.

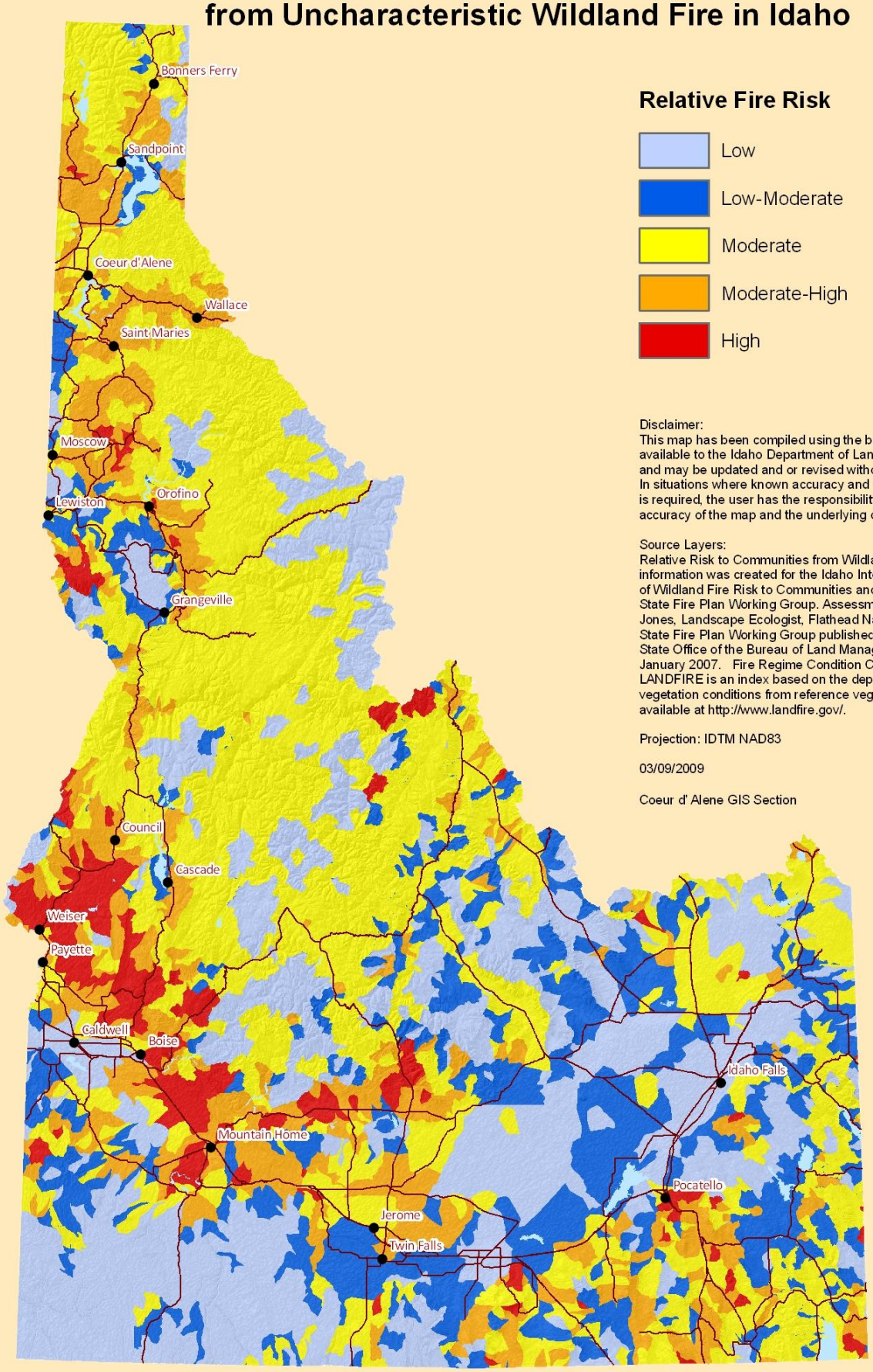
The Core Team considered using the HFRA standard definition for WUI boundaries in this analysis. This definition was used in the recent Idaho Roadless Rule to identify Community Protection Zones (CMZ's). The Core Team compared statewide HFRA "standard definitions" WUI mapping with the WUI mapping from 2001 already included in the Communities at Risk model chosen for use. The HFRA-based mapping was very close to the WUI mapping in the Communities at Risk model and would not change the characterization of this issue. The Core Team felt the Communities at Risk model is the best tool available for characterizing the many integrated elements of community wildfire risk.

(4) Wildland Urban Interface (WUI) mapping per the Idaho Interagency Assessment of Wildland Fire Risk to Communities: This dataset identifies wildland urban communities from the Federal Register (66 Fed. Reg. 753, January 4, 2001) and inhabited areas from

the 2000 Census. These areas were buffered by a distance of one mile to identify the wildland urban interface areas. This is already included within the model chosen for use.

Community Protection Zones (CPZ's) from Idaho Roadless Rule. We compared the CPZ's mapped in the Idaho Roadless Rule with the WUI used in the ***Idaho Relative Risk to Communities from Wildfire*** analysis that was used for this issue. The WUI boundaries used in the Idaho Relative Risk analysis include all of the Roadless Rule CPZ areas. The Idaho Relative Risk analysis considered additional variables (i.e. ignition history, slope, other factors) and therefore provides a more expanded characterization of fire risk to communities than the Roadless Rule's CPZ mapping.

Relative Risk to Communities and Ecosystems from Uncharacteristic Wildland Fire in Idaho



Relative Fire Risk

- Low
- Low-Moderate
- Moderate
- Moderate-High
- High

Disclaimer:
This map has been compiled using the best information available to the Idaho Department of Lands at the time and may be updated and or revised without notice.
In situations where known accuracy and completeness is required, the user has the responsibility to verify the accuracy of the map and the underlying data sources.

Source Layers:
Relative Risk to Communities from Wildland Fire in Idaho information was created for the Idaho Interagency Assessment of Wildland Fire Risk to Communities and approved by Idaho State Fire Plan Working Group. Assessment completed by Jeff Jones, Landscape Ecologist, Flathead National Forest, Idaho State Fire Plan Working Group published through the Idaho State Office of the Bureau of Land Management, January 2007. Fire Regime Condition Class (FRCC) from LANDFIRE is an index based on the departure of current vegetation conditions from reference vegetation conditions available at http://www.landfire.gov/.

Projection: IDTM NAD83

03/09/2009

Coeur d' Alene GIS Section

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Issue: Potential Loss of Canopy to Development, Urbanization and Recreation

The intent of this issue is to:

1. Identify the areas at greatest risk of conversion from forestland to other uses—specifically development. Often, forested areas are highly desirable for home sites or new subdivisions. With this conversion comes a loss of productive forests, increased wildfire risk to property as more homes are "in the woods", and pressure to reduce or eliminate management on adjacent lands. Also important are those areas that may be converted from one housing density to a significantly higher density within developed areas as this may also lead to loss of canopy and the benefits it provides.
2. Identify those areas were pressure from off road vehicle (ORV) use in undesignated areas can lead to degradation of forested areas. Such use has increased erosion, user conflicts, spread of invasive species, damage to cultural sites, disturbance to wildlife, destruction of wildlife habitat, and risks to public safety. Along with fire and fuels, invasive species and loss of open space, this issue is one of the US Forest Service's "four threats." Managing the areas where impact or potential impact is greatest, in addition to educational efforts will help alleviate these impacts.

Originally, Canopy Loss due to Urbanization and Development; and Recreation Pressure were separate issues. IDL Staff made the decision to combine them as they are both impacted by population density, and because we were only measuring ORV pressure within the Recreation dataset. It was felt that to separate them would be placing too great an emphasis on population density by counting it twice.

Data used:

1. Development Potential

The National Guidance suggested using the "Forests on the Edge" data developed by Dr. David Theobold, Colorado State University. These data use the SERGoM v3 model, described in the research paper **Watersheds at Risk to Increased Impervious Surface Cover in the Conterminous United States,** to predict housing density in ten-year increments from 2000 to 2030. By subtracting 2000 housing densities from 2030 predicted housing densities, we can express the potential areas of new development.

The Theobold data broke out housing density into ten classes; we modified these to eight classes as follows:

1. No Development or >80 acres per unit (rural)
2. 40-80 acres per unit (rural 1)
3. 20-40 acres per unit (rural 1)
4. 10-20 acres per unit (rural 2)
5. 1.7-10 acres per unit (rural 2)
6. 0.6-1.7 acres per unit (exurban/urban)
7. <0.6 acres per unit (exurban/urban)
8. Urban/built up (commercial, industrial, transportation)

When considering the movement from one density class to another, we wanted to make some judgment about the relative impact of that change. IDL Staff developed the following matrix showing values from 0 (no change) and 1 (low impact change) to 5 (highest impact change) and classified the data accordingly. The numbers in the colored boxes represent the housing density classes shown above. So, movement from density class 2 (one unit per 40 – 80 acres) in 2000 to density class 4 (10-20 acres per unit) by 2030 is considered a very high impact (value of five), A movement from density class 2 (one unit per 40 – 80 acres) in 2000 to density class 3 (one unit per 20–40) acres in 2030, on the other hand, is considered a high change (value of 4).

		2030							
		No Dev	Rural			Urban			
2000		1	2	3	4	5	6	7	8
No Dev	1	--	~~1~~ 3	~~1~~ 4	~~3~~ 5	5	5	5	5
Rural	2	--	--	~~0~~ 4	~~2~~ 5	5	5	5	5
	3	--	--	--	~~0~~ 4	5	5	5	5
	4	--	--	--	--	3	4	5	5
Urban	5	--	--	--	--	--	2	4	5
	6	--	--	--	--	--	--	4	5
	7	--	--	--	--	--	--	--	3
	8	--	--	--	--	--	--	--	--

-- = no or negative change
1 = low impact change
2 = low-moderate impact change
3 = moderate impact change
4 = high-moderate impact change
5 = high impact change

1. Recreation Pressure from ORV's

We used a model developed by the Idaho Department of Lands that incorporated US Census data for population density, the number of ORV registrations by county, TIGER 2000-based streets dataset, and travel distance preferences from 2002 Recreation Demand Assessment by the Idaho Department of Parks and Recreation.

We used the following assumptions in developing the model:

- Census population can be used as a surrogate for overall recreation pressure
- OHV registration totals by county can be used to estimate motorized recreation pressure
- The public road network is how recreation pressure is transmitted and dispersed to forested lands
- Recreation pressure comes primarily from urban population centers within and outside the state:
    1. Boise/Nampa/Caldwell
    2. Twin Falls
    3. Pocatello
    4. Ogden/Layton, UT
    5. Logan, UT
    6. Idaho Falls
    7. Moscow, ID/Pullman, WA
    8. Clarkston, WA/Lewiston, ID
    9. Spokane, WA/Coeur d'Alene, ID
- Recreation pressure on a forestland can come from multiple population centers and is additive
- Recreation pressure decreases as travel time to a recreation destination increases (actually, not an assumption but confirmed by IDPR recreation demand surveys)
- All parts of the state are equally desirable recreation destinations and certain destinations (such as resort areas, parks, etc.) do not attract more recreation pressure than others
- Recreation activity is defined as that which lasts a day or less; multi-day recreation activities are not considered

The result is a map that shows ORV pressure based on a 1 to 3 hour travel time. Those areas closest to urban areas (requiring less time to get to) were scored highest. Data was divided into three classes, scored 1 through 3. More information on this model can be found by reading the **Modeling Recreation Pressure on Idaho Forest Lands**.

Issue Process: The two datasets were added together, and then stratified into 5 classes (low to high risk) using natural breaks in the data.

Data considered, but not used:

Development Potential

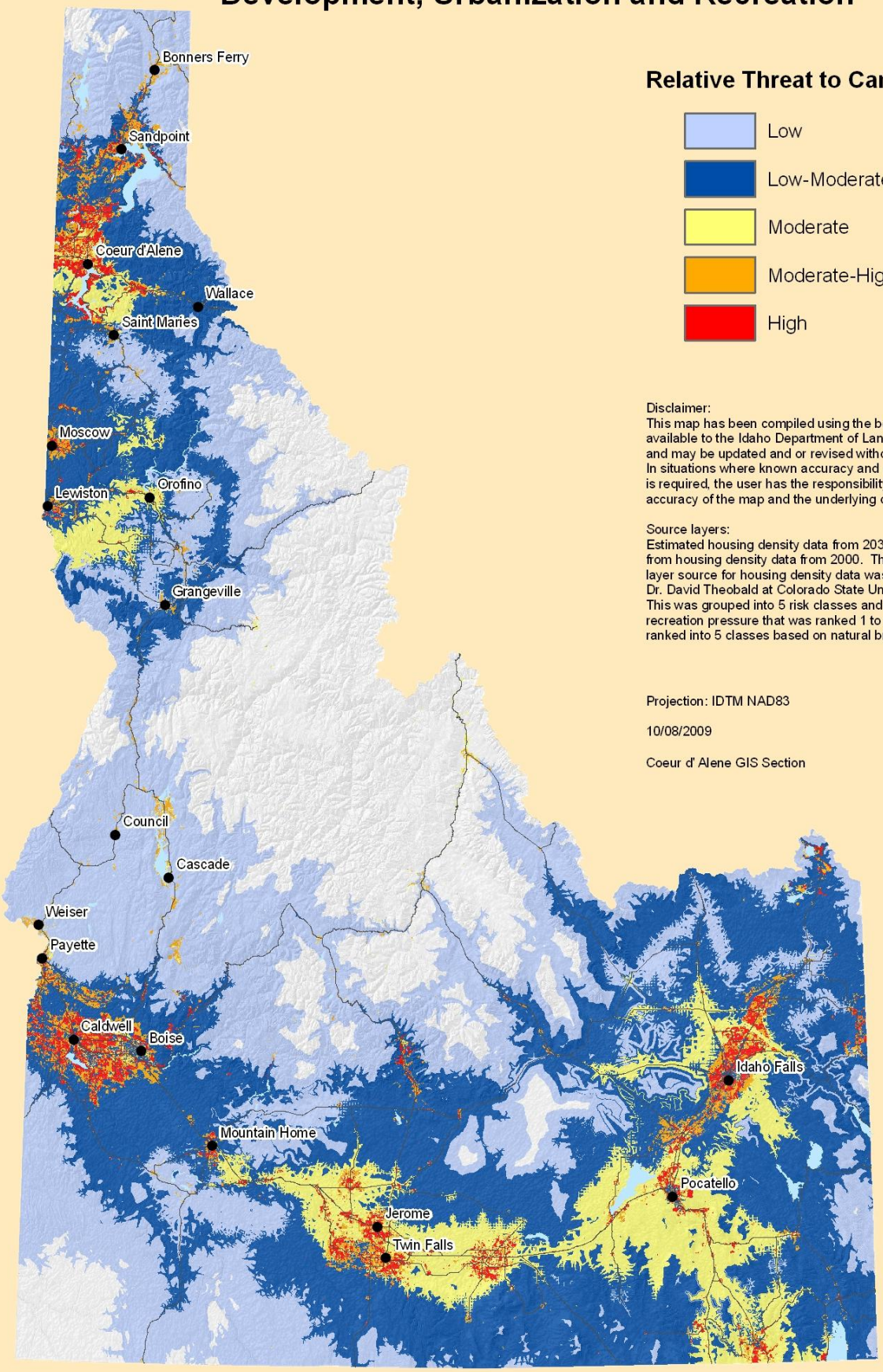
The Core Development Team also suggested using the industrial forestlands owned by Real Estate Investment Trusts (REITs) and Timber Investment Management Organization (TIMOs), since the potential divestiture of these lands for development is increasing. Upon further investigation, IDL GIS staff determined these datasets were unavailable, and were therefore not used.

Recreation Pressure

One of the datasets considered early on was the High-Use Dispersed Recreation Areas, from the Interior Columbia Basin Ecosystem Management Project, a model that incorporated several other datasets. This was ultimately not used due to currency of data and the feeling that what the model we had available to us was better.

We also wanted to incorporate data from Idaho Parks and Recreation, and this is part of the model we are using. Additionally, we contacted the Idaho Conservation League and the Wilderness Society, but they did not have data the type of geospatial data we needed.

Potential Loss of Forests and Canopy from Development, Urbanization and Recreation



Relative Threat to Canopy

- Low
- Low-Moderate
- Moderate
- Moderate-High
- High

Disclaimer:
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In situations where known accuracy and completeness is required, the user has the responsibility to verify the accuracy of the map and the underlying data sources.

Source layers:
Estimated housing density data from 2030 subtracted from housing density data from 2000. The original data layer source for housing density data was produced by Dr. David Theobald at Colorado State University.
This was grouped into 5 risk classes and added with a recreation pressure that was ranked 1 to 3. The sum was ranked into 5 classes based on natural breaks in the data.

Projection: IDTM NAD83

10/08/2009

Coeur d' Alene GIS Section

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Issue: Relative Potential Benefit to Wildlife and Biodiversity

The intent of this issue is to:

- Identify the areas of greatest conservation value for wildlife habitat and plant and animal biodiversity, and where management can enhance these values.

Discussion: Initially, this issue was listed as two separate ones – 'Wildlife Benefit' and 'Healthy Forest Ecosystems.' After conversations with representatives of Idaho Fish and Game (IDFG) and The Nature Conservancy (TNC), a decision was made to combine these into a Wildlife and Biodiversity issue. Principle reasons for this are that data for priority conservation areas, developed by the TNC, and Special Status Species data (including threatened and endangered) included plant communities and species as well wildlife. Breaking these apart would have the effect of overweighting fish and wildlife.

This issue will highlight those areas were forests play a key role in wildlife critical habitat and range, threatened, endangered and rare fish and wildlife habitat and plant communities. Within the context of the full assessment and response strategy, projects proposed within areas of overall high priority—which include areas identified as high priority for this issue—should consider activities that will enhance the habitat of the plant, fish and wildlife species listed within those areas.

Data used:

Multiple data layers informed this issue. These are:

1. **Fish Distribution,** comprised of:
    a. **Bull Trout Fish Distribution**
    b. **Cutthroat Trout distribution**
    c. **Chinook Salmon distribution**
    d. **Steelhead Salmon distribution**
    e. **Sockeye Salmon distribution**

    All fish distribution data came from Streamnet (http://www.streamnet.org/mapping_apps.html). The data represent current distribution and activity for the above species. More information on creation of this feature class is available at http://www.streamnet.org/about.html. Initially, distribution data for each species was buffered by 75 feet on any critical habitat stream, river, or lake. These buffered layers were then converted into a 30 m raster grid and re-classed to either a 1 (presence) or 0 (absence). After discussion at the July 14, 2009 Stakeholder

meeting and subsequent conversations with Gregg Servheen (ID F&G) and Bob Unnasch (TNC), this was changed such that stream segments were brought up to a 6th order HUC. The final fish distribution map was derived by adding up the five sub layers and reclassifying ***0 through 5*** based on the number of separate species represented in each pixel.

2. **Comprehensive Wildlife Conservation Strategy (CWCS) Focal Areas and Big Game**
   a. **Focal Areas** from the Idaho CWCS (http://fishandgame.idaho.gov/ifwis/ifwisweb/IDCWCS/FA/)

      Through the workshop process, Idaho conservation partners mapped and attributed focal areas across Idaho. These are general areas known to be important for the species of greatest conservation need identified in the Idaho Comprehensive Wildlife Conservation Strategy, but by no means are intended to imply that conservation actions should be restricted to these areas. Focal areas were defined as resource-based, management-based, or both:

      Resource Focal Area:
      A geographical area necessary for the long-term persistence of SGCN and their habitats (in other planning efforts these may be referred to as High Resource Value Areas or Biologically Important Areas).

      Management Focal Area:
      A general geographical area that targets resources and efforts where they can benefit the largest number of species and habitats in need of conservation. Management focal areas are generally larger and may include species and/or habitats other than SGCN as well as non-biological factors.

      Focal areas were classified by their type, converted to 30m raster, and reclassified as: ***0 where none exist, 1 where it is a resource Focal Area, and 3 if it is a Management Focal Area***.

   b. **Big Game Habitat** from Idaho Fish and Game, including:

      i. **Mule Deer** –Summer and Winter Range, and other Important Habitat
      ii. **Elk** – Critical Summer and Winter Range
      iii. **Mountain Goat** – Habitat
      iv. **Bighorn Sheep** – Priority Habitat

      Species were selected, and data provided by the Idaho Fish and Game Department. These species represent the most critical big game species per the CWCS. Each species habitat/range was converted to 30m raster and classified as **1 where the species exists, and 0 where it doesn't**.

The scores from both a) and b) above were added together. Pixels could have a score from 0 to 7. These were reclassified by natural breaks into five classes, 0 through 5.

3. **The Nature Conservancy Ecoregional Conservation and Priority Conservation Areas**, comprised of:

    a. **Canadian Rocky Mountains Ecoregional Assessment Data – Priority Conservation Areas**. This data is access restricted. Information on the assessment, including report, maps and data can be accessed at: (http://www.waconservation.org/ecoCanadianRockies.shtml)

    b. **Columbia Plateau Ecoregional Assessment Data – Priority Conservation Areas**. This data is access restricted. Information on the assessment, including the report, maps and data can be accessed at: (http://www.waconservation.org/ecoColumbiaPlateau.shtml)

    c. **Middle Rockies – Blue Mountains Ecoregional Assessment Data – Conservation Areas**. The assessment report and data can be accessed at: (http://www.waconservation.org/ecoBlueMountains.shtml)

    d. **Utah – Wyoming Rocky Mountains Ecoregional Assessment Data – Conservation Areas**. The assessment report can be accessed at: (http://conserveonline.org/coldocs/2003/10/uwrm_plan_ver2001.pdf)

    The metadata for Conservation Area datasets describes them as:

    "These data describe the priority areas for conserving imperiled species and functioning ecosystems. These extraordinary places are all part of a common "ecoregion", sharing similar climate, geologic historic, landforms, and native species. Resources for conservation in these ecoregions are limited, urban areas are expanding, and an extraordinary heritage of native species and ecosystems is at risk. This assessment is intended to help conservation agencies, planners, and organizations direct their resources to the most important places for conservation. It describes a "portfolio" of priority conservation areas which are 1) of exceptional biological value and 2) the most likely places for conservation to succeed based on their current condition, land use, and other factors. Most importantly, this portfolio captures as much of the biodiversity of the ecoregion as possible, ensuring that each local site contributes to an ecoregion-wide strategy for conservation."

    While all identified conservation areas are considered priority, these area within the first two datasets (a. and b.) were further refined to include those which are most important and/or at highest risk.

Because datasets c. and d. did not further prioritize conservation areas, there may be more identified conservation areas relative to the other two. For this reason, all areas were combined, converted to a 30m raster grid. Pixels were classified with a value of ***3 if they were a conservation or high conservation area per the datasets used, and 0 if they did not.***

4. **Federally Listed Threatened and Endangered Species,** from the Idaho Conservation Data Center, Idaho Department of Fish and Game—from 2007.

   The occurrences represent Federally Listed Threatened and Endangered in Idaho. This spatial coverage and the occurrences contained in it are not a public record. Data were converted to 30m raster pixels, and classified with a ***1 if a T&E species exists, and 0 if not***. These species are listed at the end of this document.

Issue Process: The four layers listed above were added together and reclassified by natural breaks into five classes indicating low to high relative benefit to Wildlife and Biodiversity.

Data Considered but not Used:

Early on, when Healthy Forest Ecosystems was being considered as a separate issue, the Core Development Team looked at using the Legacy Areas of Need and Fire Regime Condition Class to inform this issue. It was determined that the **Legacy Areas of Need** (AON) stood on its own as a separate assessment, and included many of the data being used in the SAFR. Rather than double count these data, the Legacy will be incorporated into the assessment as supporting information, and will be part of the Response Strategy. The SAFR, or components thereof, may be used as a secondary sort tool to further refine priority areas for potential Legacy Conservation Easements.

Fire Regime Condition Class represents areas depending on how well they are within or depart from historic fire regimes. The team felt that areas within historic fire regimes were those that were likely to be resilient to wildfire, and relatively intact. However, the disclaimer in this analysis states "Fire Regime Condition Classes were developed for the western United States and were not intended to be mapped or summarized at a finer level (e.g., mapped or summarized for a single state), which could provide misleading results." For this reason, we felt using this in our statewide assessment would be an inappropriate and potentially inaccurate use of the data. (Note that per the discussion in the Wildfire Issue, updated FRCC data was determined to be acceptable and is being used to inform that issue. The model for this issue had already been modified a number of times, and no further discussion took place regarding reconsideration of this dataset.)

Species listed in Idaho based on published population data

Notes:

- This report shows the species listed in this state according to the Federal Register listing description.
- This list does not include experimental populations and similarity of appearance listings.
- This list includes species or populations under the sole jurisdiction of the National Marine Fisheries Service.
- Click on the highlighted scientific names below to view a Species Profile for each listing.

Listed species (based on published population data) -- 22 listings

Animals -- 18 listings

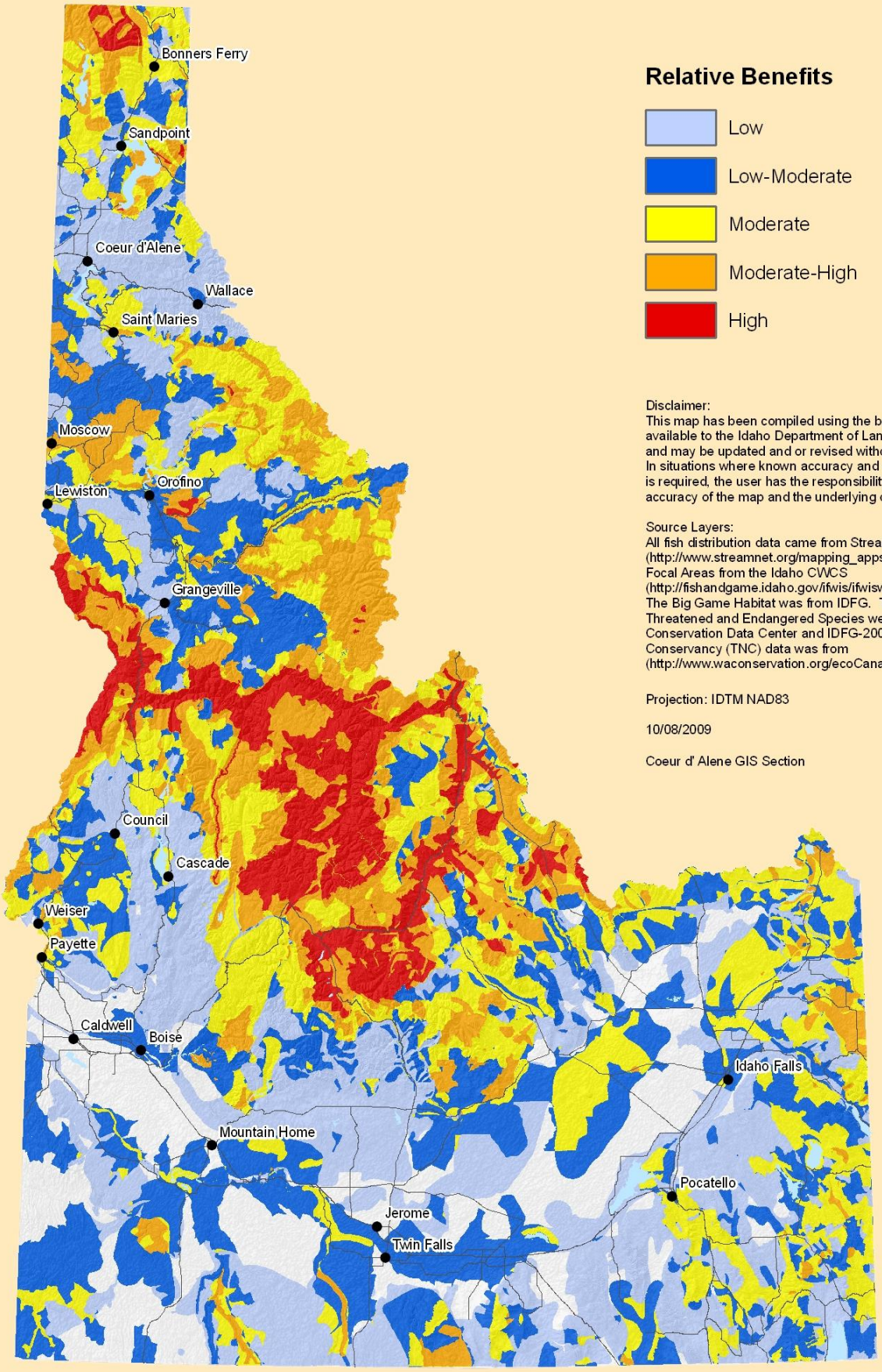
Status	Species/Listing Name
T	Bear, grizzly lower 48 States, except where listed as an experimental population or delisted (*Ursus arctos horribilis*)
E	Caribou, woodland Selkirk Mountain population (*Rangifer tarandus caribou*)
E	Curlew, Eskimo (*Numenius borealis*)
E	Limpet, Banbury Springs (*Lanx sp.*)
T	Lynx, Canada lower 48 States DPS (*Lynx canadensis*)
E	Rabbit, pygmy Columbia Basin DPS (*Brachylagus idahoensis*)
T	Salmon, chinook fall Snake R. (*Oncorhynchus (=Salmo) tshawytscha*)
T	Salmon, chinook spring/summer Snake R. (*Oncorhynchus (=Salmo) tshawytscha*)
E	Salmon, sockeye U.S.A. (Snake River, ID stock wherever found.) (*Oncorhynchus (=Salmo) nerka*)
T	Snail, Bliss Rapids (*Taylorconcha serpenticola*)
E	Snail, Snake River physa (*Physa natricina*)
E	Snail, Utah valvata (*Valvata utahensis*)
E	Springsnail, Bruneau Hot (*Pyrgulopsis bruneauensis*)
T	Squirrel, northern Idaho ground (*Spermophilus brunneus brunneus*)
T	Steelhead Snake R. Basin (*Oncorhynchus (=Salmo) mykiss*)
E	Sturgeon, white U.S.A. (ID, MT), Canada (B.C.), Kootenai R. system (*Acipenser transmontanus*)
T	Trout, bull U.S.A., conterminous, lower 48 states (*Salvelinus confluentus*)
E	Wolf, gray Lower 48 States, except where delisted and where EXPN. Mexico. (*Canis lupus*)

Plants -- 4 listings

Status	Species/Listing Name
T	Catchfly, Spalding's (*Silene spaldingii*)
T	Four-o'clock, MacFarlane's (*Mirabilis macfarlanei*)
T	Howellia, water (*Howellia aquatilis*)
T	Ladies'-tresses, Ute (*Spiranthes diluvialis*)

Last updated: June 19, 2009

Relative Potential Benefit to Biodiversity and Wildlife



Relative Benefits

- Low
- Low-Moderate
- Moderate
- Moderate-High
- High

Disclaimer:
This map has been compiled using the best information available to the Idaho Department of Lands at the time and may be updated and or revised without notice. In situations where known accuracy and completeness is required, the user has the responsibility to verify the accuracy of the map and the underlying data sources.

Source Layers:
All fish distribution data came from Streamnet (http://www.streamnet.org/mapping_apps.html). Focal Areas from the Idaho CWCS (http://fishandgame.idaho.gov/ifwis/ifwisweb/IDCWCS/FA/) The Big Game Habitat was from IDFG. The Federally Listed Threatened and Endangered Species were from the Idaho Conservation Data Center and IDFG-2007. The nature Conservancy (TNC) data was from (http://www.waconservation.org/ecoCanadianRockies.shtml)

Projection: IDTM NAD83

10/08/2009

Coeur d' Alene GIS Section

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Issue: Relative Potential Benefit to Water Quality from Forests and Canopy

The intent of this issue is to:

- Identify the areas of greatest need with respect to water quality and quantity, and where forests can have the greatest benefit.

Discussion: Rural forests and urban tree canopy have a tremendous value toward good water quality, aquifer recharge, stormwater mitigation and erosion control. Water is, in fact, one of the biggest issues in the west and is important for fish, wildlife and humans (agriculture, horticulture, industry and for drinking water). Forest canopy shades and cools streams—important for healthy fish habitat. Leaves of trees intercept rainfall, lowering the impact of rain on soil. Roots systems help break up compacted ground while stabilizing soil, leading to greater groundwater recharge, reduced stormwater runoff and associated contaminant loads, and less erosion.

This issue focuses forest management efforts in the areas in greatest need for improved water quality/quantity—in both rural and urban environments.

During the July 14, 2009 Stakeholder meeting, Tom Herron (ID Dept. of Environmental Quality) suggested we also include areas with Total Maximum Daily Load (TMDL) plans. These plans recommend management activities to lower loading of specific pollutants into surface waters. Areas with TMDL's may or may not be listed as impaired.

Data used:

Three data layers informed this issue. These are:

1. **Public Drinking Water**, comprised of:
    a. Source water delineations from Idaho Department of Environmental Quality's Source Water Protection program. (Note that these data are used with permission and not available for public release)
    b. Spokane Valley-Rathdrum Prairie (SVRP) Aquifer boundary for the Idaho portion of the aquifer from Idaho Department of Water Resources. Obtained from http://inside.uidaho.edu.

    The Source Water dataset delineation process "establishes the physical area around a well or surface water intake that will become the focal point of a source water assessment. The process includes mapping the boundaries of the zone of contribution (e.g., the surface and subsurface areas contributing water to the well, or surface water intake) into time of travel zones (e.g., zones indicating the number of years necessary

for a particle of water to reach a well or surface water intake). The size and shape of the source water assessment area depend on the delineation method used, local hydrogeology, and volume of water pumped from the well or surface water intake." (IDEQ 1999) Additional information on Idaho's Source Water Assessment Plan and Drinking Water Protection Program can be found at http://www.deq.state.id.us/water/prog_issues/source_water/protection.cfm.

The boundary of the SVRP aquifer was added to the source water delineation to develop a public drinking water layer. This aquifer was added because it is both a sole source for drinking water for more than 500,000 people AND because it has no bedrock cap overlying it. Due to the latter attribute, it is the only designated Sensitive Resource aquifer in Idaho. This means it receives the highest level of protection, as activities over the aquifer can have a direct and relatively quick impact on water quality within the aquifer. Subwatersheds (Hydrologic Unit Code—or HUC—6th level) were flagged if a part of the aquifer or an area of source water delineation was within them. If the watershed was flagged it was classified with a value of 5. If not, it received a value of 0 indicating it does not contain either a part of the aquifer or an area of source water delineation. This was changed for draft two such that any sub-watershed containing a part of the aquifer or an areas of source water delineation was give a value of 1. All others were given a value of 0.

2. Priority Watersheds

Priority watersheds are those containing an impaired stream or lake. Subwatersheds that contain an impaired lake or stream were originally classified with a value of 5. Subwatersheds that did not contain an impaired stream or lake are classified with a value of 0. This was changed for draft two such that any sub-watershed in which there is an impaired stream or lake was given a value of one. Those which did not were given a value of 0.

Source data is the 303(d) list of all impaired waters in the state, per Section 303(d) of the Clean Water Act. These data are part of the 2008 303d/305b Integrated Report, collected and maintained by the Idaho Department of Environmental Quality, and are available for download on-line at:
http://data.insideidaho.org/data/IDEQ/archive/streams305b2008_id_ideq.zip
http://data.insideidaho.org/util/zip.ashx?fn=http://data.insideidaho.org/data/IDEQ/downdata/lakes305b2008_id_ideq.zip

3. Impervious Surfaces

Impervious surfaces came from the National Land Cover Database (NLCD) 2001 imperviousness layer, produced through a cooperative project conducted by the Multi-Resolution Land Characteristics (MRLC) Consortium, a partnership of federal agencies

(www.mrlc.gov). For a detailed definition and discussion on MRLC and the NLCD 2001 products, refer to http://www.mrlc.gov/mrlc2k.asp.

The NLCD_2001_impervious layer was used where the percent of imperviousness of a 30 meter cell was converted to the impervious area and summed to a 6thorder HUC. Any HUC that had 2% or greater impervious surfaces was counted and given a value of 1. All others received a value of 0.

4. **Areas with total Maximum Daily Load (TMDL) Plans**

   Areas with TMDL's were derived from the 2008 303(d)-305(b) integrated water quality report by the Idaho Department of Environmental Quality. All sub-watersheds in which a TMDL plan was located received a value of 1, all others were given a value of 0.

Issue Process: All four datasets were added together giving a range of scores of 0 through 4. The zero was dropped and the other scores were reclassified with scores of 2 – 5.

Data Considered, but not used:

The following datasets were also considered, but not used:

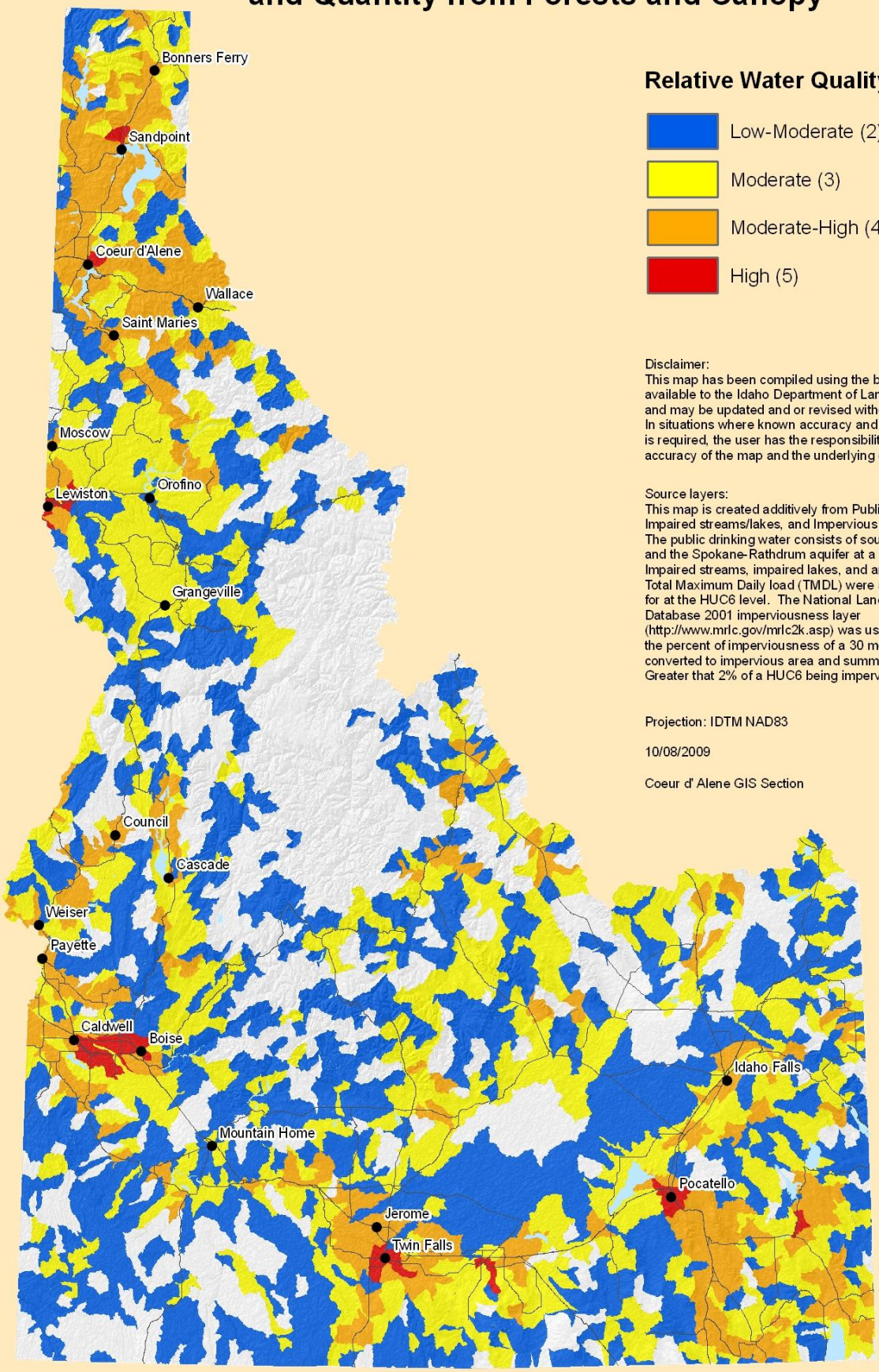
- Water temperature: temperature data is one of the attributes that may contribute to a lake or stream being classified as 303(d), so is already included.
- Well Locations/permits and the areas they draw from: There are more than 170,000 well permits within Idaho—most are for single dwellings, but other uses include industry, commercial, irrigation (agriculture), fire protection, heating, public water supply and more. The core team was uncertain how best to utilize this information to inform the water quality/quantity issue, especially since well data is point information (no draw areas were available) and so many existed. We felt the most critical water use for which forestry practices can have a significant impact is municipal/public drinking water. The core team decided using municipal water source data, which includes both below and above ground water sources via the Source Water Assessment Program, would better inform this issue.
- Major deep-water aquifers: Including these aquifers would result in a lot of area. There are three aquifers in Idaho designated as sole sources for drinking water—Rathdrum Prairie, Lewiston Basin and Eastern Snake River Basin aquifers. We considered including these, but two of the three have a bedrock cap (activities over the aquifer do not necessarily directly impact water quality or quantity within the aquifers unless pumping from or injecting into them). Areas over these aquifers from which municipal or public water supplies are drawn are

already included within the source water data. As noted above, the Rathdrum Prairie Aquifer was included due to its designation as a Sensitive Resource aquifer, which affords it the highest level of protection. For this reason, this aquifer was included while the others were not.

IDEQ (Idaho Division of Environmental Quality) Ground Water Program, Idaho Source Water Assessment Plan, 1999, Boise, ID 200 p.
http://www.deq.state.id.us/water/data_reports/source_water/swa_plan_1999.pdf

IDEQ Surface Water: Integrated §303(d)/§305(b) Report
http://www.deq.state.id.us/WATER/data_reports/surface_water/monitoring/integrated_report.cfm

Relative Potential Benefit to Water Quality and Quantity from Forests and Canopy



Relative Water Quality

- Low-Moderate (2)
- Moderate (3)
- Moderate-High (4)
- High (5)

Disclaimer:
This map has been compiled using the best information available to the Idaho Department of Lands at the time and may be updated and or revised without notice. In situations where known accuracy and completeness is required, the user has the responsibility to verify the accuracy of the map and the underlying data sources.

Source layers:
This map is created additively from Public drinking water, Impaired streams/lakes, and Impervious surfaces. The public drinking water consists of source water, and the Spokane-Rathdrum aquifer at a HUC6 level. Impaired streams, impaired lakes, and areas of Total Maximum Daily load (TMDL) were accounted for at the HUC6 level. The National Land Cover Database 2001 imperviousness layer (http://www.mrlc.gov/mrlc2k.asp) was used where the percent of imperviousness of a 30 meter cell was converted to impervious area and summed to a HUC6. Greater that 2% of a HUC6 being impervious was counted.

Projection: IDTM NAD83

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Coeur d' Alene GIS Section

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Issue: Relative Potential Benefit to Air Quality from Forests and Canopy

The intent of this issue is to:

- Identify are the areas of greatest need with respect to air quality and where forests can have the greatest benefit.

Discussion: Air quality is both impacted by and benefited from forests. Wildfires—especially large uncharacteristic ones—pump a great deal of particulates (from smoke) and carbon into the air. Communities within the air sheds of these fires suffer poorer air quality and commensurate health impacts. Certain tree species are also net producers of biogenic volatile organic compounds (BVOC's), which can exacerbate ozone production, especially in urban areas. However, forest canopy can also absorb and filter particulates and pollutants out of the air, improving air quality. Likewise, trees sequester carbon and release oxygen—important for mitigating climate change and for human and animal health. Since temperature is a catalyst for production of volatile organic compounds (VOC's), the cooling effect of tree canopy in urban areas can lower their production. Sources of VOC's include any petroleum product that breaks down (asphalt, plastics, etc.) and parked vehicles (evaporation of fuel in gas tanks). By also cooling buildings and thereby lowering energy use, urban tree canopy can also reduce energy production. If this energy is from fossil fuels, this results in additional emissions reductions, including carbon.

It makes good sense to manage forests within urban air sheds to increase forest health and fire resiliency, thereby reducing negative impacts on public health. Likewise, increasing canopy cover and forest management within these areas also has a positive public health impact by helping reduce the causes of pollution while filtering out other pollutants and particulates.

Data used:

There were three principle datasets used in this analysis.

1. **Non-attainment zones**.

   Non-attainment areas were obtained from the Idaho Department of Environmental Quality. These are areas within Idaho where air pollution levels persistently exceed the national ambient air quality standards (NAAQS), designated "nonattainment." EPA considers any geographic area that meets or has pollutant levels below the NAAQS an attainment area. Under ideal circumstances, all of Idaho would be classified as "attainment." Areas with persistent high pollutant levels are designated as nonattainment areas, meaning these areas have violated federal health-based standards for outdoor air pollution. Each nonattainment area is declared for a specific pollutant,

meaning the same area could be "attainment" for one pollutant, but "nonattainment" for a different pollutant. Nonattainment areas for different pollutants may overlap each other or share common boundaries.

This layer was used to select all subwatersheds (Hydrologic Unit Code—or HUC—6th level) that contained non-attainment areas. Subwatersheds that contained a non-attainment area were given a value of 5 and Subwatersheds that did not contain a non-attainment area were given a value of 0.

2. **Smoke impact zones**

   These data were provided by the Idaho/Montana Airshed Group http://www.smokemu.org/index.php. Air Impact Zones are areas where smoke from wildfires is likely to be a problem because of local topography, meteorology, and areas with existing air quality problems that smoke from wildfires will exacerbate, or other factors. Increasing canopy in these areas will help mitigate the impacts of particulates from smoke, improving air quality and public health.

3. **Canopy cover relative to impervious surfaces**

   Data used were two products of the National Land Cover Dataset (NLCD) 2001—Impervious surfaces and Tree Canopy. These data were produced through a cooperative project conducted by the Multi-Resolution Land Characteristics (MRLC) Consortium, a partnership of federal agencies (see www.mrlc.gov). For a detailed definition and discussion on MRLC and the NLCD 2001 products, refer to http://www.mrlc.gov/mrlc2k.asp.

   As noted in the issue discussion above, impervious surfaces have a negative impact on air quality for a variety of reasons. Research has demonstrated the significant positive impact of tree cover in such areas by filtering particulates, absorbing CO2 and other pollutants, and lowering ambient air temperature while reducing the impact of ultraviolet radiation. With these data, we are identifying areas that have a high percentage of impervious surfaces, but lack significant canopy cover in the surrounding area. Indentified, then, are areas where additional canopy can have a substantial impact in mitigating poorer air quality to which impervious surfaces contribute.

The NLCD_2001_impervious layer was classified on the percent imperviousness value by natural breaks into 5 classes and weighted as follows:

Class	% Impervious	Weight
0	0 – 6	0
1	7 – 17	1
2	18 – 30	2
3	31 – 46	3
4	47 – 65	4
5	66 – 100	5

The NLCD_2001_canopy layer was classified on the percent canopy cover value. A neighborhood mean canopy cover was created from the canopy cover data by taking the mean value of the 25 (5 by 5) neighboring cells for every cell. The mean canopy cover value is a measure of the canopy cover surrounding impervious areas. The mean canopy cover was grouped by natural breaks into 5 classes and weighted as follows:

Class	Mean % Canopy	Weight
1	0 – 17.431	0
2	17.432 – 38.349	1
3	38.50 – 59.267	1
4	59.268 – 78.690	2
5	78.691 – 100	3

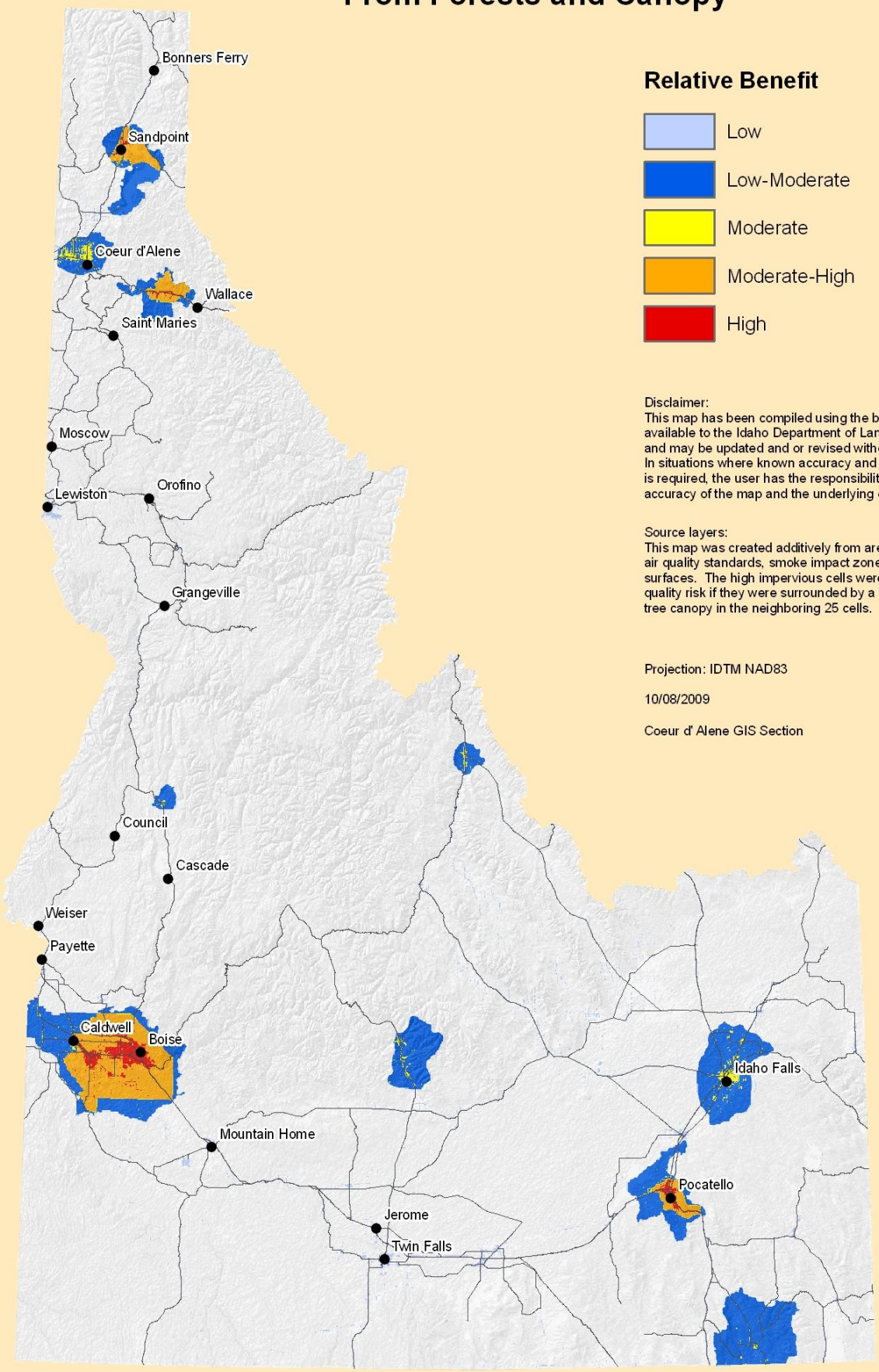
Then, the Impervious surface weight was lowered by the mean percent canopy cover weight.

Issue Process: The map is created additively from areas that did not attain air quality standards, are within smoke impact zones, and have a high percentage of impervious surfaces with low percentages of surrounding canopy cover. The additive result was reclassified into 5 classes based natural breaks giving resulting values of 0 – 5.

Data Considered, but not used:

Data on above-ground dry biomass was considered for this issue, as it can be used as a surrogate for carbon sinking. However, the Core Guidance Team determined not to use it for this issue, feeling it was more of an economic issue than one of air quality. As noted above, within this issue, we are trying to locate the areas in which increased canopy could have a relatively high potential for improving poor air quality.

Relative Potential Benefit to Air Quality From Forests and Canopy



Relative Benefit

- Low
- Low-Moderate
- Moderate
- Moderate-High
- High

Disclaimer:
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Source layers:
This map was created additively from areas that did not attain air quality standards, smoke impact zones, and impervious surfaces. The high impervious cells were lowered in air quality risk if they were surrounded by a high percent of tree canopy in the neighboring 25 cells.

Projection: IDTM NAD83

10/08/2009

Coeur d' Alene GIS Section

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Issue: Relative Potential Benefit to Sustainable Forest-Based Wood Products Markets

The intent of this issue is to:

- Identify the forested areas most beneficial to existing and planned mills and biomass utilization facilities.

Discussion: In many areas of the state, communities are economically and culturally dependent upon forestlands. The benefits and products of forestlands include timber, biomass, recreation, hunting/fishing and ecosystem services. Initially, the multi-resource committee and State Assessment of Forest Resources (SAFR) Stakeholder group identified the loss of forest infrastructure (mills, markets, etc.) as a key issue (threat to forests). This threat is greater than simply economics. When markets and mills shut down, incentives to manage forests are significantly diminished, leading to an increase in forest insect and disease problems, fire risk, and a decline in overall forest health.

However, the core team felt that if markets and infrastructure were already gone, it will be very difficult to resurrect them, especially within the changing world economy. Rather, the team felt it better to regard the economic potential of forests as a benefit, and focus on where markets and mills currently exist and additional markets, such as for biomass, are being planned. As communities continue to grow, there is value to considering how this can be accomplished sustainably. That is, producing the food, energy and other resources necessary to support these populations within a set distance surrounding the community.

Drivers, such as the difficulty of Federal lands forest management, were discussed. Various ways to measure this were also discussed (such as amount of litigation in various areas), but the challenge of finding this information and developing datasets to express this is beyond the parameters of this project.

One of the more important datasets to consider is the location of current mills, and existing and planned biomass facilities. Areas that are in close enough proximity to feed these markets will be higher priority for projects. Additionally, forest productivity was also discussed at length. Currently, no dataset exists for productivity across the whole state. The team discussed alternative ways to estimate this. One is to simply use vegetation layer as a surrogate for habitat type. While this doesn't measure potential habitat, it may be all we have to work with.

Data used:

1) **Mill travel Distance**: This layer was developed using known mill locations and the time needed to haul timber to them (provided by IDL's Forest Management Bureau). The mills where divided into two categories based on their raw resource needs and production capabilities, then a cost distance analysis performed using a travel time surface layer. The resulting layer was then stratified into the travel time categories of ½ hr, 1 hr, 2 hr, 3 hr, and 4 or more. Note that mills outside of Idaho but within the travel buffer distances were also included. For small mills, we only looked at ½ hour and 1-hour travel times.

2) **Woody Biomass Facilities Travel Distance:** This layer used point locations for known and proposed biomass facilities and the time needed to deliver woody biomass to them. The facilities where divide into two categories based on their operational times and raw resource needs, then a cost distance analysis performed using a travel time surface layer. The resulting layer was then stratified into the travel time categories of ½ hr, 1 hr, 2 hr, 3 hr, and 4 or more. For small facilities, we only looked at ½ hour and 1-hour travel times.

3) **Forested Areas**: The National Land Cover Dataset 2001, produced through a cooperative project conducted by the Multi-Resolution Land Characteristics (MRLC) Consortium, a partnership of federal agencies (www.mrlc.gov). For a detailed definition and discussion on MRLC and the NLCD 2001 products, refer to http://www.mrlc.gov/mrlc2k.asp. Within this dataset are classifications of land cover, including forested areas. For this issue, the following classifications were used: Deciduous Forest, Evergreen Forest, Mixed Forest, Shrub/Scrub, Woody Wetlands, Palustrine Forested Wetlands, Palustrine Scrub/Shrub Wetlands, and Estuarine Forested Wetlands.

Issue Process:

The composite layer shows a high timber priority close to mill and biomass facilities with diminishing priority as timber is further from mills or biomass facilities. Large mills and large biomass facilities were the basis of a time travel classification. Small mills and biomass facilities were used for only ½ and 1-hour travel distance indicating their influence is limited and smaller than the large facilities. The Mill distance layer and the biomass facilities layer were combined to create a composite layer such that the value for each cell was equal to the highest value in any of the datasets. This data was masked such that only the forested areas described in #3 above are shown.

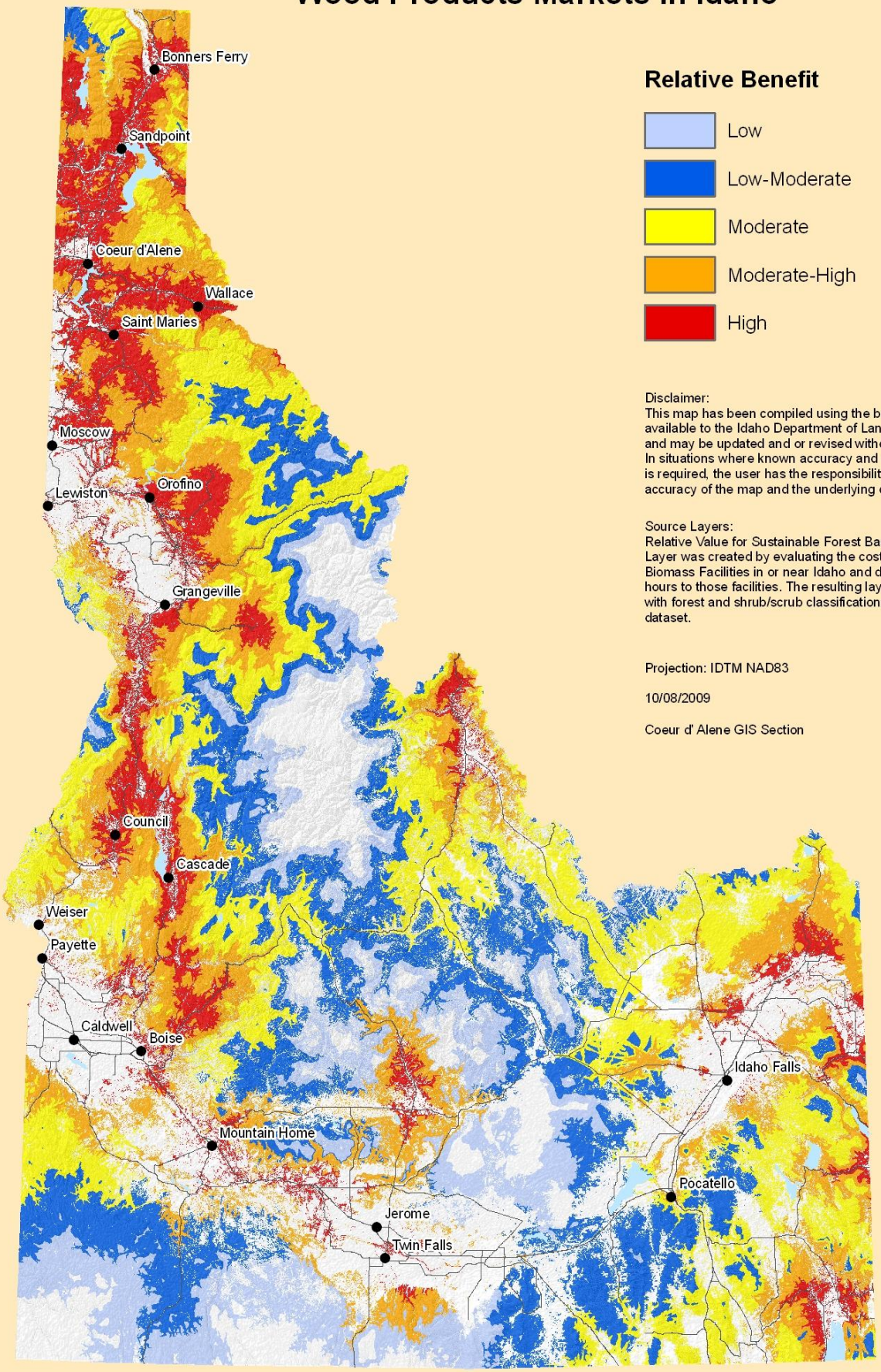
Data Considered, but not used:

Early on, the intent of this issue was in determining in what areas a lack of (or decline of) mill infrastructure or markets most threaten local economies, overall forest management, forest health, etc. As mentioned in the discussion above, the Core Guidance Team instead chose to focus on beneficial aspects of forest-based markets, identifying the forested areas that support them. Projects that promote forest health and good forest management within these areas will help develop or maintain supply.

Significant discussion revolved around the desire to incorporate forest productivity data to determine the best areas in which to work once the cost-distance analysis for mill and woody biomass facilities was complete. While this information exists, it is not inclusive of the entire state. The Core Team felt it important to use consistent statewide data to ensure relative prioritization weighed all areas against the same data. The team also considered USDA Natural Resource Conservation Service soils data, but this information is only available county by county, and the effort necessary to combine these was beyond the guidance of using the "best available existing data." The group identified forest productivity as a significant data gap that would be very beneficial to have in the future. The group did consider using an above ground biomass dataset as a surrogate for productivity, but these identified substantially the same areas as the forested classifications of the NLDC 2001 data used in this analysis.

The Core Guidance Team also discussed incorporating other economic benefits from forestlands, such as recreation, hunting and fishing, esthetics, ecosystem services, etc. Ultimately, it was felt that these were covered within the other issues and that this one should focus on timber and woody biomass based market

Relative Benefit for Sustainable Forest-Based Wood Products Markets in Idaho



Relative Benefit

- Low
- Low-Moderate
- Moderate
- Moderate-High
- High

Disclaimer:
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Source Layers:
Relative Value for Sustainable Forest Based Markets in Idaho Layer was created by evaluating the cost distance of Mills and Biomass Facilities in or near Idaho and determining travel times in hours to those facilities. The resulting layer was then masked with forest and shrub/scrub classifications from the NLCD 2001 dataset.

Projection: IDTM NAD83

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Methodology for Developing Final Assessment Priority Maps

Three different methodologies were presented at the initial State Assessment of Forest Resources (SAFR) Stakeholder meeting in October, 2008.

Methodology 1: Combining independent assessment from various landowner organizations

The first methodology would gather prioritization assessment from all major stakeholder groups in Idaho, including the Forest Stewardship Spatial Analysis Project (SAP), US Forest Service, Idaho Department of Lands Endowment Land assessment, BLM, tribal assessments, Fish and Game, etc. These would be placed on a map and an overall prioritization developed where multiple high priority areas from each assessment were contiguous. This was discarded for two reasons. First, how are areas addressed where there have been no assessments completed? Second, the likelihood is high that the issues upon which each independent assessment is based would be different, making analysis difficult to understand and challenging to describe.

Methodology 2: Weighted overlay.

This is among the most common geospatial methods of prioritization and that which was used in the SAP analysis mentioned above. For this assessment, the issues and they way they were developed may have remained the same. Then, stakeholders would have ranked these by relative importance, giving a numerical score for each such that the total of scores for all issues equaled 100. Then, scores from all stakeholders are averaged to arrive at a final weighting. The value in each cell for each issue is multiplied by the "weighted" score assigned to it. The weights each issue will receive depends significantly on who submits scores, and can be skewed if, say, a particular profession is over or under represented. It may also have the effect of placing greater emphasis on either threat of benefit issues. For instance, the highest weights may be assigned to issues that threaten forests. The end result may be prioritization on areas that are at high risk, but for which relative benefits may vary widely.

Methodology 3: Threats/Benefits Matrix

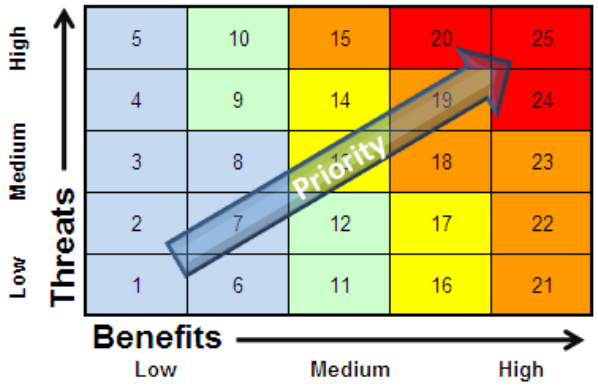
The third methodology presented, and the one chosen is a threats/benefit matrix. The key forestry related issues identified by the Assessment stakeholders and further refined by the Core Guidance Team are categorized into two groups. The first included those issues which threaten forests—Forest Health Threats, Risk to Communities and Ecosystems from Uncharacteristic Wildfire, and Potential Loss of Forests and Canopy from Development and Recreation Pressures. The second major group includes those issues for which forests and trees provide benefit—Wildlife and Biodiversity, Water Quality and Quantity, Air Quality, and

Sustainable Forest-Based Markets. Each of these issues is considered equal and all have scores that range from 0 through 5, from no threat to high threat, and from no benefit to high benefit.

The values for each 30 meter cell in each of the "threats" issues are added together. The scores for all cells are then stratified into five classes using natural breaks. This composite threats map identifies the least threatened through the most threatened per the issues and sub-issues used in the assessment.

The same is done for the "Benefits" issues to develop a Composite Benefits map. This map shows areas with the least benefit through those with the greatest benefits as identified in the issues and sub-issues used in the assessment.

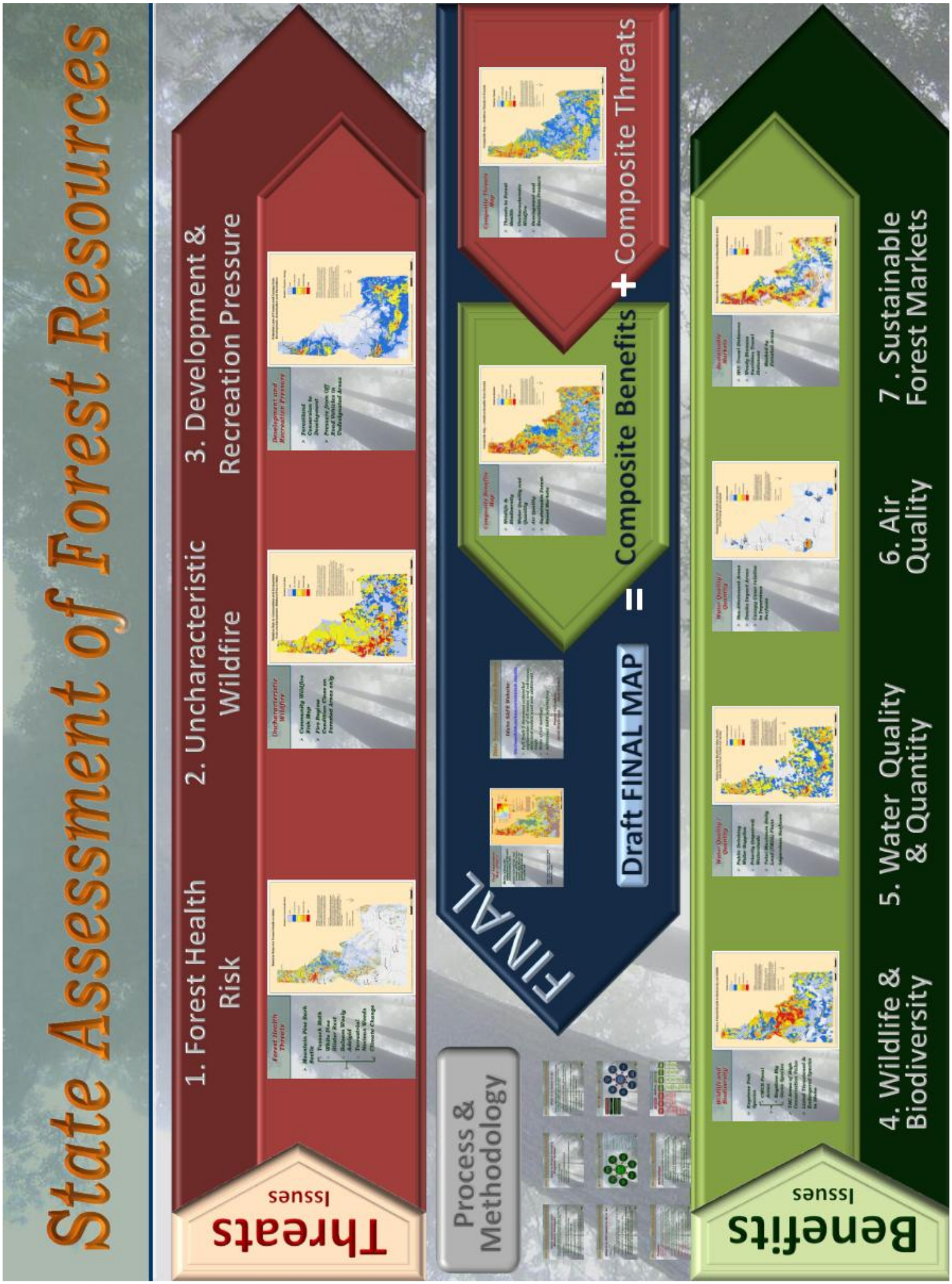
The final State Assessment of Forest Resources priority map is developed by adding the composite threats data scores to the composite benefits map. This is done is such a way that 25 unique values are calculated, resulting in a five by five matrix.



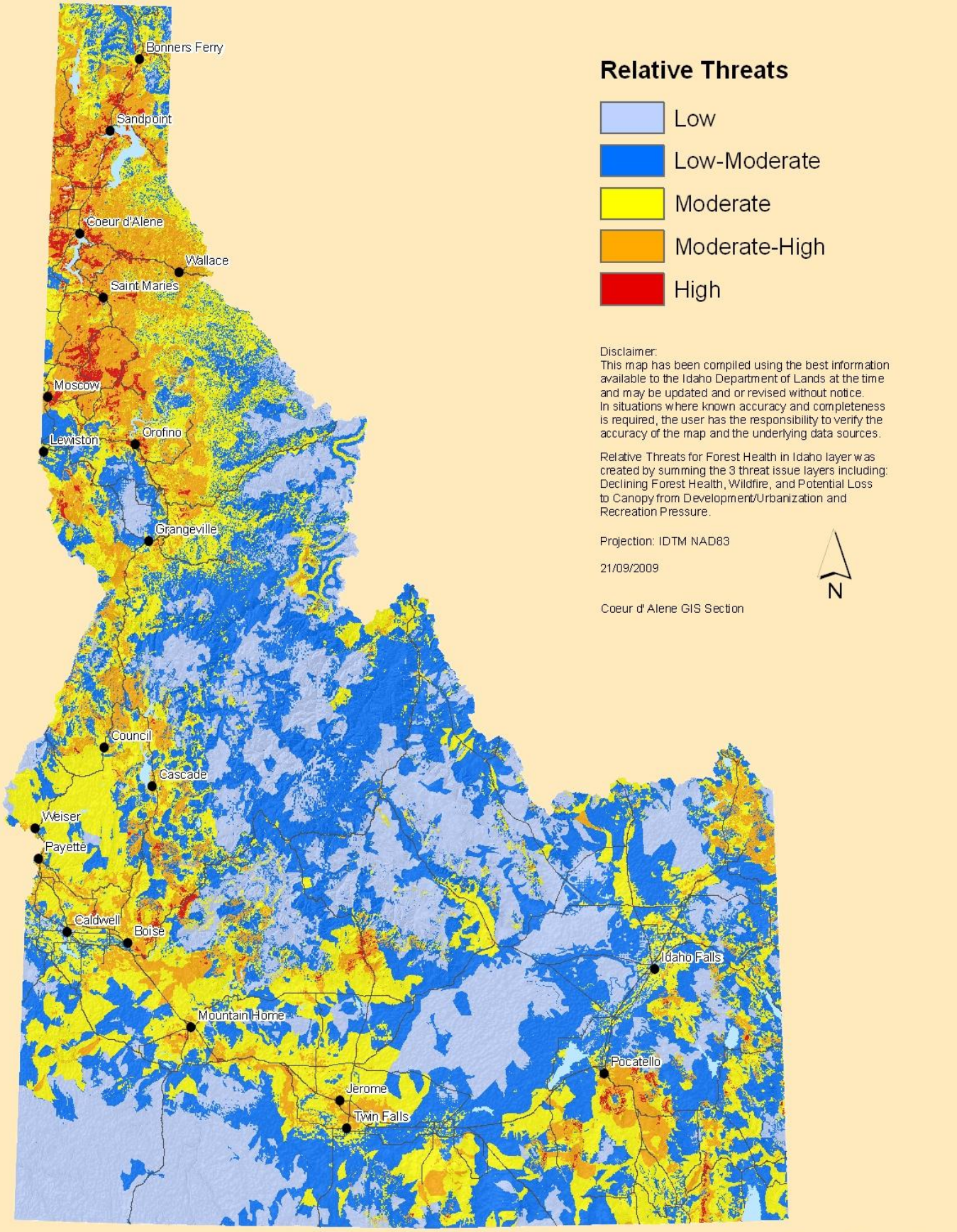
The 25 unique scores represent a combination of threat level and benefit value, and can be grouped into four categories of priority. The lowest priority areas are those that are low threat and low benefit. The highest priority are those areas which are both high threat and high benefit. From this point, stakeholders can make decisions on the relative priority of various combinations of low to high threats coupled with combinations of low to high benefit. The example above is one possible way cells can be grouped into one of four categories of priority. Priority areas in which to focus will be those colored with either red, orange and potentially down into yellow.

Masks

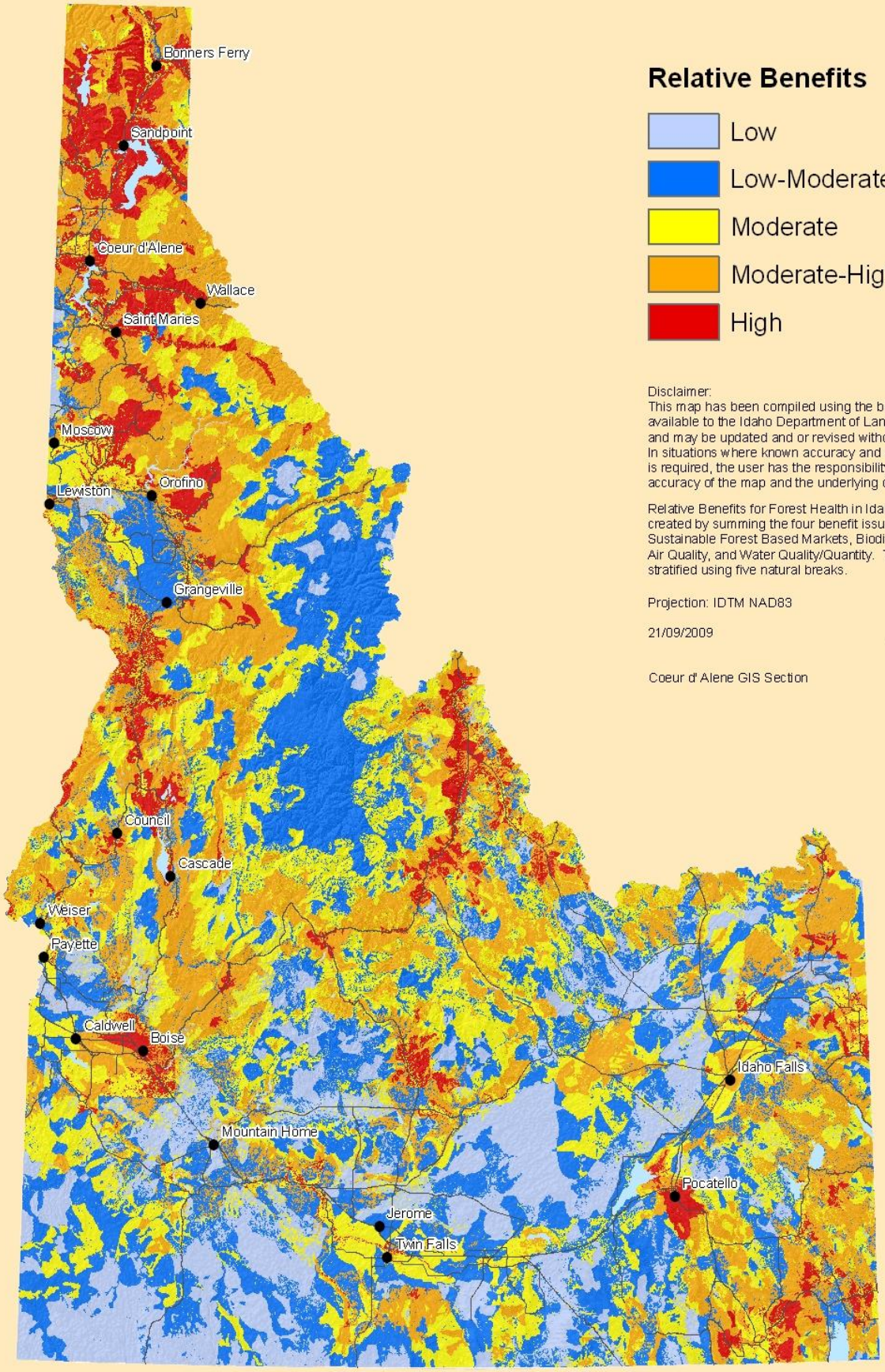
Last, the final map has areas masked out. These included wilderness areas—these were areas that lacked data from a number of the issues and sub-issues, and where management activities would be unlikely. Areas that received less than 10" of precipitation each year were also masked out, as these are unsuitable for growing trees. However, 6th order sub-watersheds that included a city boundary were unmasked, as these are unnatural environments where trees can survive and where they may play a more important role. The masks are transparent, so viewers can see the scores of the underlying sub-watersheds.


State Assessment of Forest Resources
Threats Issues
1. Forest Health Risk
2. Uncharacteristic Wildfire
3. Development & Recreation Pressure
Composite Threats
Composite Benefits
Draft FINAL MAP
FINAL
Process & Methodology
Benefits Issues
4. Wildlife & Biodiversity
5. Water Quality & Quantity
6. Air Quality
7. Sustainable Forest Markets

Composite Map — Relative Threats to Forests



Composite Map — Relative Benefits from Forests



Relative Benefits

- Low
- Low-Moderate
- Moderate
- Moderate-High
- High

Disclaimer:
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In situations where known accuracy and completeness is required, the user has the responsibility to verify the accuracy of the map and the underlying data sources.

Relative Benefits for Forest Health in Idaho layer was created by summing the four benefit issue layers including: Sustainable Forest Based Markets, Biodiversity and Wildlife, Air Quality, and Water Quality/Quantity. The final layer was stratified using five natural breaks.

Projection: IDTM NAD83

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Final Idaho State Assessment of Forest Resources Map

As explained in the Methodology section on page 47, each of the subwatersheds carries with it both a benefits score (1 through 5) and a threats score (1 through 5). A subwatershed, then, can have one of 25 combinations of these threats and benefits scores. These scores were reclassified from 1—lowest risk, lowest benefit to 25—highest risk, highest benefit. It must be stressed that these are relative values using the best available data for the identified issues. An area identified as lowest risk does not mean there are no risks, or even that risks are not significant. Rather, it means that the data and methodology used in the assessment indicates that area has lower risks relative to other areas in the state. The purpose of the assessment is not that all areas are identified as high priority, but that it serves as a tool to help us better understand where we should consider targeting limited resources, focused on multiple specific issues to affect change on a landscape scale. This approach differs from the historic approach of providing assistance and investing resources based on requests, which may or may not be in areas of greatest need or benefit.

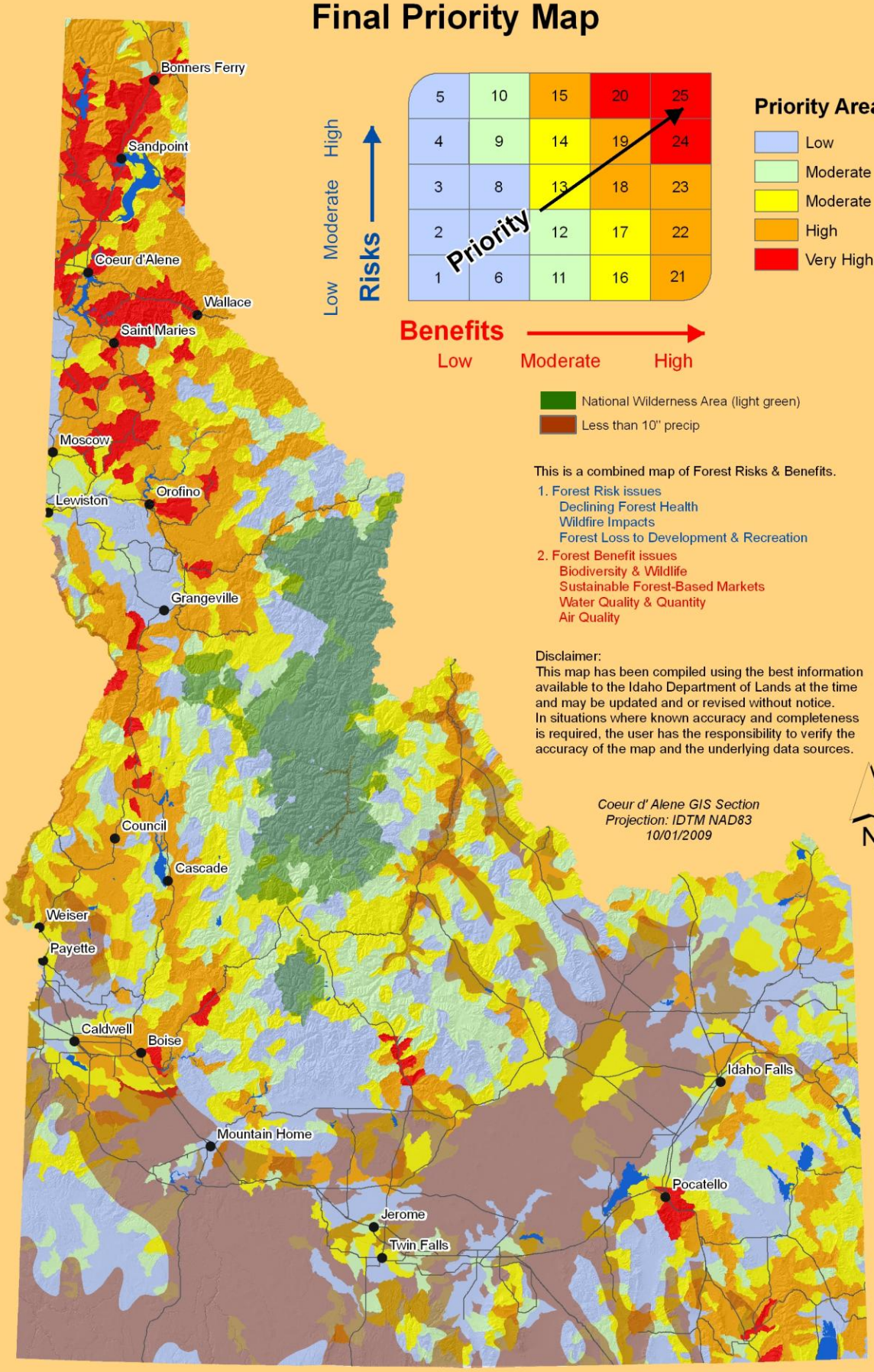
The matrix approach, yielding the 25 unique values, allows some manipulation of the results. Areas that are high benefit and high threat, for instance, will be a higher priority that areas of low benefit and low threat. Taking this a step further, stakeholders agree that areas which have high benefit but low threats are still important for project work, as maintaining those benefits is important. On the other hand, areas that are high threat, but low benefit are not as critical. If those should succumb to threats, the loss isn't as high as areas that have greater benefit.

The data is sensitive to this approach. Adjusting the values into different categories of low through very high value has significant impact on the final map. After considering a number of different iterations, staff proposes the one found on the following page.

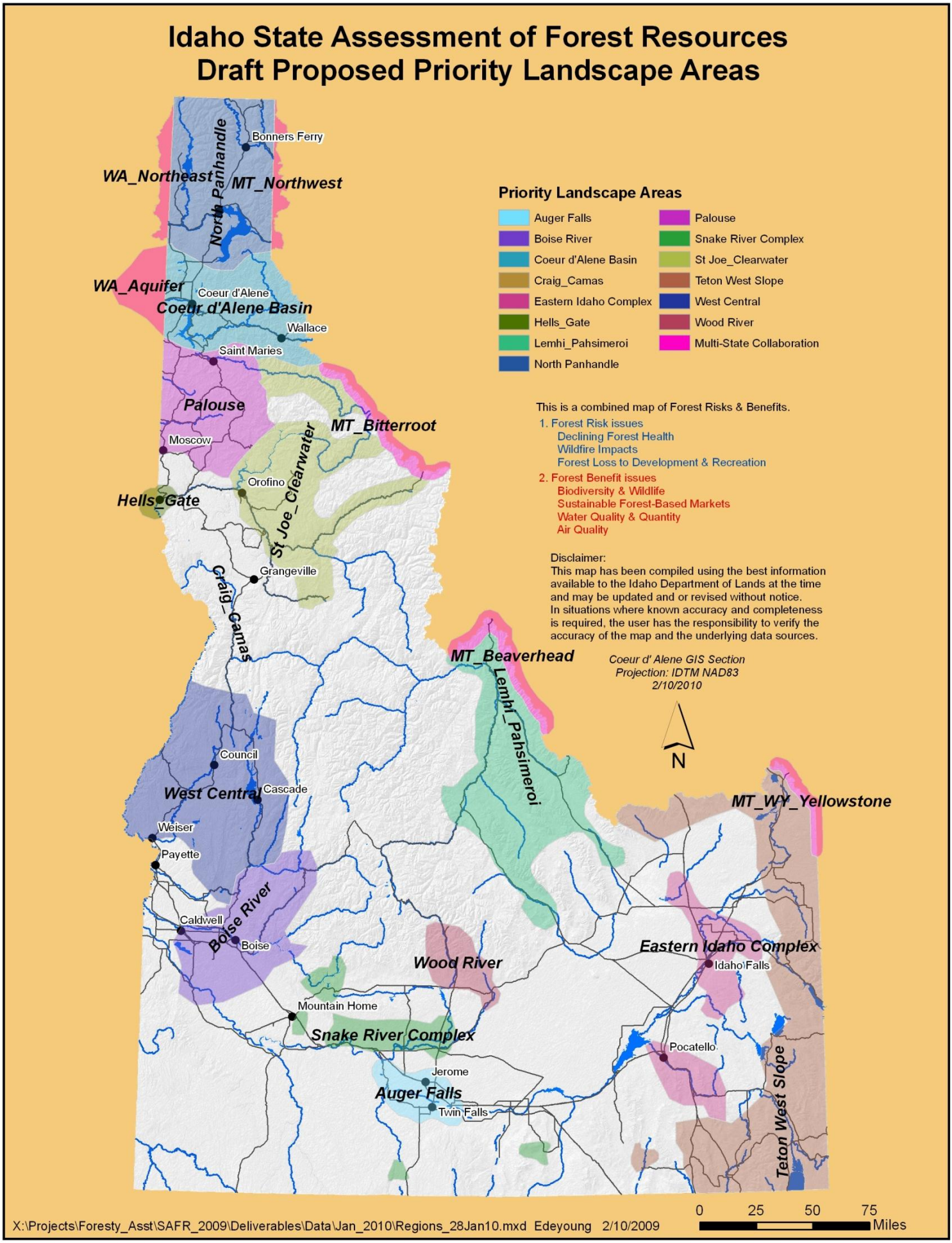
As we consider the results, it is our intent that the Response Strategy will focus in areas of Very High (red), High (orange) and, in some cases Moderate-High (yellow) priority categories. Areas that are green or blue will not be considered priority unless by adjacency to the other areas, projects make sense in these areas, or where unique situations exist that were not adequately captured by the available data. These will be described in the Response Strategy.

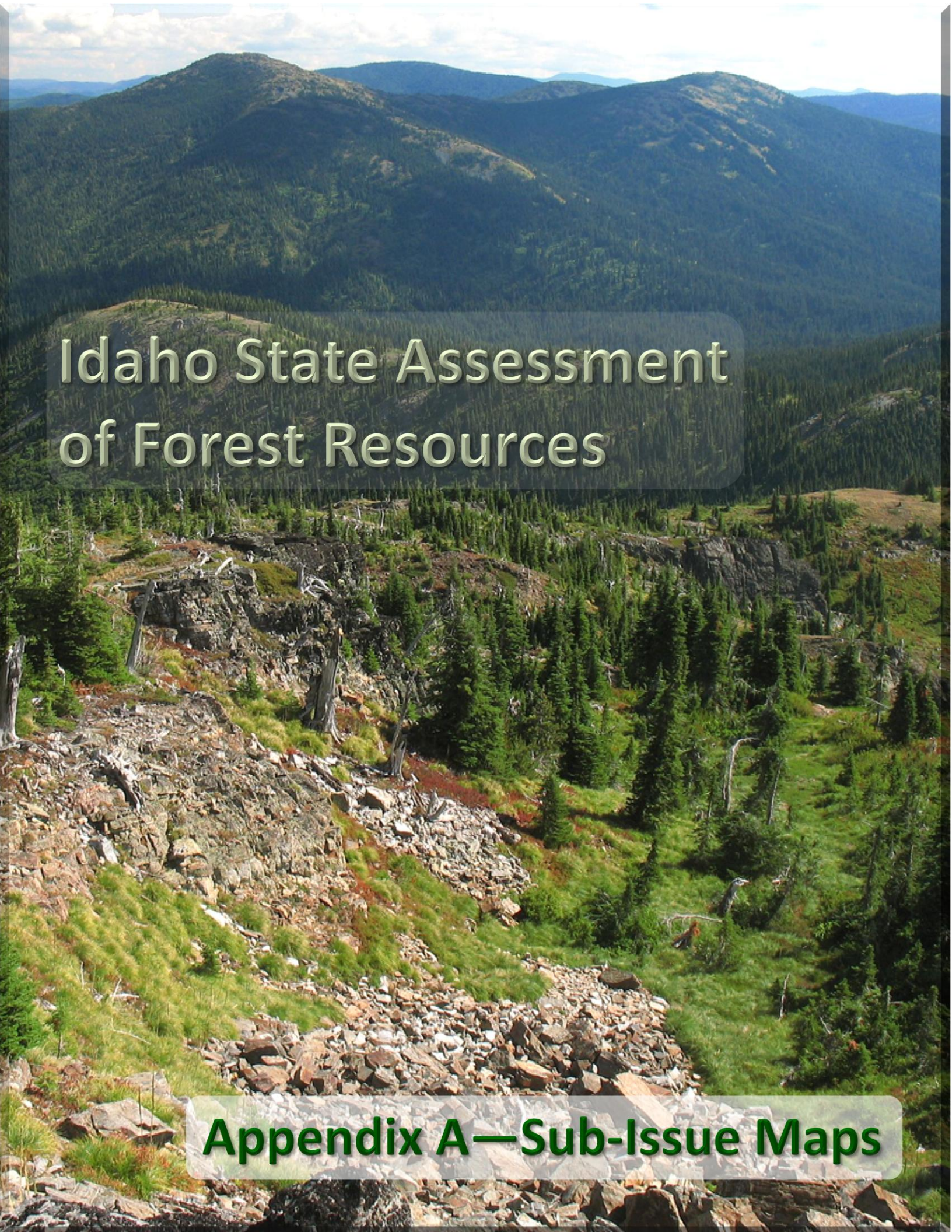
From this map, another was developed denoting Priority Landscape Areas (page 54). These are generalized areas in which goals and strategies will be developed. In addition to information derived from the geospatial assessment—trends, conditions, issues and opportunities for collaboration will be identified locally and become part of the overall State Forest Resource Strategy. Boundaries on the Priority Landscape Areas map are meant to be pliable and adjustable to fit developing strategies/actions. The Forest Resource Strategies are meant to be dynamic, and modified as conditions change, new information is obtained and work is completed.

Idaho State Assessment of Forest Resources
Final Priority Map



Idaho State Assessment of Forest Resources
Draft Proposed Priority Landscape Areas





Idaho State Assessment of Forest Resources

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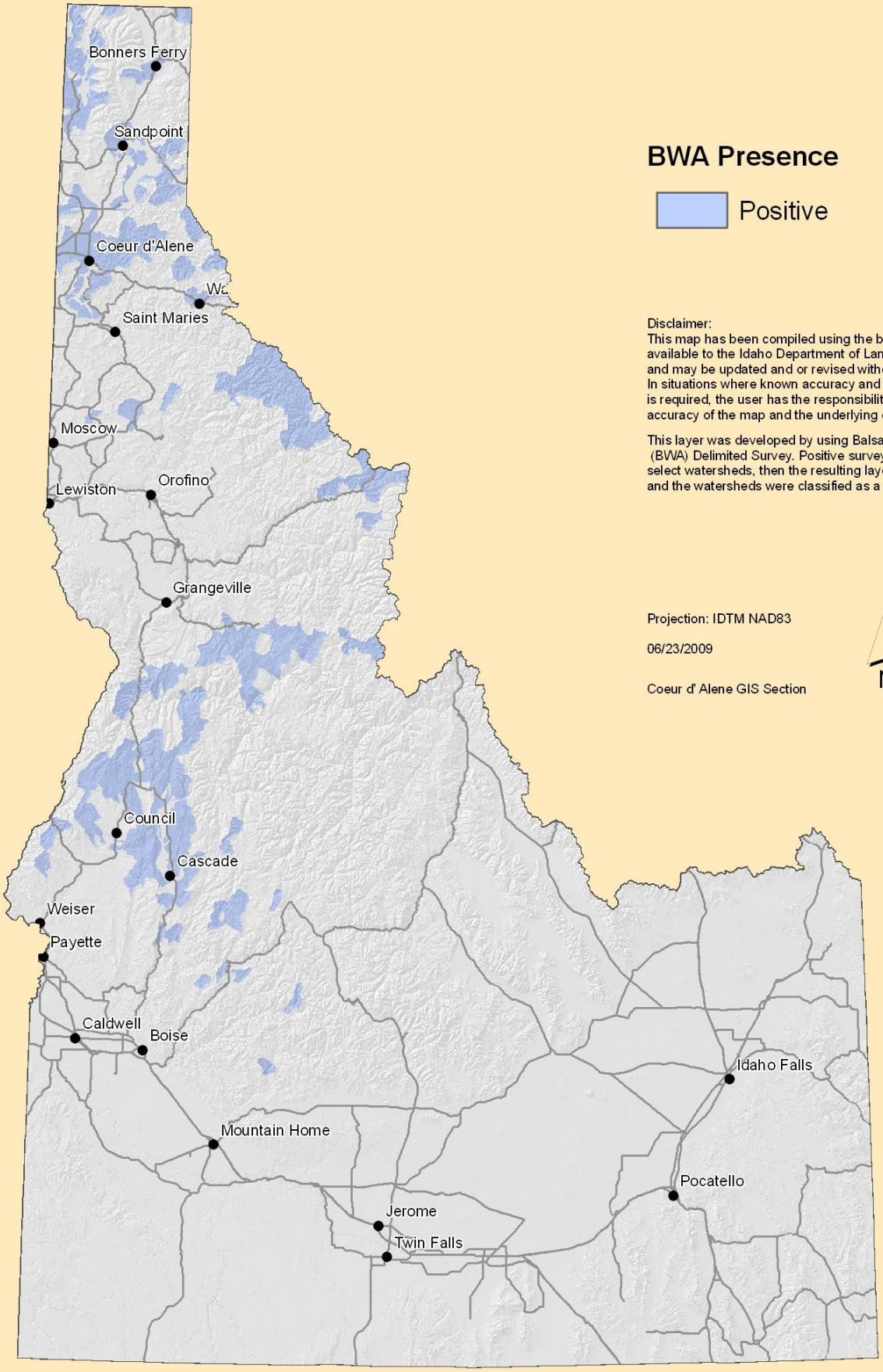
  (Models are proprietary and used in the assessment with the permission of the Idaho Department of Lands.)

Balsam Wooly Adelgid (BWA) Presence



BWA Presence

Positive

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This layer was developed by using Balsam Woolly Adelgid (BWA) Delimited Survey. Positive survey points were used to select watersheds, then the resulting layer was converted to a grid and the watersheds were classified as a value of 1.

Projection: IDTM NAD83

06/23/2009

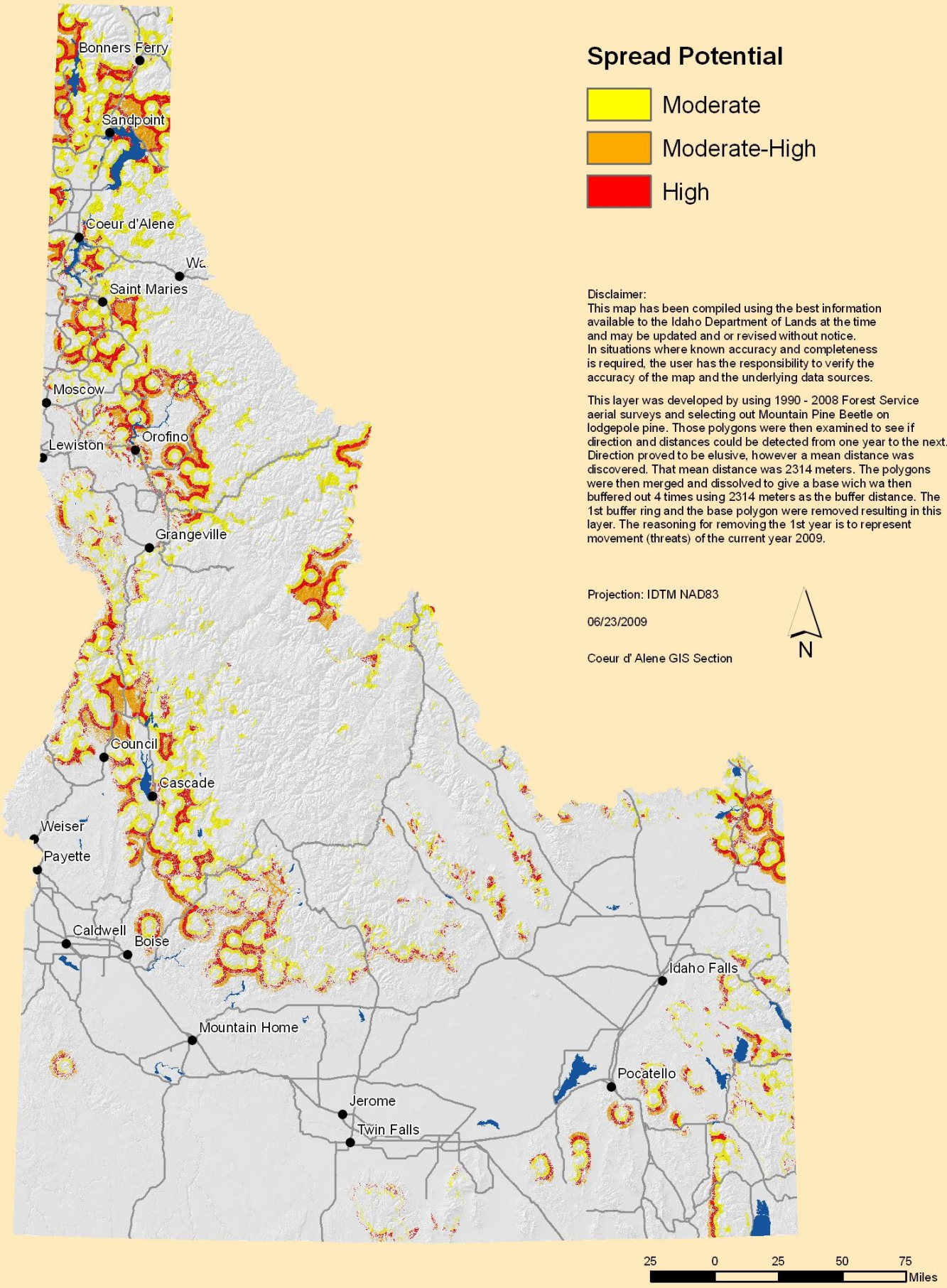
Coeur d' Alene GIS Section

N

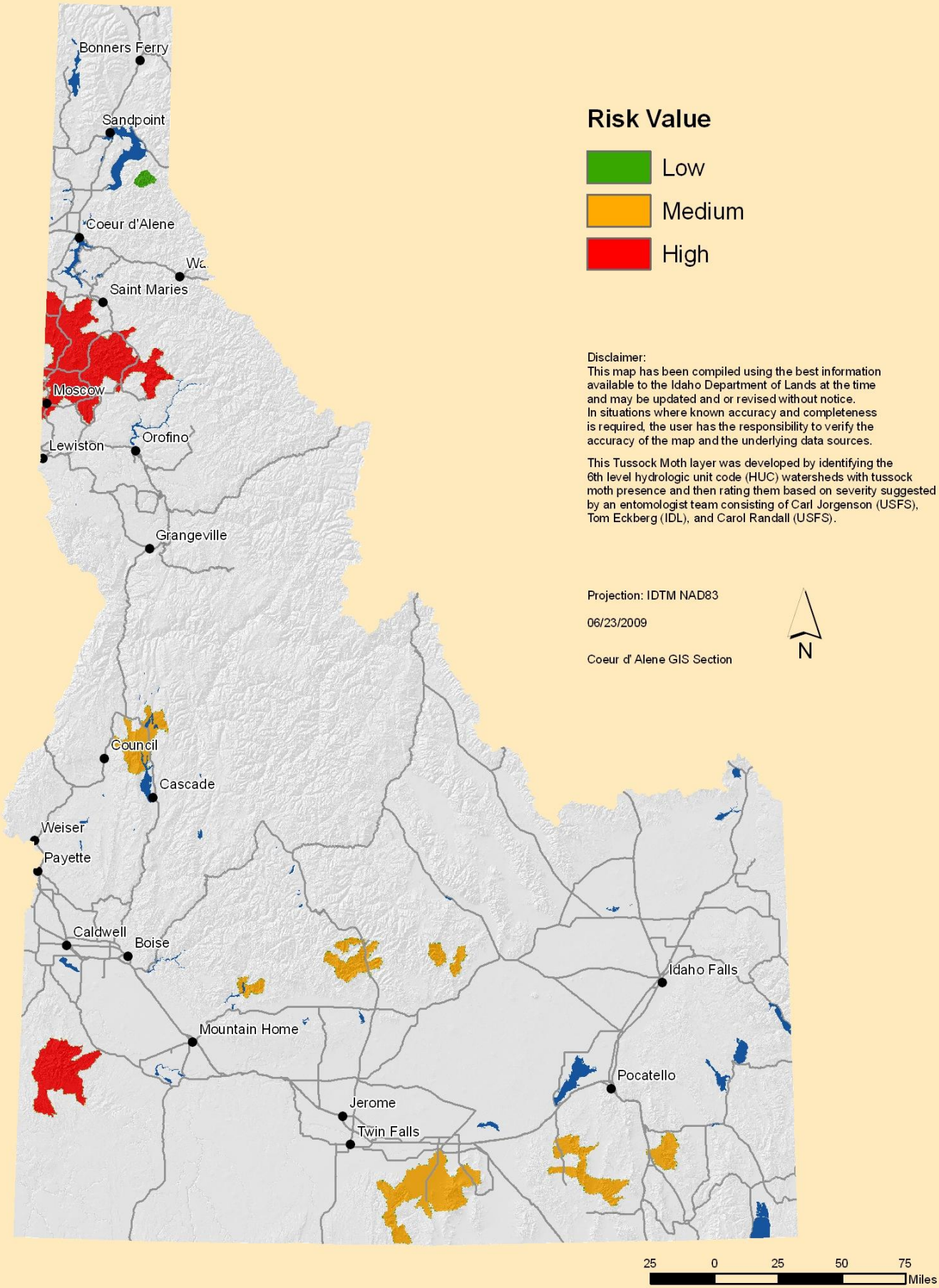
25 0 25 50 75 Miles

\\SAFR_Layers_2009\Issue_Layers\Issue_Parts\Declining_Forest_Health\DFH4.pdf MLonneker 06/23/2009

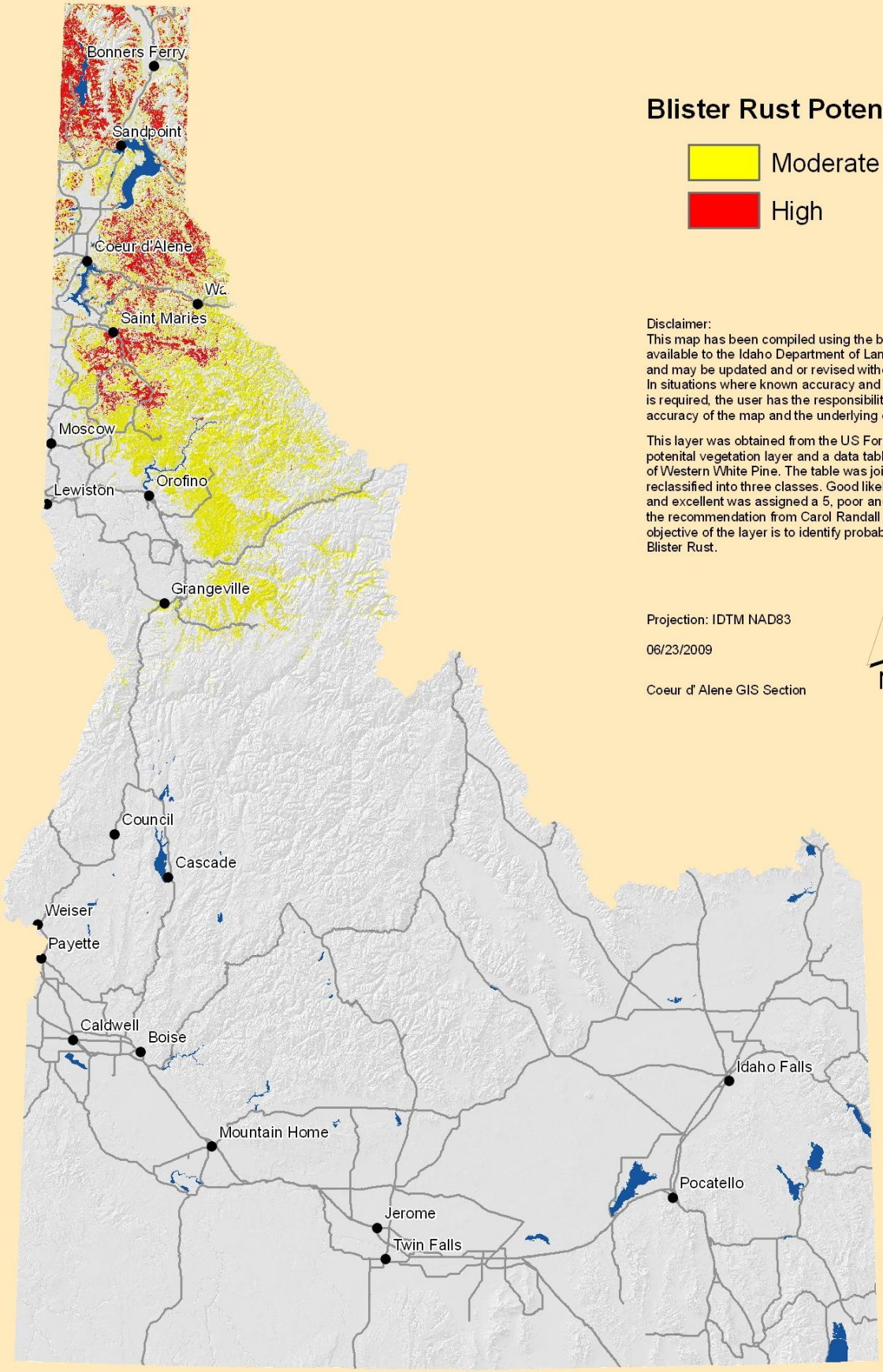
Mountain Pine Beetle (MPB) Spread Potential



Relative Value of Tussock Moth Infestation in Idaho



Blister Rust Potential Based on White Pine Habitat



Blister Rust Potential

- Moderate
- High

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This layer was obtained from the US Forest Service in the form of a potenital vegetation layer and a data table breaking down liklihood of Western White Pine. The table was joined to the layer and reclassified into three classes. Good likelihood was assinged a 3 and excellent was assigned a 5, poor and fair were assigned 0 on the recommendation from Carol Randall and Tom Eckberg. The objective of the layer is to identify probable areas of concern for Blister Rust.

Projection: IDTM NAD83

06/23/2009

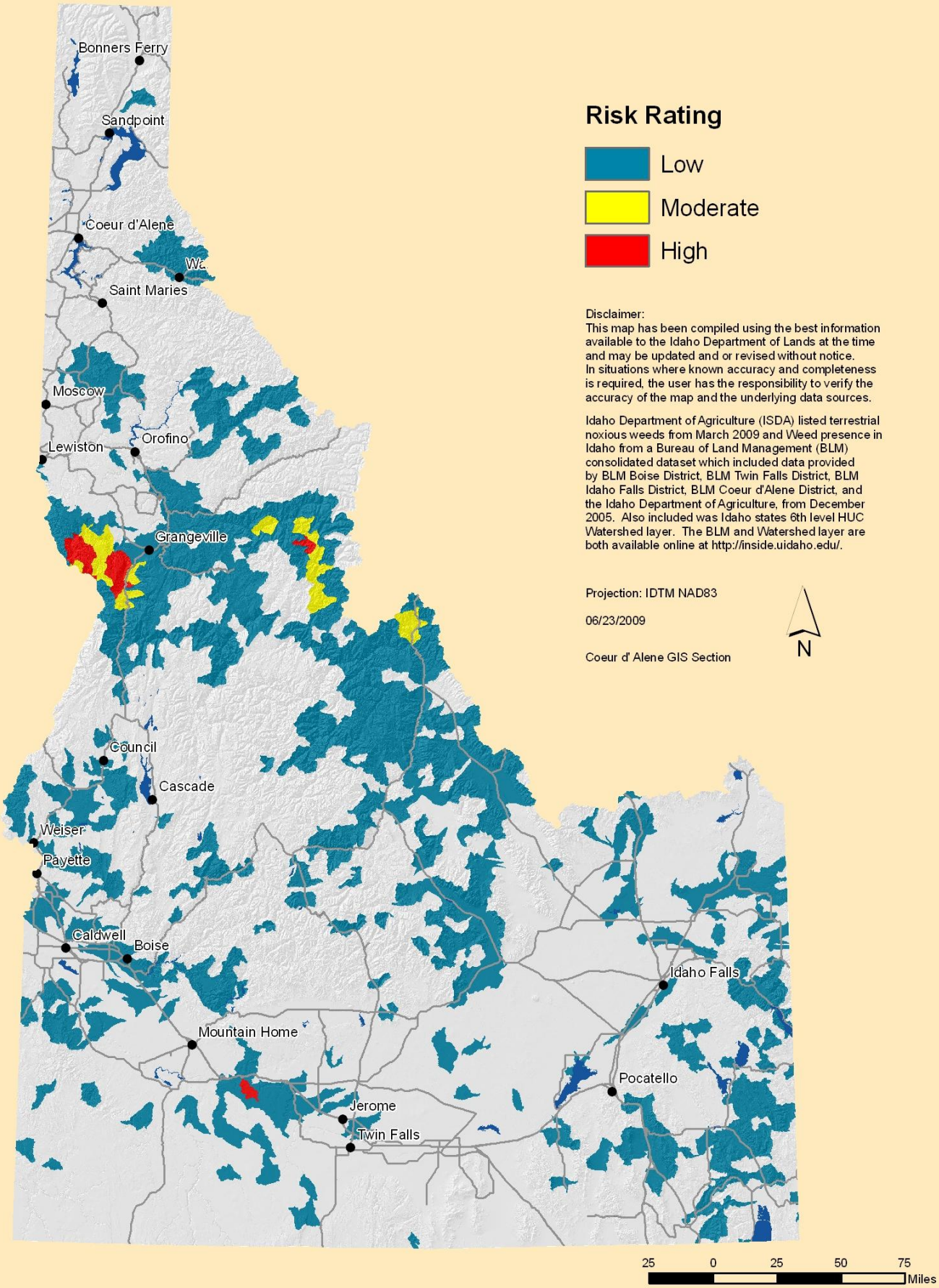
Coeur d' Alene GIS Section

N

25 0 25 50 75 Miles

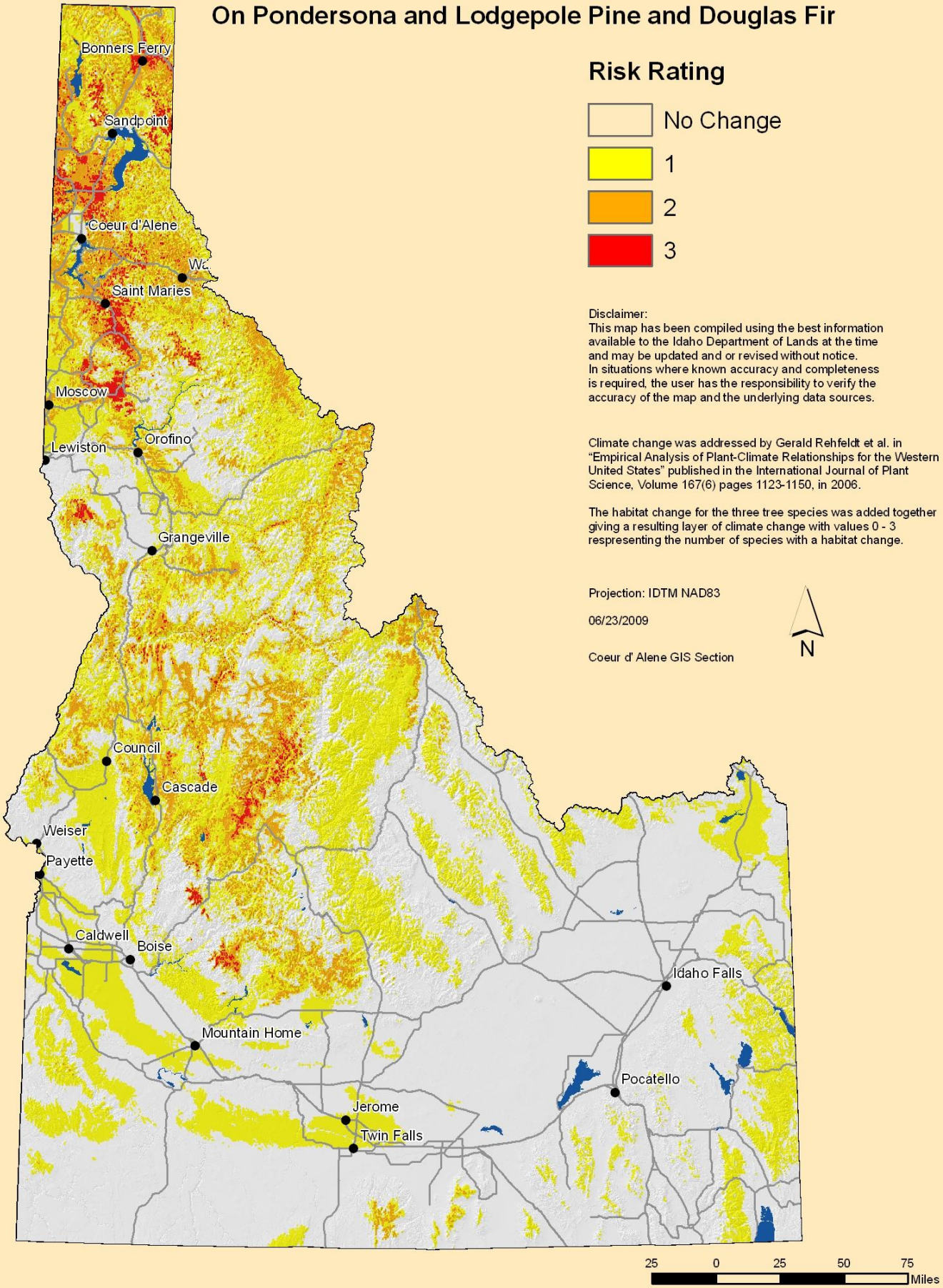
\\SAFR_Layers_2009\Issue_Layers\Issue_Parts\Declining_Forest_Health\DFH4.pdf MLonneker 06/23/2009

Noxious Weed Rating Based on Percent Coverage in Idaho

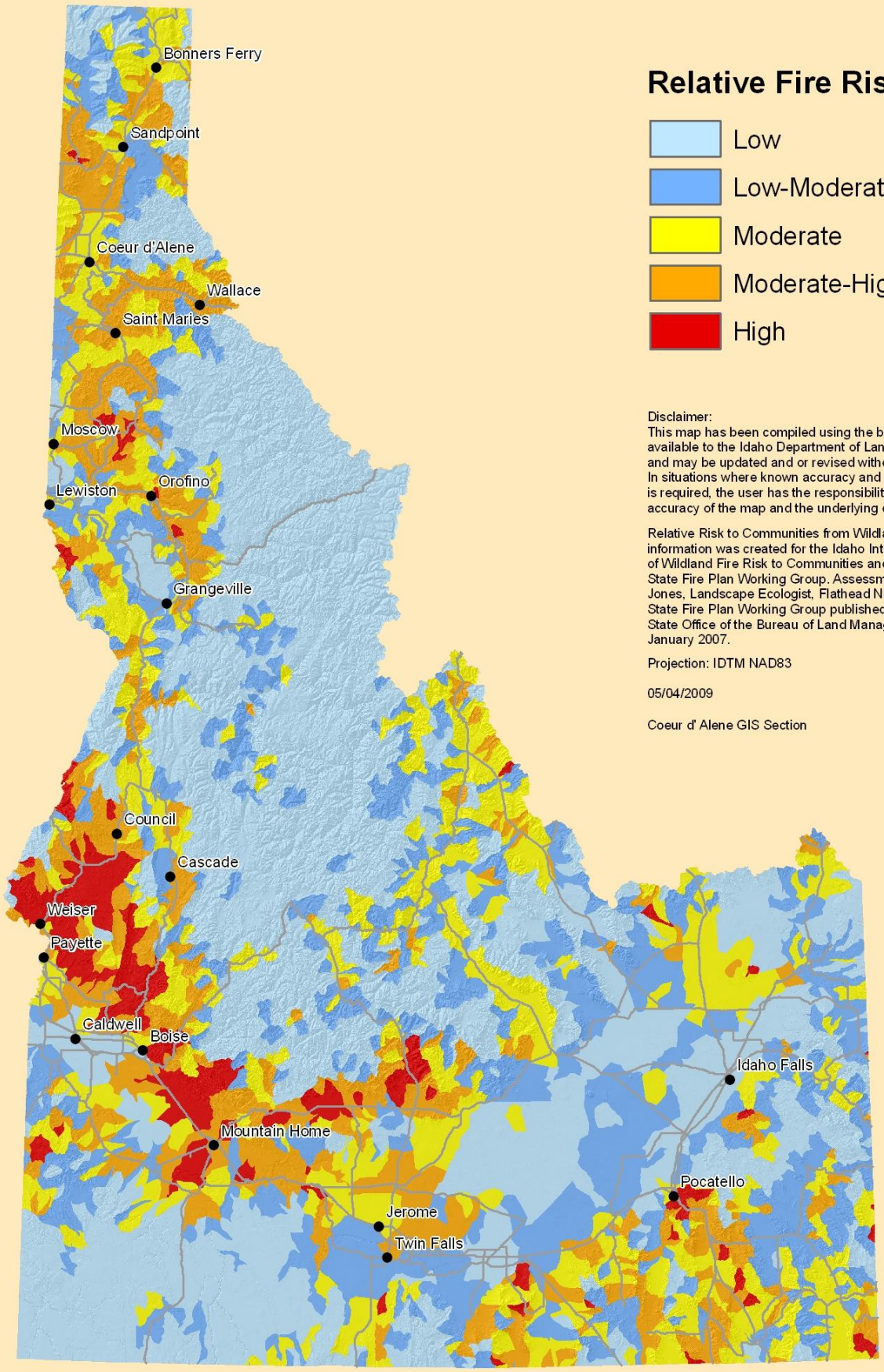


Forest Effects of Climate Change for 2000 - 2030

On Pondersona and Lodgepole Pine and Douglas Fir



Relative Risk to Communities from Wildland Fire in Idaho



Relative Fire Risk

- Low
- Low-Moderate
- Moderate
- Moderate-High
- High

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Relative Risk to Communities from Wildland Fire in Idaho information was created for the Idaho Interagency Assessment of Wildland Fire Risk to Communities and approved by Idaho State Fire Plan Working Group. Assessment completed by Jeff Jones, Landscape Ecologist, Flathead National Forest, Idaho State Fire Plan Working Group published through the Idaho State Office of the Bureau of Land Management, January 2007.

Projection: IDTM NAD83

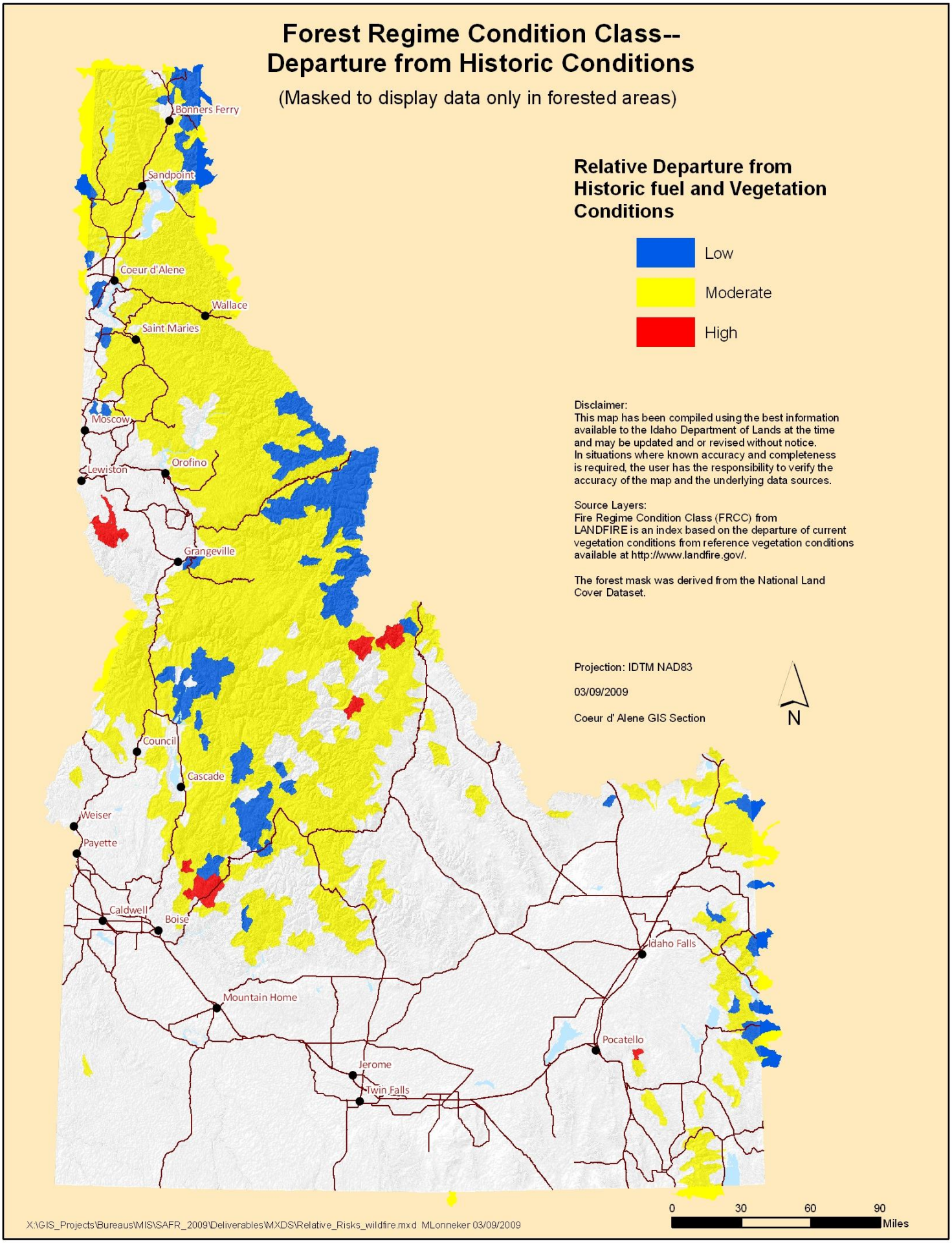
05/04/2009

Coeur d' Alene GIS Section

N

30 0 30 60 90 Miles

G:\SAFR_Layers_2009\Fire\fire.pdf MLonneker 05/04/2009


Forest Regime Condition Class--
Departure from Historic Conditions
(Masked to display data only in forested areas)
Relative Departure from Historic fuel and Vegetation Conditions
Low
Moderate
High
Disclaimer:
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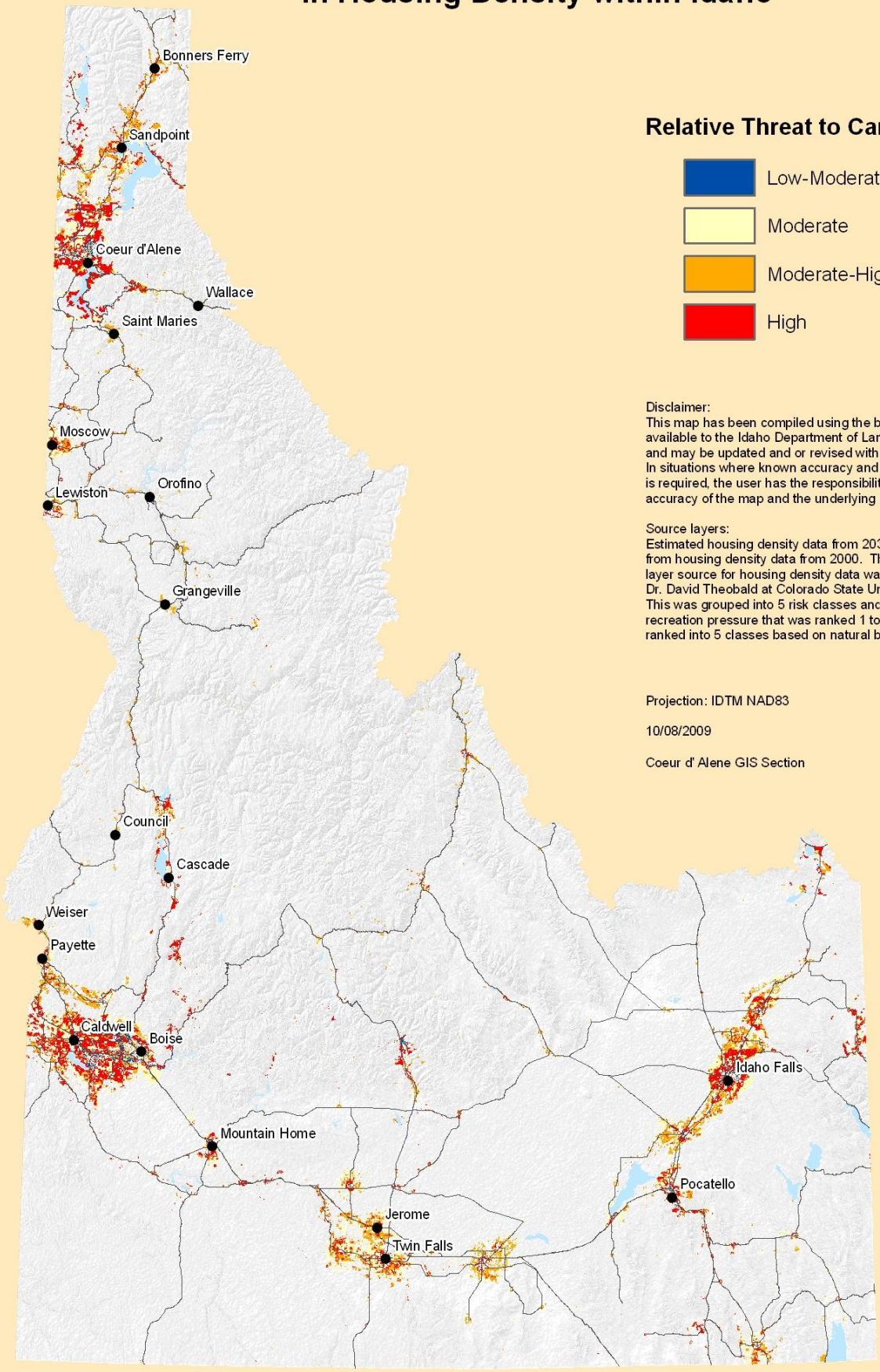
Source Layers:
Fire Regime Condition Class (FRCC) from LANDFIRE is an index based on the departure of current vegetation conditions from reference vegetation conditions available at http://www.landfire.gov/.
The forest mask was derived from the National Land Cover Dataset.
Projection: IDTM NAD83
03/09/2009
Coeur d' Alene GIS Section
N
Bonners Ferry
Sandpoint
Coeur d'Alene
Wallace
Saint Maries
Moscow
Lewiston
Orofino
Grangeville
Council
Cascade
Weiser
Payette
Caldwell
Boise
Mountain Home
Idaho Falls
Pocatello
Jerome
Twin Falls
0
30
60
90
Miles
X:\GIS_Projects\Bureaus\MIS\SAFR_2009\Deliverables\MXDS\Relative_Risks_wildfire.mxd MLonneker 03/09/2009

Development Risk based on Estimated Changes in Housing Density within Idaho



Relative Threat to Canopy

- Low-Moderate
- Moderate
- Moderate-High
- High

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Source layers:
Estimated housing density data from 2030 subtracted from housing density data from 2000. The original data layer source for housing density data was produced by Dr. David Theobald at Colorado State University.
This was grouped into 5 risk classes and added with a recreation pressure that was ranked 1 to 3. The sum was ranked into 5 classes based on natural breaks in the data.

Projection: IDTM NAD83

10/08/2009

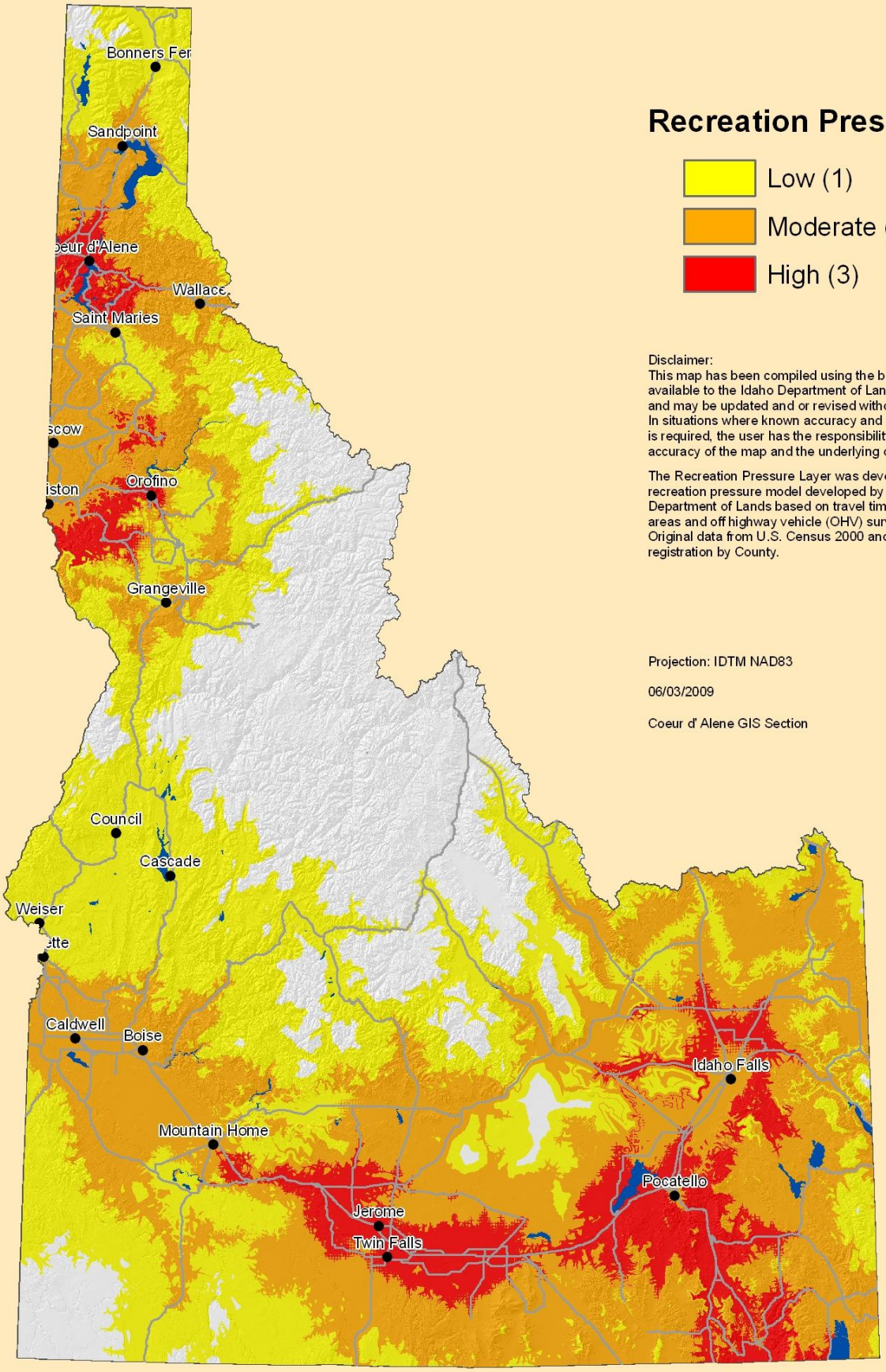
Coeur d' Alene GIS Section

N

0 30 60 90 Miles

X:\GIS_Projects\Bureaus\MIS\SAFR_2009\Deliverables\MXDS\Dev_urban_Recreation.mxd MLonneker 10/08/2009

Off Highway Recreation Pressure in Idaho



Recreation Pressure

- Low (1)
- Moderate (2)
- High (3)

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The Recreation Pressure Layer was developed using a recreation pressure model developed by the Idaho Department of Lands based on travel times from populated areas and off highway vehicle (OHV) surveys.
Original data from U.S. Census 2000 and 2006. OHV registration by County.

Projection: IDTM NAD83

06/03/2009

Coeur d' Alene GIS Section

N

25 0 25 50 75 Miles

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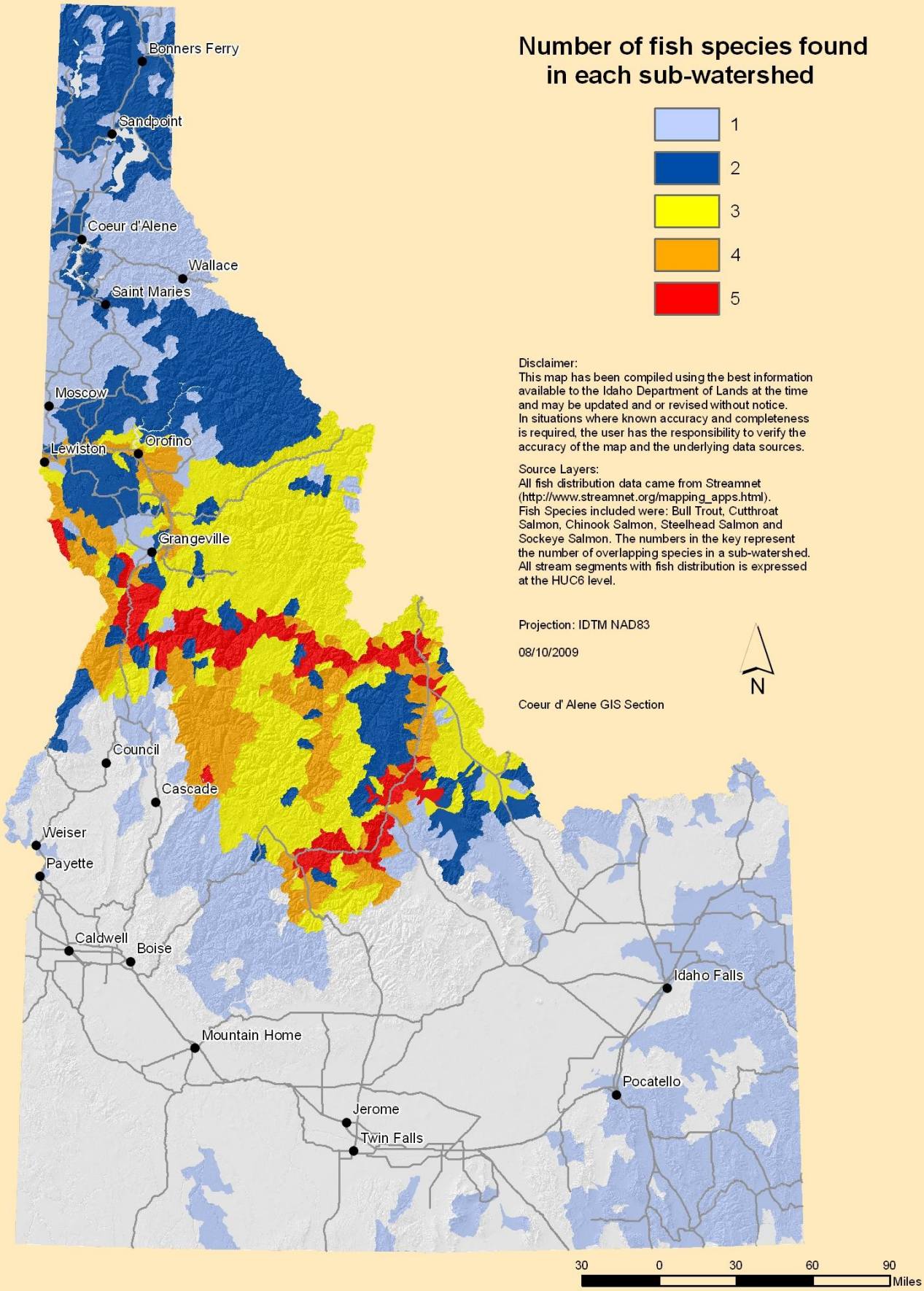
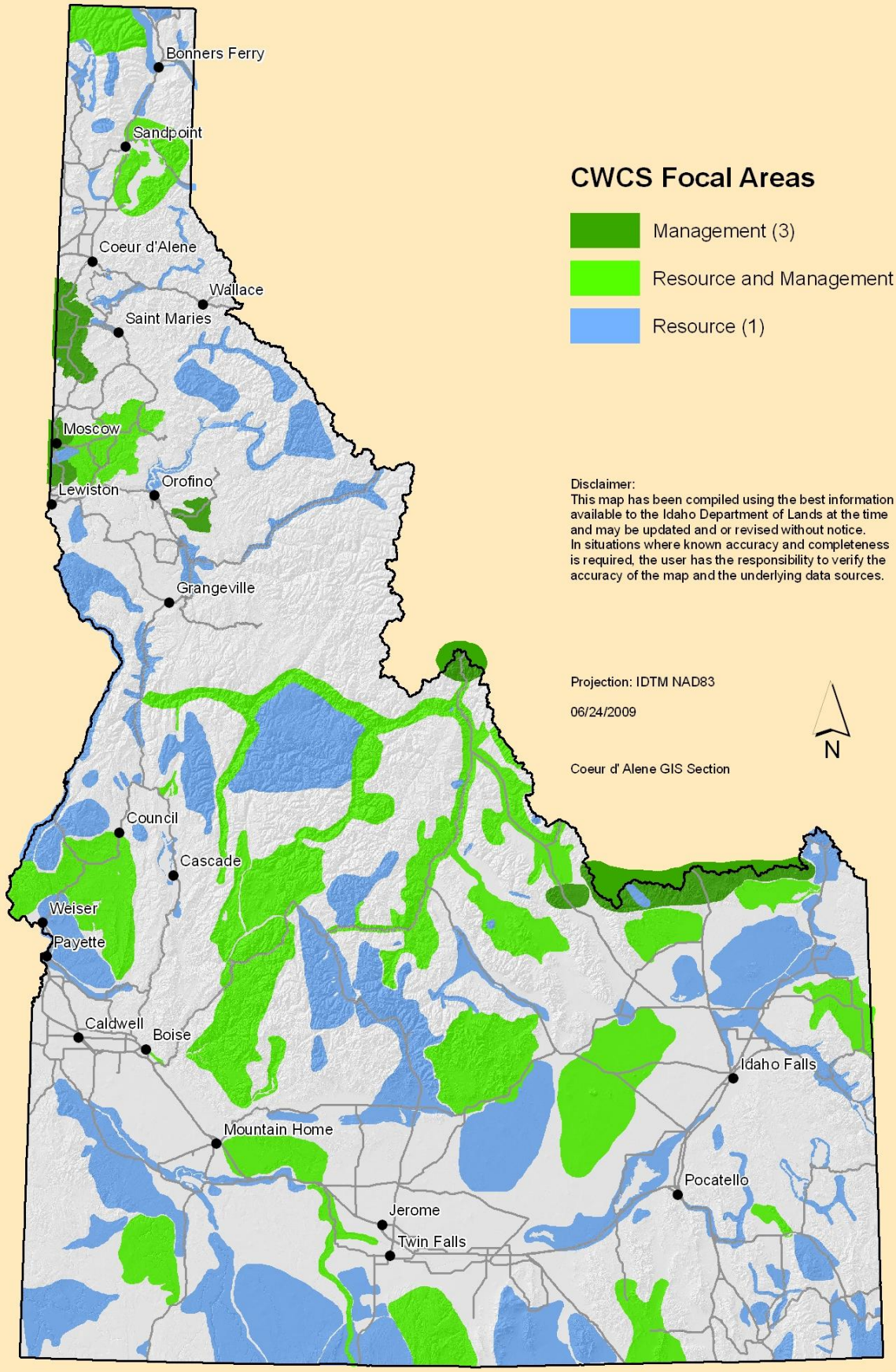
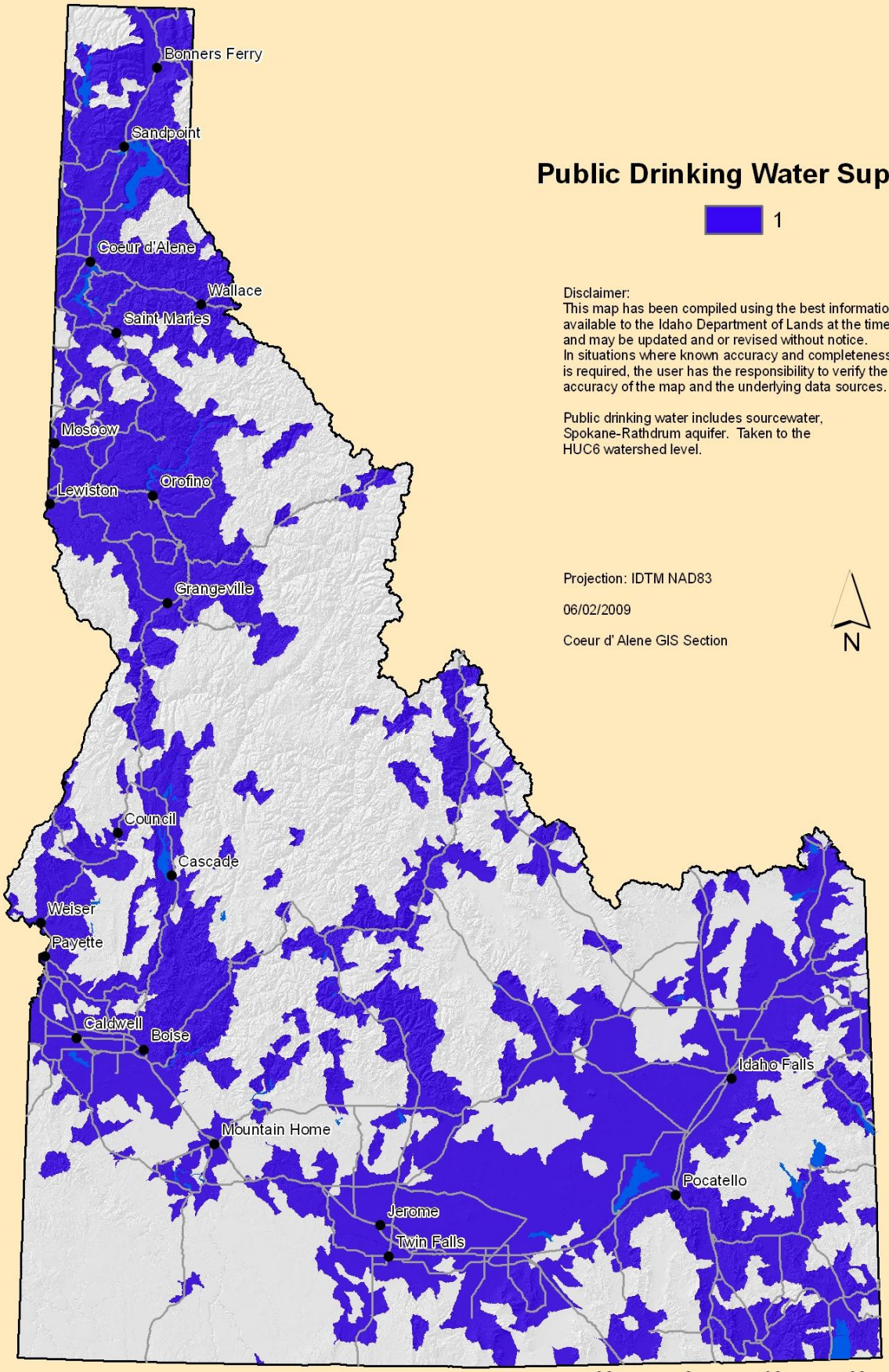
Fish Distribution of Five Keystone Species



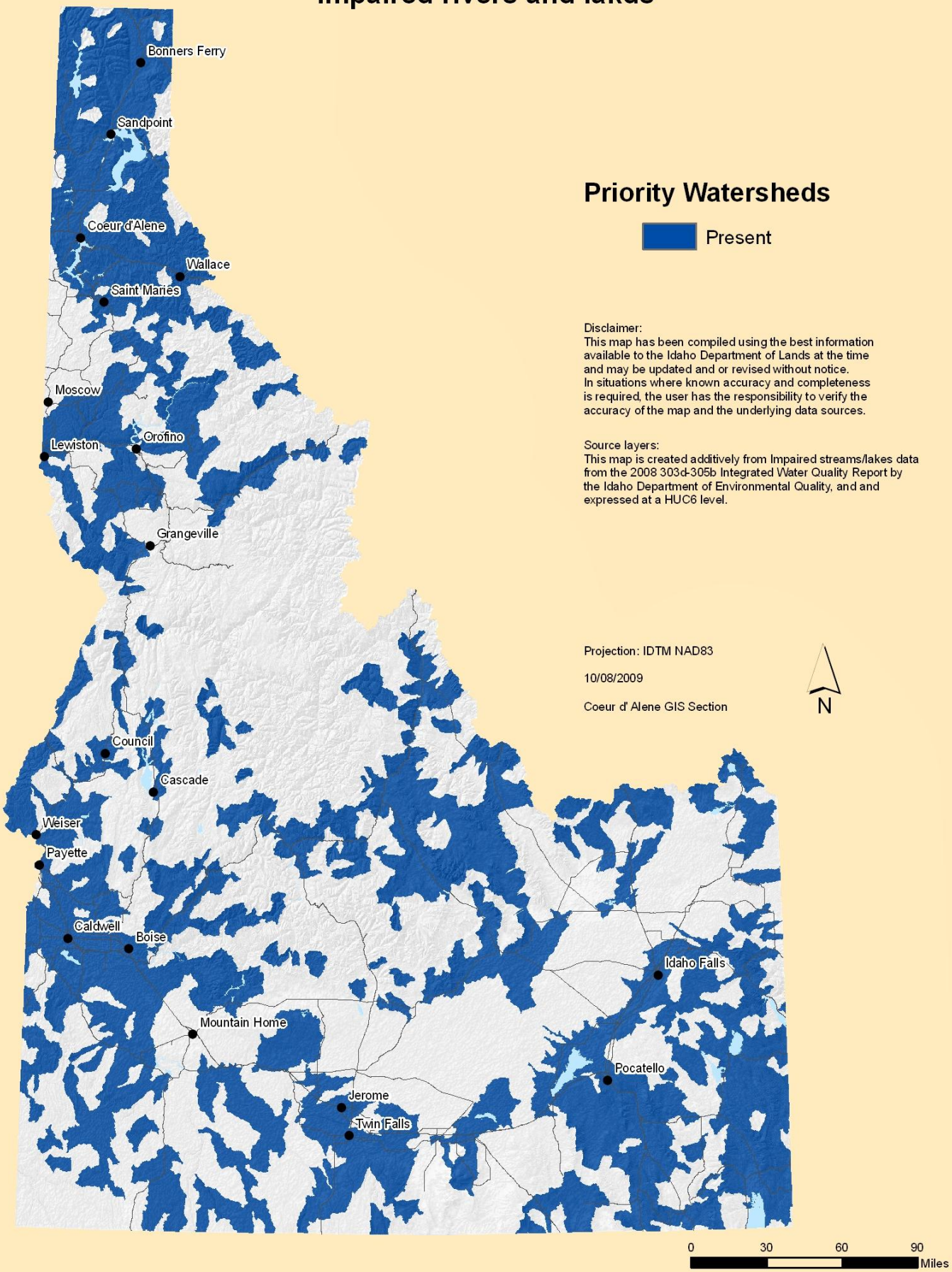
Comprehensive Wildlife Conservation Strategy Focal Areas



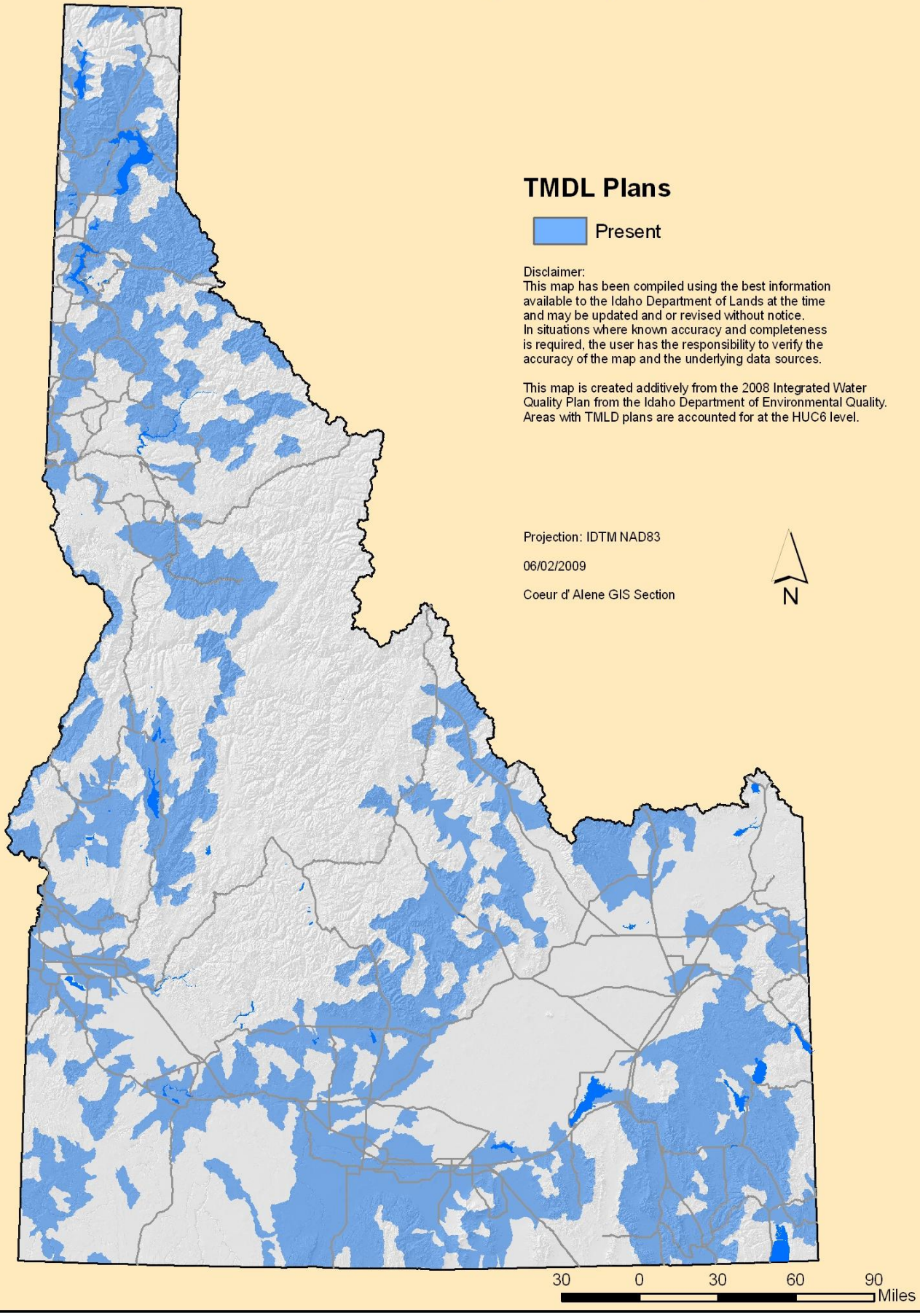
Public Drinking Water Sources -- Surface and Below Ground



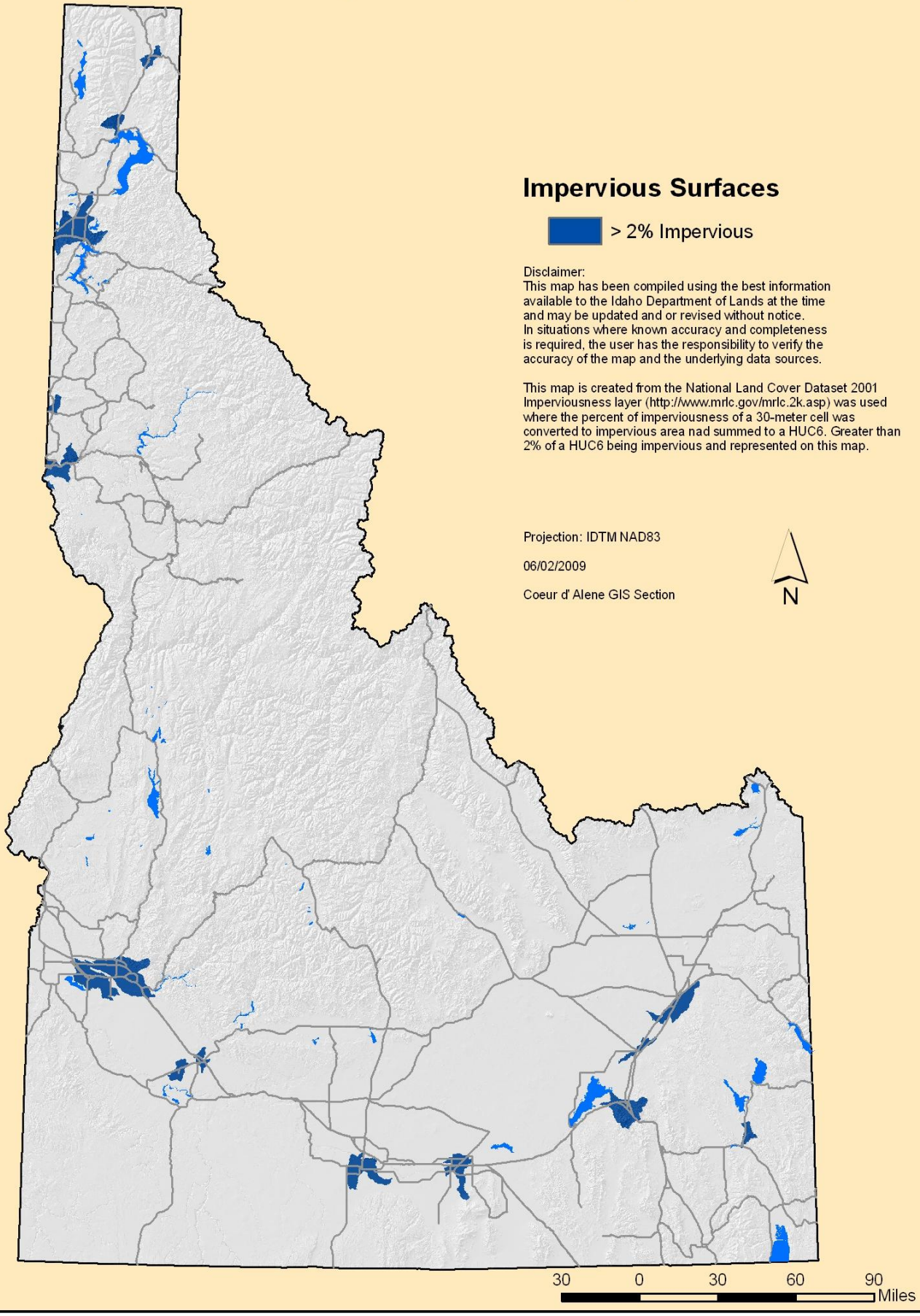
Priority Watersheds (Watersheds with 303d listed impaired rivers and lakds



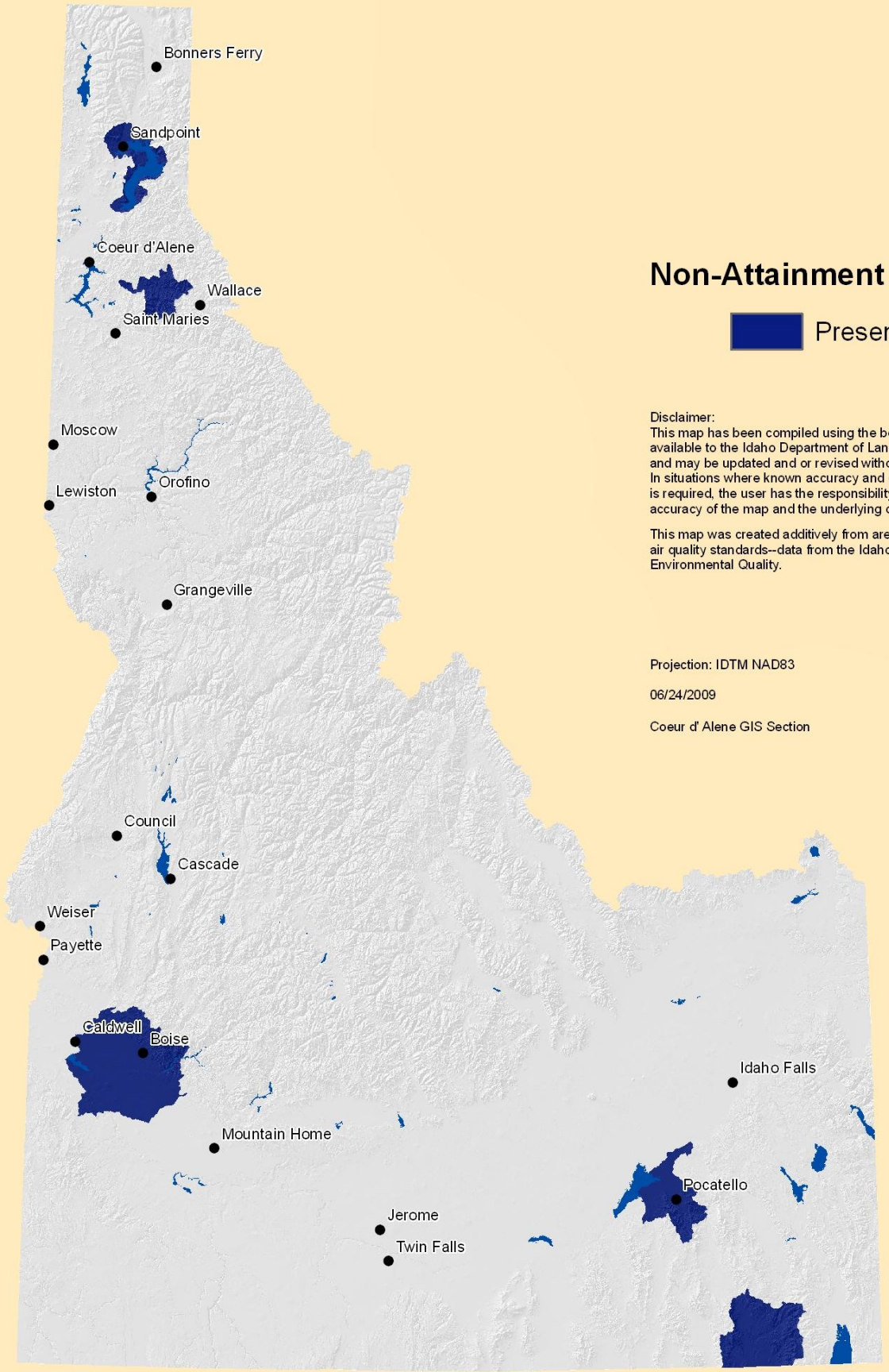
Areas with Total Maximum Daily Load (TMDL) Plans



Sub Watersheds that have greater than 2% Impervious Surfaces



Air Quality Non-Attainment Zones



Non-Attainment Zones

Present

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This map was created additively from areas that did not attain air quality standards--data from the Idaho Department of Environmental Quality.

Projection: IDTM NAD83

06/24/2009

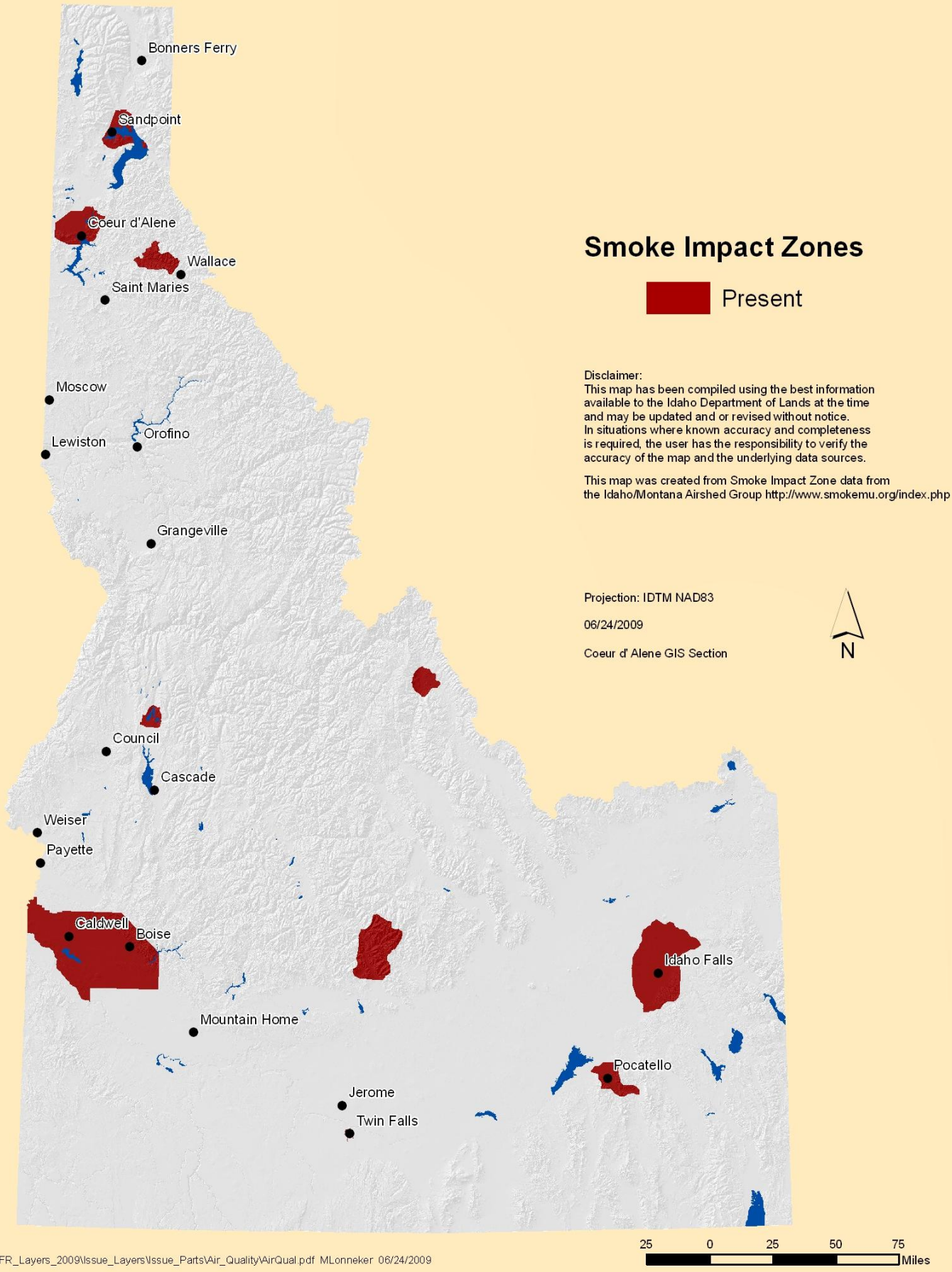
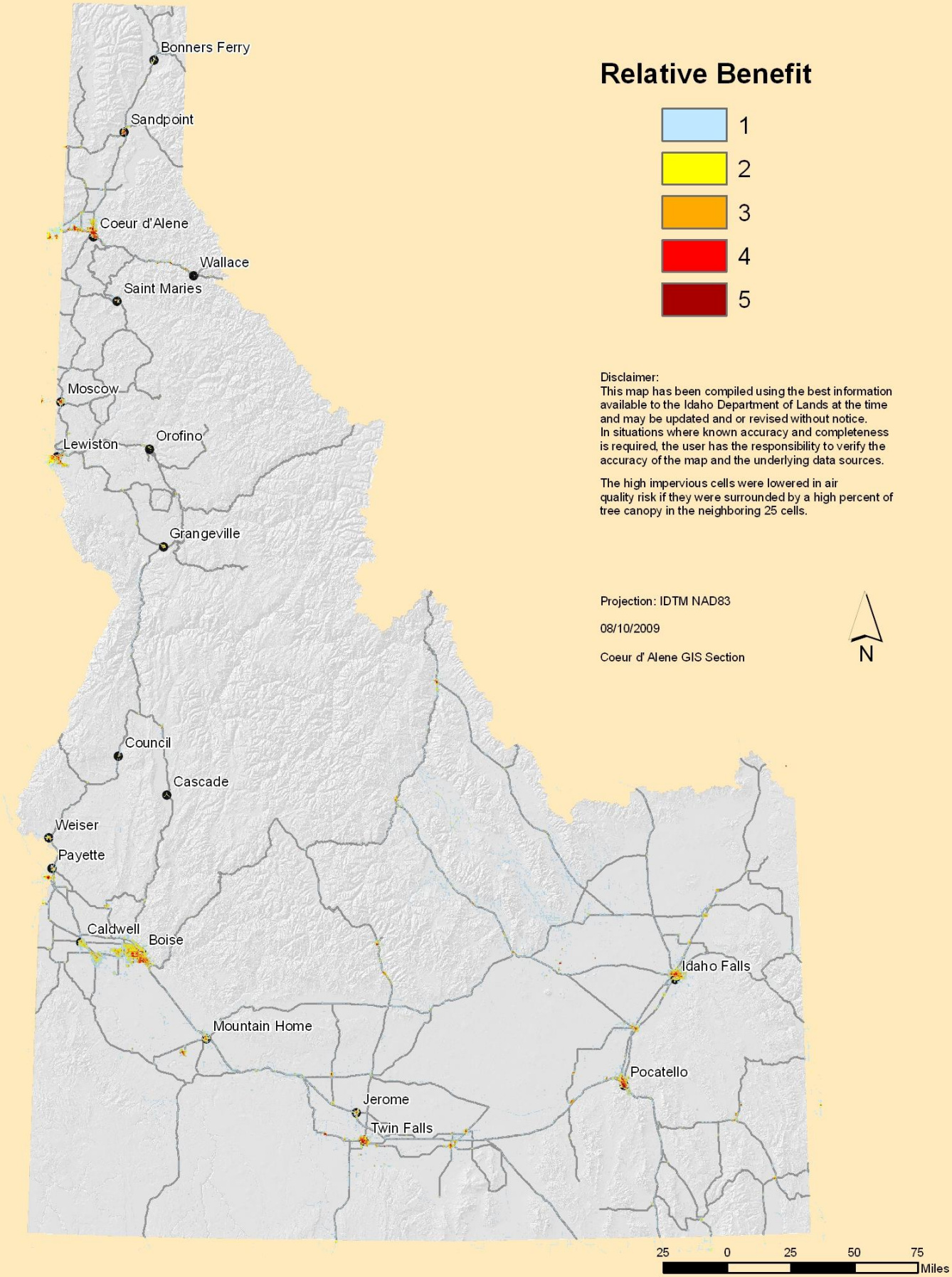
Coeur d' Alene GIS Section

N

25 0 25 50 75 Miles

Z:\SAFR_Layers_2009\Issue_Layers\Issue_Parts\Air_Quality\AirQual.pdf MLonneker 06/24/2009

Smoke Impact Zones



Canopy Cover Relative to Impervious Surfaces