The Potential Natural Vegetation (PNV) Temperature Total Maximum Daily Load (TMDL) Procedures Manual

Revised October 2009

Prepared by:
Mark Shumar and Jessica de Varona

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Prepared for:
Surface Water Program Office
Idaho Department of Environmental Quality
1410 N. Hilton St., Boise, ID 83706

Prepared by:
Mark Shumar and Jessica de Varona
State Technical Services Office
Idaho Department of Environmental Quality
1410 N. Hilton St., Boise, ID 83706

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1. INTRODUCTION

This manual provides information about the effect of temperature on water quality. It also provides procedures for analyzing streams to determine how to create a temperature TMDL based on shade from potential natural vegetation (PNV). This manual should also help guide the reader to understanding how certain types of changes in and around the streams could improve water quality in streams that are impaired by temperature.

1.1 Water Temperature and Water Quality

Water temperature affects all aspects of living organisms in streams. It affects the lifecycle timing of macroinvertebrates, their metabolism and their abundance, and it affects primary productivity, dissolved oxygen concentrations, nutrient cycling, and the abundance of aquatic macrophytes, submerged, floating, and emergent (Fletcher et al., 2000; Rutherford et al., 1997). Increased water temperatures have consequences for these processes, including a loss in resistance to invasive species. And it affects fish, both their survival and reproduction. Cold water fishes (salmonids), especially, are very susceptible to increasing water temperatures that can disrupt their reproduction (timing for spawning and emergence), their metabolism (burning of fat reserves), and their growth (Cafferata, 1990; Nelson et al., 2007; Thompson, 2005). Changes in temperature regimes can alter these processes such that some native species are excluded (Amaranthus et al., 1989; Poole and Berman, 2001).

1.2 Water Temperature Behavior in Streams

Water temperature is a measure of the concentration of heat energy in a stream (Poole and Berman, 2001). Its behavior is similar to chemical concentrations of other pollutants. It can be diluted when warmer water is added to cooler water, similar to the way water with a higher concentration of a pollutant is added to water with a lower concentration. When water is taken out of the stream (not including via evaporation), temperature is not affected because the concentration of heat energy remains the same until more heat load is added.

Heat load is a measure of heat energy added to a stream. Water temperature is dependent upon heat load (energy) and discharge (volume). Heat energy is transferred directly from the sun to the stream by radiation. Atmospheric heat (e.g., air temperature) reaches the stream surface by convection (mixing, circulating), conduction (transfer of kinetic energy), and advection (horizontal transfer), and then enters the channel depths via conduction. Apparently at one time it was thought that air temperature was primarily responsible for influencing changes in water temperature (Thompson, 2005). Contrary to those previous notions, air temperature and other sources of heat transfer (evaporation, condensation, conduction, and convection) play minor roles in increasing stream temperature when compared to direct solar radiation (Amaranthus et al., 1989; Thompson, 2005).

1.3 Factors Controlling Water Temperature in Streams

Poole and Berman (2001) provided an excellent glimpse into the myriad of processes that control stream water temperature. They indicated that, "interactions between external drivers of stream temperature and the internal structure of the integrated stream system…,"—the channel, riparian zone, and alluvial aquifer—"ultimately determine channel water temperature." They described the primary determinants of stream temperature as the climate (solar radiation, air temperature, and near-stream wind speed), stream morphology, ground water influences, and riparian canopy condition. As a stream forms in its headwaters, it leaves the ground to become surface water. The temperature of the ground water (phreatic aquifer) is the baseline temperature for the stream. The stream's temperature trends away from baseline towards atmospheric temperature as water progresses downstream. This process can be rapid in the absence of buffers and insulating factors (as described by Poole and Berman, 2001).

Insulators to stream heating include channel width and riparian vegetation, specifically its height, density, and proximity to the stream (Poole and Berman, 2001). The riparian plant community blocks incoming solar radiation, directly reducing the heat load to the stream. It also reduces near-stream wind speed and traps air against the water surface, reducing heat exchange with the atmosphere (decreasing convection and advection of heat energy). Riparian vegetation will emit long-wave radiation overnight which can offset outgoing radiation, from the stream keeping minimum temperatures higher (Rutherford et al., 1997). Channel width affects the surface area available for heat exchange and influences the ability of the riparian plant community to shade the stream. Increases in channel width and/or reductions in riparian shade ultimately lead to increased heat load and increases in stream temperature. Additionally, Fletcher et al. (2000) noted that reductions in canopy cover over streams increased the amount of macrophytes in the stream, especially floating macrophytes. This increase in macrophytes has consequences for the energy and nutrient dynamics of streams.

Buffers of stream temperature work to store heat already in the system and integrate variation in discharge and temperature through time (Poole and Berman, 2001). The most important buffer is the hyporheic flow (that portion of the alluvial aquifer in close proximity to the stream where stream flow may enter and leave throughout its course). Hyporheic flow is affected by many aspects of channel morphology and pattern. The more water that enters and is stored in the hyporheic zone, the more likely it will be buffered from further heating, perhaps even cooled by the surrounding substrate and released to the stream as cooler water further downstream. Changes in channel morphology that diminish exchange with the alluvial aquifer reduce this buffering capacity and ultimately lead to increased stream temperatures.

Poole and Berman (2001) provided a preview of the various stream characteristics (shade, discharge, tributaries, phreatic and hyporheic ground water) that vary with stream size. For example, first and second order streams are most influenced by riparian shade and phreatic ground water temperatures, but are least affected by stream discharge (presumably because their discharge is small to begin with). These low ordered streams are moderately influenced by tributaries and hyporheic ground water influences. Third

and fourth order streams are most influenced by tributary inputs, the mixing of warmer waters with cool waters, and are moderately influenced by all the other characteristics (riparian shade, stream discharge, and ground water sources, both phreatic and hyporheic). These middle orders are perhaps the most vulnerable to increased temperatures, due to all these potential pathways of heat load. Fifth order and larger streams are most susceptible to discharge influences, least susceptible to riparian shading influences, and variably influenced by the other characteristics. Large streams are too wide for riparian shade to have much influence, and their large water volume may diminish the relative influences of tributaries and ground water. It is the internal mixing and the diversity of thermal refugia that provide the greatest buffering capacity in large streams. Rutherford et al. (1997) indicated that the rate of heating decreases with increasing stream size (i.e., mean depth) because, for a given surface heat flux, the rate of change in water temperature is inversely proportional to mean depth. They continue with the idea that eventually stream temperatures reach a dynamic equilibrium where heat gains from radiation balance heat loss from back radiation, evaporation, and conduction. At that point, maximum and minimum daily temperatures do not change much with distance downstream. Thus, under identical shade conditions, it takes higher order streams longer to heat to a given temperature than low order streams. This suggests that lower order streams are more vulnerable to negative effects from shade loss than higher order streams.

Changes in the landscape as the result of natural and anthropogenic factors can adversely affect the insulating and buffering capacities of stream temperature. Removal of riparian vegetation directly affects incoming solar radiation and the heat load to the stream. Cafferata (1990) noted that clear-cut logging, even with buffer strips (of unspecified widths) remaining, increased daily maximum stream temperatures by 4 ºF (2.2 ºC) in California coastal watersheds. Amaranthus et al. (1989) indicated that stream temperatures increased after intense wildfire reduced the canopy cover over streams. They noted that even standing dead material and the shade produced by it was enough to keep streams cooler than those without such shade. Teti (2003) showed that a volume of water will heat up faster with less shade than with more shade under otherwise identical conditions. Steedman et al. (1998) showed that removal of forest vegetation on the southern shore of a lake will increase water temperatures locally. Rutherford et al. (2004) showed that daily maximum stream temperatures changed by about 4 ºC over a distance of 600 to 960 meters immediately downstream from a 40 to 70% change in riparian shade. Sherri Johnson of the USDA Forest Service Pacific Northwest Research Station conducted an elegant experiment where streams once open to sunlight were artificially shaded, producing a concomitant drop in stream temperature, regardless of surrounding air temperature (Thompson, 2005).

Additionally, anthropogenic factors affecting discharge, water volume, and flow rate (dams, withdrawals, flow alteration) change the basic relationship between heat energy and volume, creating increases or decreases in stream temperature. Welsh et al. (2005) warned that focusing solely on riparian condition could cause the overall effects of landscape change on stream temperatures to be ignored. Changes in channel dimensions and morphology that may result from a myriad of activities can either directly alter

channels or indirectly alter channel morphology from changes in flow, runoff, and sedimentation. Widening of stream channels affects the insulating capacity of streams by moving riparian vegetation back, reducing shade and creating more surface area for heat loading. Changes in channel morphology (down-cutting, channelization, straightening, etc.) also affect the buffering capacity of streams by potentially decreasing contact with the hyporheic ground water (Thompson and Duncan, 2004). Increased down-cutting, lowering of water tables, loss of contact with floodplains, and loss of sinuosity all play a part in affecting stream temperature. Thus, it seems that many of the same factors that affect siltation and sedimentation in streams also simultaneously affect factors controlling stream temperature.

1.4 Addressing Temperature Effects on Water Quality With PNV Temperature TMDLs

Total maximum daily loads (TMDLs) that address problems with sediment in streams, and their associated implementation plans, will likely contribute benefits to stream temperature regimes by improving stream buffering factors. In this document, we provide procedures for developing a temperature TMDL based on riparian shade and channel width (insulating factors). Although other aspects of channel morphology are important to the buffering capacity of stream temperature, as we have described above, the insulating factors that protect a stream from direct solar radiation and direct heat load are best addressed through this temperature TMDL process. The following temperature TMDL process is based on the concept of achieving riparian shade conditions similar to those produced by potential natural vegetation (PNV) in the riparian zone. The term PNV was developed by A.W. Kuchler, an American geographer and naturalist involved in plant classification systems. "*In the 1960s, Dr. Kuchler developed the classification system for types of vegetation that would cover the land if there were no disturbances from man or nature. Then he applied this system to create a map of the US. The classification system was adopted as the base for university and government sponsored research and program development. Although other models derived from climate, biomes, ecoregions, and life zones have been developed, the terms for Kuchler vegetation types are commonly used*" (Ann Watkins, Rutgers University at http://newarkwww.rutgers.edu/guides/vegetation.htm). In our case, PNV represents "system potential" vegetation, the mature vegetated landscape that was present before European settlement, which included some level of natural age-class diversity and disturbance history. System potential shade is a broad scale view of shade conditions along a stream. As such, it is unlikely that all sites will be at their potential due to localized natural disturbance (e.g., fire, flood, landslide, disease), causing some fraction of the area to be in a less than "mature" condition. This document contains shade curves (in Appendix A) that show effective shade level as a function of channel width, for use as target shade levels. These shade curves have been developed for forest and riparian plant communities throughout Idaho, based on system potential vegetation.

In the following PNV temperature TMDL process, we will describe procedures for estimating existing shade on streams (those no more than 50 meters wide at bankfull), estimating natural bankfull width, and determining appropriate PNV shade targets. The load analysis will demonstrate how to convert shade (as a percent of solar radiation

blocked) to heat load received by the stream surface (in kilowatt hours per day [kWh/day]). Daily heat loads reflect how much excess load the stream receives because it lacks target levels of shade. Although a daily load is determined for an entire stream, for the purposes of setting total maximum daily loads, interested parties can look at the difference between existing and target shade on specific reaches of streams. Information about these specific differences can help interested parties to investigate, prioritize, and, we hope, mitigate problems with excess heat loading.

PNV shade levels and loads are assumed to be the natural condition, thus stream temperatures under PNV conditions are assumed to be natural (so long as there are no point sources or any other anthropogenic sources of heat in the watershed), and are thus considered to meet Idaho water quality standards, even though they may exceed numeric criteria.

2. METHODS

This section provides methods for determining the existing amount of shade on streams through interpretation of aerial photographs and on-site (field) observations that can be used to verify the aerial photograph interpretations. Also provided are methods for determining a stream's natural bankfull width and using it, along with the natural riparian plant community, to help establish the target level of shade for the stream. Methods for determining a stream's heat load capacity, estimating its existing heat load, and allocating the existing heat load among sources of heat inputs to the stream are also provided in this section, along with examples of the figures, based on aerial photographs, that illustrate existing levels of shade, target levels of shade, and the amount of difference between existing and target levels.

2.1 Aerial Photograph Interpretation

At DEQ, A PNV-style temperature TMDL analysis begins with an aerial photograph interpretation performed in the ArcGIS program. The procedure for making this interpretation is outlined below.

Interpretations of existing shade levels are represented as 10% class intervals starting with shade class 0 (i.e., a shade value of 0), which represents shade levels ranging from 0 to 9.9%, and proceeding through shade class 90, representing shade levels from 90 to 100% (adapted from the CWE process, IDL, 2000). For example, a stream segment that is interpreted as having a shade level anywhere between 30 and 39.9% would be assigned a shade value of 30.

Following are the steps in the procedure for interpreting shade levels from an aerial photograph.

- Use an NHD (national hydrography dataset) layer, either a 1:100K or a 1:250K hydrography, to select the streams to be analyzed in the TMDL.
- Export the selected streams to a shapefile so that the line representing each stream can be divided into segments to represent different shade levels that exist on different segments of the stream.

- Overlay the shapefile onto an aerial photograph, usually an NAIP (National Agriculture Imagery Program) photograph.

  NOTE: Presently, 2004 photographs are the highest quality and most extensive of these images available at Idaho DEQ. Photographs from 2006 are also available for a major portion of the state, but the images are of lower quality.

- View the aerial photograph at very high magnification, usually 1:3000; this makes it easier to differentiate between individual streams and the vegetation surrounding them, and to see where changes in vegetation type or amounts of stream cover occur.

  NOTE: For a segment of stream, an interpretation of the existing shade level is made based on plant types, their perceived density, amount of topographic relief, and other indicators such as presence of roads, fire scars, floodplain width, etc. This interpretation—to determine which shade class (described below) to assign to a particular segment of stream—is a best professional judgment (BPJ) activity that improves in accuracy with experience. Field verification, discussed below, is paramount for enhancing that experience and confirming the BPJ-based determination.

- To assign the interpreted existing shade value to a segment of stream on the shapefile line that corresponds with it, enter the value into a field in the attribute table in the ArcGIS program.

- Further along the stream, at the point where you feel the existing shade has changed enough for the next segment of stream to be assigned a different shade class, use the ArcMap editing tool to split the shapefile line.

- Assign a new shade value to the next stream segment just created by splitting the shapefile line, by entering it into the attribute table.

- Simultaneously, you may use the Google Earth program to watch for topographical features such as mountains or deep canyons that could affect stream shade.

  NOTE: The estimate is based on a general intuitive observation about the kind of vegetation present, its density, the width of the stream, and other features. It is important to note that the visual estimates made from the aerial photos are strongly influenced by canopy cover and stream width. It is not always possible to visualize or anticipate shade characteristics resulting from topography and landform.

2.2 Field Verification of Shade Level Estimates

After the aerial photograph interpretation is complete, the shade values assigned to the stream segments need to be checked for accuracy, since they are only estimates based on BPJ. Sufficient field verification of the estimates is important for adding credibility to the assigned shade values. In our process, we use a solar pathfinder for the field verification. The pathfinder measures effective shade and takes into consideration all physical features that block the sun from hitting the stream surface, including vegetation, hillsides, canyon walls, terraces, man-made structures, etcetera. The estimate of shade made visually from an aerial photo does not always take into account topography or any shading that may occur from physical features other than vegetation. However, research

has shown that shade, measured with a solar pathfinder, and canopy cover, measured with a densiometer, are remarkably similar (OWEB, 2001), reinforcing the idea that riparian vegetation and objects proximal to the stream provide the most shade and other objects/features have less effect. Our own experience with measuring canyon shade revealed that even the steepest canyons (e.g., Owyhee, Bruneau) only provide a six-month average (April through September) shade level of 30% or less on their rivers below. A 15-meter wide river may enjoy 50% shade from a black cottonwood riparian plant community, whereas only receive 30% shade from a canyon wall in the plant community's place. This shade difference presumably results from the plant's ability to overhang the water providing more vertical cover on the stream itself.

A solar pathfinder allows a person to trace the outline of shade-producing objects onto specialized charts called monthly solar path charts. In the current procedure, it is not necessary to trace the outlines onto the charts; instead, photographs are taken and interpreted later by specialized software. We use the term "trace" from now on to represent the photograph of a monthly solar path chart at a certain location as will be described later. The percentage of the sun's path covered by shade-producing objects is the effective shade on the stream at the spot where the trace is made. To adequately characterize the effective shade on a reach of stream, a minimum of 10 traces should be made, at systematic or random intervals, along the stream reach in question.

Tools Needed for Field Verification

A Solar Pathfinder and associated Assistant software can be purchased for under $400 (http://www.solarpathfinder.com/). A reasonably effective handheld GPS unit costs around $250. Any digital camera is adequate; however, you may want to invest in a waterproof camera in case you drop it in the stream. A field notebook and waders are also handy.

Procedure for Field Verification of Shade Level Estimates

Following are the steps in the procedure for making a trace, at a single sampling (tracing) location.

- Place the solar pathfinder in the middle of the bankfull width of the stream at about the bankfull water level (see Figure 1).

Figure 1. Correct in-stream placement of a solar pathfinder.

NOTE: Bankfull width is the distance between each the two side of the banks, at the high-water level. It is important to use bankfull width and not wetted width because stream flows change throughout the year and the wetted width is only representative of the stream at the time it is sampled rather than an entire year. Additionally, the riparian vegetation typically begins at the bankfull mark, so placing the pathfinder in the middle of the bankfull width makes it equidistant from riparian communities on either side of the stream.

- Follow the manufacturer's instructions (orient the pathfinder to South, and keep it level) for taking photographs of the pathfinder dome.

  NOTE: Historically, a trace was taken by using a white wax pencil to draw an outline of the vegetation over a stream reflected on the solar pathfinder's dome onto a chart of the sun's path for the year. Now, instead, a photograph is taken of the reflection in the dome, described in the following steps.

- Take a photograph of the reflection in the dome of the solar pathfinder, to be processed later using the Solar Pathfinder Assistant software program.

  NOTE: Take the picture with the camera held about a foot or two above the pathfinder, and pointed down vertically toward the solar pathfinder's dome.

  Also, it is best, to stand on the north-side of the pathfinder, if possible, and make sure other people and any non-stationary objects are not in the reflection thereby blocking the reflection of the shade-providing cover. In situations where the sun is reflecting on the dome, you may need to hold up your hand, hat, book or other object to block the direct sunlight, in order to get the best quality picture (see Figure 2).
  Bright sunlight can make an image unreadable or white-out a portion of the shade-providing cover in an image, so it is important to pay attention to this detail to keep from getting unusable photographs.

Figure 2. Taking a photograph of the solar pathfinder dome. Note the photographer's raised hand blocking direct sunlight.

Systematic selection of sampling locations, as illustrated in Figure 3, is easiest to accomplish without biasing the locations. To systematically select sampling locations, take the following steps.

- Start at a unique location, such as 50 meters (m) from a bridge or fence line, and place the pathfinder and photograph it as described above.
- Then proceed upstream or downstream, stopping to place the pathfinder and take a photo of it at fixed intervals (e.g., every 50 m, every 50 paces, etc.).

Figure 3. Ten systematically selected solar pathfinder sampling locations within one stream reach.

Instead of systematically selecting sampling locations, you can also select them randomly, by generating random numbers and using them as interval distances.

While using the solar pathfinder, it is a good idea to measure and record bankfull widths, make notes of observations, and photograph the stream landscape at several unique locations, paying special attention to changes in riparian plant communities and what kinds of plant species (the large, dominant, shade-producing ones) are present.

Additionally, you can take densiometer readings at the same locations as solar pathfinder photos. This would allow you (or anyone with the data) to later develop relationships between canopy cover (measured with the densitometer) and effective shade (measured with the solar pathfinder) for a given stream. If you choose to use a densitometer, bear in mind that a convex densiometer is a dome that projects outward at angles similar to the dome of the pathfinder, so it measures more than vertical cover. A concave densiometer projects points more or less straight up above the instrument and provides a closer approximation of vertical cover.

For field verification purposes, it is helpful to take each set of 10 solar pathfinder photographs within a reach that is assigned a single estimated shade class interval, to make sure you have enough data for a particular segment of stream to determine the accuracy of the shade estimate.

At each sampling location, you should record a waypoint on a GPS unit, so you have the latitude and longitude of the location, which is needed for processing in the Solar Pathfinder Assistant program, and to locate the sampling location on the aerial photograph in ArcMap. If some waypoints cannot be recorded, waypoints such as those for the first and last traces in a set may be substituted for those in between.

In a field notebook, it is important to make note of which photograph matches with which GPS waypoint, and to record the bankfull width and observations of the vegetation at each location. Instead of keeping track in a notebook, you could include a sheet of paper or a GPS unit displaying the latitude and longitude in each photograph, as shown in Figure 4. For recording the vegetation observed, it is important to record the dominant species of trees and shrubs or to note whether grasses are dominant (it is not necessary to identify the specific species of grasses or forbs present). Photographs of the landscape and vegetation at each sampling location are also useful, both for later reference and for visual aids in TMDL documents and presentations.

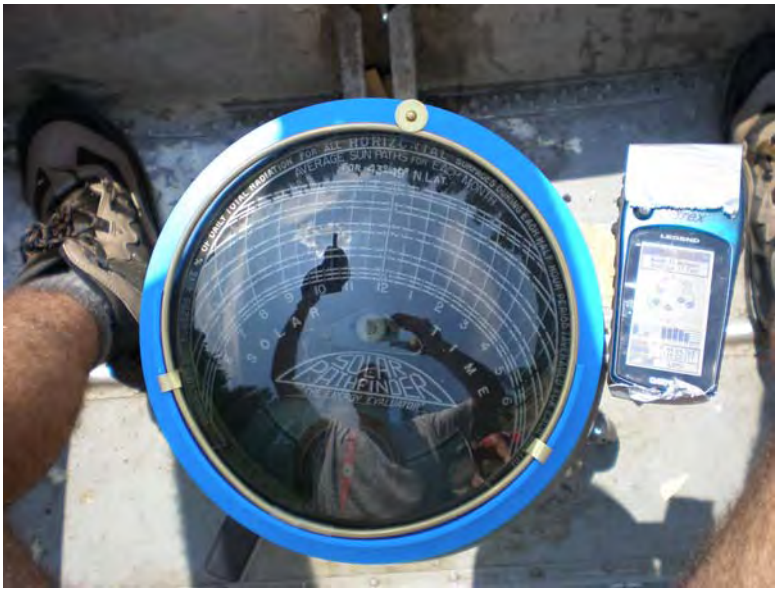
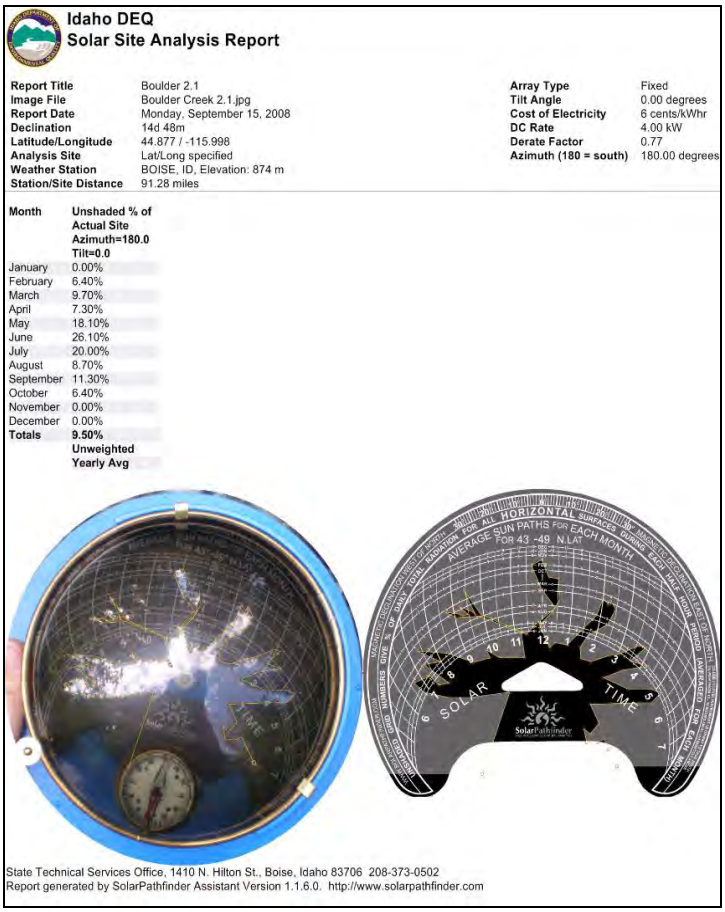


Figure 4. Taking a photograph of the solar pathfinder along with a GPS unit that is displaying the latitude and longitude at that location.

To process the data from the sampling locations in the Solar Pathfinder Assistant software program, take the following steps.

- Select the photograph from the first trace and enter the corresponding latitude and longitude (or Zip Code if you do not have coordinates) into the appropriate boxes. Be sure to click the "ecological" button, to set the tilt to "0."
- Follow the program instructions for producing a Solar Site Analysis Report (a trace on a solar chart and calculation of "% unobstructed").
- An example of the Solar Site Analysis Report produced by the Solar Pathfinder Assistant software is shown in Figure 5.



Idaho DEQ
Solar Site Analysis Report

Report Title	Boulder 2.1	**Array Type**	Fixed
Image File	Boulder Creek 2.1.jpg	**Tilt Angle**	0.00 degrees
Report Date	Monday, September 15, 2008	**Cost of Electricity**	6 cents/kWhr
Declination	14d 48m	**DC Rate**	4.00 kW
Latitude/Longitude	44.877 / -115.998	**Derate Factor**	0.77
Analysis Site	Lat/Long specified	**Azimuth (180 = south)**	180.00 degrees
Weather Station	BOISE, ID, Elevation: 874 m		
Station/Site Distance	91.28 miles		

Month	**Unshaded % of Actual Site Azimuth=180.0 Tilt=0.0**
January	0.00%
February	6.40%
March	9.70%
April	7.30%
May	18.10%
June	26.10%
July	20.00%
August	8.70%
September	11.30%
October	6.40%
November	0.00%
December	0.00%
Totals	**9.50%**
	Unweighted Yearly Avg

State Technical Services Office, 1410 N. Hilton St., Boise, Idaho 83706 208-373-0502
Report generated by SolarPathfinder Assistant Version 1.1.6.0. http://www.solarpathfinder.com

Figure 5. Pathfinder Assistant Report.

The important column, for temperature TMDL purposes, is the one titled "Unshaded (or Unobstructed) % of Actual Site". You must convert the data in this column from unshaded percentages to shaded percentages. Convert each unshaded percentage to a shaded percentage by subtracting it from 100%. (Only the percentages for the months from April through September are used in our TMDL process, so it is not necessary to convert the percentages for any of the other months.)

- After the percentages have been converted, average the shaded percentages for each month from April through September to get a single 6-month average percentage of shade for each pathfinder photo. After this has been done for all the photos (usually 10) for one stream reach, calculate average of the 6-month average percentages, to get a single average shade percentage for the entire reach. Compare this average reach percentage to the percentage of existing shade estimated for the same reach by aerial photograph interpretation.

We use an average for the six-months of April through September to represent the shade conditions and sun levels that the stream would experience over the majority of the critical time period for aquatic life. Historically, temperature data have shown that criteria violations can occur during the late spring spawning period for salmonids (April through June), during the peak summer (July and August), and during early fall spawning (September). Stream temperatures are rarely a problem outside of this time period.

The field-verified averages for each stream reach and the corresponding existing shade estimates are compared to determine the degree to which shade estimates from aerial photos reflect actual shade measured at the stream reach sites. The comparison is accomplished by entering the data into a table (or tables) like the example in Table 1.

Table 1. Example Comparison Between Aerial Photo Interpretations and Solar Pathfinder Results.

aerial class	pathfinder actual	pathfinder class	delta		stream site
40	39.9	40	0		mill
20	54.5	50	-30		birch
20	26.6	20	0		squaw
50	43.8	40	10		trapper1
50	34.6	30	20		trapper2
70	39.9	40	30		fall
60	35.5	30	30		goose
40	45.4	40	0		big cottonw
20	14.9	10	10		emery1
50	50	50	0		emery2
30	29.7	30	0		trout1
30	18.4	10	20		trout2
10	8.75	0	10		blue hill
10	10.9	10	0		lwr birch
60	67.5	60	0		cold1
40	65.3	60	-20		cold2
38	37	33	5	average	
18.44	17.93	18.44	15.92	std dev	
9.03	8.78	9.03	7.80	95%CI	

The table contains the following four columns:

- The first column is for the shade value for the shade class estimated by aerial photograph interpretation.
- The second column is for the field verified average shade percentage from the pathfinder readings.
- The third column is for the shade value for the shade class that the actual shade from the pathfinder reading falls into, and
- The fourth column is for the difference (delta) between the estimated shade class and actual shade class.

The last column (delta) primarily reflects the average difference between estimated shade (aerial class) and measured (field-verified) shade (pathfinder class). All of the data from the field verification sites may be included in a single table with a separate line for each pathfinder site to obtain a single average for which the entirety of the aerial photograph estimates may be compared. Note in the example (Table 1) that the average difference between aerial photo-based estimates and pathfinder-verified shade was 5% ± 7.8% (average ± 95% C.I.).

To get differences between estimated shade and actual existing (field-verified/measured) shade for individual streams, you can make a separate table for each stream with more than one field verification site

Using the information from the table, compare actual shade to estimated shade at each stream reach site. If they are different, adjust the shade value assigned on the aerial photograph in ArcGIS, to reflect the actual shade values for each specific stream reach site. For example, the results shown in Table 1 suggest that the aerial photo-based estimates were over-estimates by an average of 5%. To correct for this discrepancy, you could change all non-verified estimates downward by one 10% class interval to compensate. For each stream reach site that has field-verified (pathfinder) results, you would correct the value, if necessary, to reflect the pathfinder results at each location. Conversely, you could use the results from the calculation table such as the example in Table 1 to calibrate your eye for interpreting shade values, by looking on the at the stream reaches on the aerial photo for which the actual shade percentage is known from field-verification (pathfinder) results. Then you could review and, if needed, re-interpret the shade values assigned to the rest of the stream segments.

Procedure for Field Verification for Monitoring Purposes

These field verification methods can be used for implementation purposes, to monitor progress towards meeting shade targets. In the same manner as just described, you can, at any time, determine the actual shade level for any individual stream segment, by taking a minimum of 10 pathfinder measurements averaged together, to provide a current shade level for that stream segment. Then you can compare that current level to the target shade level for that stream segment, as discussed in Section 2.5.

2.3 Load Analysis

Load analysis for PNV TMDLs is accomplished with a spreadsheet table specifically designed for this purpose—a load analysis table. With the correct inputs, these tables will perform the necessary calculations and provide the necessary outputs—the analysis results. Table 2 shows a blank load analysis table and Table 3 is an example of a completed load analysis table.

Note: The load analysis table refers to “potential” shade and “potential” load, which in this context is synonymous with “target” shade or load.

After you make any necessary adjustments of existing shade values, based on field verification results, have been made to individual stream segments on the aerial photo (recall that your original interpretations of existing shade values reside as a shapefile overlain onto an aerial photo in ArcMap), take the following steps:

- Use the measuring tool in ArcMap to measure the stream-shade segments individually (in meters) from headwaters to mouth.
- Enter the length of each stream segment and its corresponding shade value into the first two columns of a load analysis table (See Table 2 and Table 3).

- Starting again at the headwaters of each stream (usually first line on the load analysis table), record the vegetation type that each segment falls into, in the area adjacent to the last table column of the load analysis table. Segments may be broken up further if the same shade level falls into more than one dominant vegetation type.

  For determining the dominant vegetation type on forest lands, use a National Forest Potential Vegetation GIS layer (each National Forest has its own layer which can be called Assessment Group, PVG, PVT, etc. The discussion in the Appendix on how shade curves were developed will discuss these layers in more detail. Currently, the layers can be obtained from Mark Shumar in DEQ Technical Services or from the Forests themselves.). To do this:

- Add a Potential Vegetation layer to the aerial photo you are working with in ArcMap, so that when looking at each stream segment, you can determine which vegetation type is dominant. Outside of National Forest lands (i.e., outside the extent of their Potential Vegetation GIS layer), you must decide what is the likely dominant potential natural vegetation along the stream.

  In all but the most severe cases of vegetation removal, usually a remnant stand will indicate the most likely vegetation type on the stream. Using these visual remnants, local published or knowledgeable person information if available, and your knowledge about where typical riparian species dominate in relation to zones of elevation, make a decision about what potential natural vegetation type should exist on a segment of stream.

  If the vegetation type is a forest type, use the most appropriate National Forest Potential Vegetation type. If the vegetation type is non-forest and in southern Idaho (south of the Salmon/Clearwater divide) or in the Palouse Prairie region, then select the appropriate value from the most appropriate Southern Idaho Non-forest shade curve, as described in section 2.5 (shade curves are found in the Appendix of this manual).

Table 2. Blank Load Analysis Table for PNV Temperature TMDLs (6.38 is the conversion factor from shade to load).

Segment Length (meters)	Existing Shade (fraction)	Existing Summer Load (kWh/m^2/day)	Potential Shade (fraction)	Potential Summer Load (kWh/m^2/day)	Potential Load minus Existing load (kWh/m^2/day)	Existing Stream Width (m)	Natural Stream Width (m)	Existing Segment Area (m^2)	Existing Summer Load (kWh/day)	Natural Segment Area (m^2)	Potential Summer Load (kWh/day)	Potential Load minus Existing Load (kWh/day)	Lack of Shade (%)	Stream Name
		6.38		6.38	0.00			0	0	0	0	0	0	Vegetation
		6.38		6.38	0.00			0	0	0	0	0	0	Type
		6.38		6.38	0.00			0	0	0	0	0	0	
		6.38		6.38	0.00			0	0	0	0	0	0	
		6.38		6.38	0.00			0	0	0	0	0	0	
		6.38		6.38	0.00			0	0	0	0	0	0	
		6.38		6.38	0.00			0	0	0	0	0	0	
		6.38		6.38	0.00			0	0	0	0	0	0	
		6.38		6.38	0.00			0	0	0	0	0	0	
		6.38		6.38	0.00			0	0	0	0	0	0	
		6.38		6.38	0.00			0	0	0	0	0	0	
		6.38		6.38	0.00			0	0	0	0	0	0	
		6.38		6.38	0.00			0	0	0	0	0	0	
		6.38		6.38	0.00			0	0	0	0	0	0	
		6.38		6.38	0.00			0	0	0	0	0	0	
		6.38		6.38	0.00			0	0	0	0	0	0	
		6.38		6.38	0.00			0	0	0	0	0	0	
		6.38		6.38	0.00			0	0	0	0	0	0	
							Total	**0**	**0**	**0**	**0**	**0**	**0**	

Table 3. Example Load Analysis Table for PNV Temperature TMDLs.

Segment Length (meters)	Existing Shade (fraction)	Existing Summer Load (kWh/m^2/day)	Potential Shade (fraction)	Potential Summer Load (kWh/m^2/day)	Potential Load minus Existing load (kWh/m^2/day)	Existing Stream Width (m)	Natural Stream Width (m)	Existing Segment Area (m^2)	Existing Summer Load (kWh/day)	Natural Segment Area (m^2)	Potential Summer Load (kWh/day)	Potential Load minus Existing Load (kWh/day)	Lack of Shade (%)	**Sublett Creek**
AU# ID17040210SK021_02 SF Sublett Creek														
1170	0.5	3.075	0.89	0.6765	-2.40	1	1	1170	3597.75	1170	791.505	-2806.245	-39	yellow willow
AU# ID17040210SK021_03 NF Sublett Creek														
1260	0.4	3.69	0.46	3.321	-0.369	4	4	5040	18597.6	5040	16737.84	-1859.76	-6	yellow willow
AU# ID17040210SK021_03 Sublett Creek														
530	0.4	3.69	0.39	3.7515	0.0615	5	5	2650	9778.5	2650	9941.475	162.975	0	yellow willow
100	0.3	4.305	0.39	3.7515	-0.5535	5	5	500	2152.5	500	1875.75	-276.75	-9	
610	0.1	5.535	0.39	3.7515	-1.7835	5	5	3050	16881.75	3050	11442.075	-5439.675	-29	
950	0.5	3.075	0.5	3.075	0	5	5	4750	14606.25	4750	14606.25	0	0	coyote willow
140	0	6.15	0.5	3.075	-3.075	5	5	700	4305	700	2152.5	-2152.5	-50	
AU# ID17040210SK020_0L Sublett Reservoir														
1100	0	6.15	0	6.15	0	250	250	275000	1691250	275000	1691250	0	0	water
AU# ID17040210SK019_02 Sublett Creek														
910	0	6.15	0.58	2.583	-3.567	4	4	3640	22386	3640	9402.12	-12983.88	-58	coyote willow
230	0.1	5.535	0.58	2.583	-2.952	4	4	920	5092.2	920	2376.36	-2715.84	-48	
2340	0	6.15	0.58	2.583	-3.567	4	4	9360	57564	9360	24176.88	-33387.12	-58	
							Total	**306,780**	**1,846,212**	**306,780**	**1,784,753**	**-61,459**	**-27**	

2.3.1 Bankfull Width

Channel width is needed because the width of the stream affects the amount of shade the stream can receive, and therefore affects the target shade for each stream segment. For streams of different widths with the same vegetation type, the ones with smaller widths have greater shade than the wider ones. As impacts to streams and riparian areas occur, width-to-depth ratios tend to increase such that streams become wider and shallower. As streams become wider, shadow length produced by vegetation covers a smaller percentage of the water surface. Widened streams may also have less vegetative cover if shoreline vegetation has succumbed to erosion.

Stream widths (existing and natural) are recorded for each segment (see the seventh and eighth columns in Tables 2 and 3). Bankfull widths are used because data for this measurement of width is readily available, and because it best approximates the width between the point on each side of the stream where riparian vegetation starts

Note: see Idaho DEQ BURP Field Manual (IDEQ, 2007) for an explanation of how bankfull width is determined at the site.

Existing width is the bankfull width of the stream in its current condition. Measurements of current bankfull width may not reflect widths that were present under PNV conditions. Natural width estimates are intended to be more reflective of naturally–occurring (PNV) conditions, and are used in calculating shade targets for the stream segments.

Estimate the natural bankfull width by consulting the regional hydrology curves for the major basins in Idaho (Figure 2), to estimate natural bankfull width from estimates of watershed drainage area. Make the natural width estimates by taking the following steps.

- Determine the drainage area (in square miles [sq mi]) for a given stream by using the USGS *Streamstats* Web site (http://water.usgs.gov/osw/streamstats/idaho.html) to delineate watersheds from several points along the stream in question.
- For the watershed of the stream in question, enter its estimated drainage area (in square miles) from *Streamstats* into a specialized spreadsheet table (see Table 4) that contains the regional curve equations.
- Use the spreadsheet table to calculate a theoretical bankfull width for each location, and also to record any measured (existing) widths.

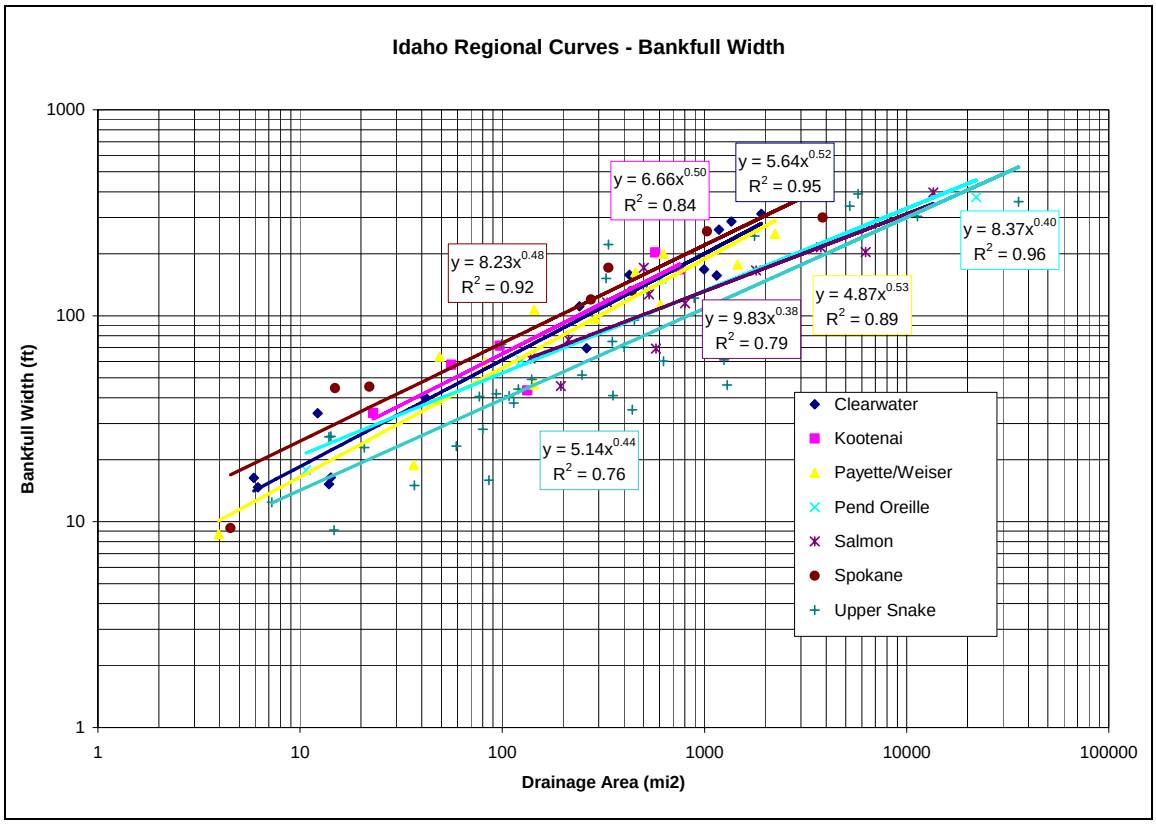


Figure 6. Regional Curves Providing Bankfull Width as a Function of Drainage Area. Based on data compiled by Diane Hopster, Idaho Department of Lands.

Table 4. Example Calculation Table of Regional Curve-Based Estimates, and Existing Measurements, of Bankfull Width.

Location	area (sq mi)	US (m)	Salm (m)	P/W (m)	existing (m)
Lime Creek @ mouth	133.4	13	19	20	13.5
Lime Creek below Trail Creek	96.66	12	17	17	11.8
Lime Creek below Sprout Creek	37.6	8	12	10	
NF Lime Creek @ mouth	17.2	5	9	7	
MF Lime Creek @ mouth	17.15	5	9	7	5.5
SF Lime Creek @ mouth	45.85	8	13	11	
Smith Creek @ mouth	52.74	9	14	12	
Smith Creek above Mule Gulch	8.37	4	7	5	5

US = Upper Snake, Salm = Salmon, P/W = Payette/Weiser basins

Table 4 is an example of a calculation table (from the South Fork Boise River Subbasin) that provides estimated bankfull widths for specific locations on several streams, based on three separate regional curves for comparison. The table also displays existing bankfull widths measured during site visits—usually during pathfinder field verification exercises, or during BURP surveys. Any other available information on bankfull width, often collected and reported by other agencies, is also recorded in Table 4 as existing bankfull width.

To determine what is the natural bankfull width for a certain location on a given streams, we compare the estimated width based on drainage area (the curve-based estimate) and the measured existing width, and we usually use the smaller of the two as the natural width in the load analysis. It is important to be cautious about using existing bankfull width data. Generally, there is very little data about a stream's width and it is usually measured in very small reaches which may not be representative of larger segments of stream. For example, at BURP sites bankfull width is usually measured three times in the sampled reach which maybe only 150 meters long. This BURP site maybe a particularly wide or narrow spot in the stream that poorly represents bankfull width for the next 1000 meters or more up and down the stream from that point. Therefore, when comparing existing bankfull width data to curve-based estimates, use a weight-of-evidence approach to determining if and when existing widths should dictate the natural width of the stream.

For each stream you evaluate in the load analysis, estimated the bankfull widths at specific locations based on drainage area, using the regional hydrography curve (Figure 6) that best matches the watershed you are working with. Usually this will be the curve for the basin your watershed is located in. However, sometimes your watershed is not located in one of the basins represented by these regional curves, and you have to make a decision which basin, among those for which there is a curve available, best approximates the basin your watershed is located in with regard to characteristics such as regional climate, geology, and type of response to precipitation or snowmelt (e.g., is it a "flashy" system or not?). For example, two of the creeks shown in Table 4, Lime Creek and Smith Creek, are in the Boise River Basin, which is not one of the basins represented by the regional curves shown in Figure 6. Therefore, we chose to examine stream widths predicted by the curves representing several nearby basins, including the Upper Snake Basin (from Wyoming to King Hill), the Salmon Basin, and the Payette and Weiser Basin (both these rivers are included in the same basin). The Upper Snake Basin has the least precipitation and includes some of the drier portions of the state, hence the regional curve tends to produce the smallest bankfull widths for a given drainage area size. The Salmon Basin has higher precipitation and more snowmelt than the Upper Snake and tends to produce a larger bankfull width for any given drainage area. The Payette/Weiser Basin tends to be intermediate between Upper Snake and Salmon Basins, but is a more "flashy" system with rapid snowmelt episodes in spring. Hence, the Payette/Weiser curve tends to produce widths of intermediate size except that for larger drainage area sizes, the bankfull width produced by the Payette/Weiser curve will be larger than that produced by the Salmon curve. Smith and Lime Creeks (Table 4) in the Boise River Basin are likely best represented by the Upper Snake Basin curve. These creeks emanate from dry ponderosa pine forests to sagebrush-dominated basalt plateaus before entering basalt canyon country into the South Fork Boise River. Existing measurements of bankfull width, although sparse, do show similarity to the widths predicted by the Upper Snake Basin curve. In a load analysis for Smith and Lime Creeks, natural widths would likely be similar to, if not the same as, existing widths.

2.3.2 Shade Target Selection

Target shade levels are determined using shade curves developed for Idaho vegetation types (see Shade Curves for Targets, Appendix A). For each specific potential natural

vegetation type, a shade curve shows the relationship between stream width and the amount of effective shade produced by that vegetation type. As a stream gets wider, the shade decreases because the vegetation has less ability to shade the center of wide streams. As the vegetation gets shorter (from, say, a tree-dominated type to a shrub-dominated type), the plant community is able to provide less shade at any given stream width. To determine potential natural vegetation shade targets used in the load analysis (the fourth column of Tables 2 and 3), the effective shade curves created for Idaho vegetation types are used. Vegetation community modeling is the shade calculator sub-routine of the temperature model called *Shade.xls* produced by the Washington Department of Ecology , and was used to produce these shade curves. For more information about Shade.xls, see Figure 7. Effective shade curves include percent shade on the vertical axis, and stream width on the horizontal axis. For a given vegetation type, there are separate curves for each of three aspects (north/south [N/S], east/west [E/W], and diagonals[NE/SW-NW/SE]). Shade curves for Idaho, along with a discussion on their creation, are presented in Appendix A.

Shade.xls: a tool for estimating shade from riparian vegetation
Washington State Department of Ecology
Olympia, Washington

Shade.xls was adapted from a program that was originally developed by the Oregon Department of Environmental Quality (ODEQ) as part of their HeatSource model version 6. Shade.xls calculates shade using one of two optional methods:

- Chen's method based on the Fortran program HSPF SHADE that was developed by Y.D. Chen for his 1996 Ph.D. dissertation at the University of Georgia

- ODEQ's original method from the HeatSource model version 6.

The Chen method is documented in the PhD dissertation by Y.D. Chen and publications in the Journal of Environmental Engineering:

Chen, Y.D. (1996). Hydrologic and water quality modeling for aquatic ecosystem protection and restoration in forest watersheds: a case study of stream temperature in the Upper Grande Ronde River, Oregon. PhD dissertation. University of Georgia. Athens, GA.

Chen, Y.D., Carsel, R.F., McCutcheon, S.C., and Nutter, W.L. (1998). Stream temperature simulation of forested riparian areas: I. watershed-scale model development. Journal of Environmental Engineering. April 1998. pp 304-315.

Chen, Y.D., Carsel, R.F., McCutcheon, S.C., and Nutter, W.L. (1998). Stream temperature simulation of forested riparian areas: II. model application. Journal of Environmental Engineering. April 1998. pp 316-328.

The ODEQ method was developed by the Oregon Department of Environmental Quality (Heatsource model version 6). Documentation of ODEQ's HeatSource model is available at www.deq.state.or.us/wq/TMDLs/TMDLs.htm and www.heatsource.info

For more information about Shade.xls, contact Greg Pelletier at the Department of Ecology (gpel461@ecy.wa.gov).

Figure 7. Brief History of the *Shade.xls* Temperature Model

Following are the steps for using shade curves to determine target shade levels.

- Select a curve or curves for the vegetation type most similar to the types in your load analysis.

  NOTE: Select a curve based on the National Forest Potential Vegetation GIS layer or the Southern Idaho Non-forest Vegetation (see Appendix for shade curves) that corresponds with the plant community selected for each stream segment in the load analysis.

- For each vegetation type in your load analysis, make a shade target table, as in the example below (Table 5). The tables show the target shade level (as a percentage) at each stream width for a given vegetation type.

Table 5. Example Shade Target Table for the Black Cottonwood Vegetation Type.

Black cottonwood	1m	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m	13m
0/180 aspect	97	97	96	96	94	91	88	85	82	78	74	70	67
45/135/225/315 aspect	98	97	96	96	94	91	88	85	81	76	72	68	64
90/270 aspect	97	97	97	96	95	93	91	87	78	71	65	61	56
Target (%)	**97**	**97**	**96**	**96**	**94**	**92**	**89**	**86**	**80**	**75**	**70**	**66**	**62**

- Enter values taken from the shade curves into the appropriate cells in the shade target tables. More information about taking values from the shade curves is in Appendix A.
- In each shade table, for each individual stream width, the values for each of the three aspects (N/S [0/180], E/W [90/270], and diagonals [45/135/225/315]) are averaged.
- The target shade value is the average value in each column (the average of the three aspects), listed as Target %.
- In the load analysis table, for each stream segment listed, enter the target shade values, according to the natural stream width (as listed in the eighth column), into the Potential Shade column (the fourth column).

2.3.3 Load Capacity

Next, for each stream, you will enter solar load values corresponding to each existing and target shade percentage into the load analysis table. These load values are determined by multiplying the solar load recorded on a flat plat collector (under full sun), for a given period of time, by the fraction of the solar radiation that is not blocked by shade. The fraction of solar radiation not blocked by shade is the "percent open," and is equal to 100% minus the "percent shade" (%open = 100% - %shade). In other words, if a shade target level is 60% (or 0.6), then the solar load that would hit the stream (the percent open) under that target is 40% (or 0.4) of the total possible solar load (as recorded on the flat plate collector).

In our TMDL load analyses, we use solar load data recorded on a flat plate collector under full sun (i.e., no portion of the plate is shaded) at the nearest National Renewable Energy Laboratory (NREL) weather station that collects and reports these data.

The existing and target shade values are converted to solar load using the solar load data collected on flat plate collectors. We use only the data from the six-month period from April through September, to coincide with the part of the year that is of interest for a temperature TMDL for the reasons outlined earlier in this manual.

We calculate a six-month average solar load, then determine a conversion factor is derived from the solar load data. We use the conversion factor to convert the six-month average of solar load multiplied by the percent open into the solar load used in this analysis.

We use conversion factors based on data from different NREL stations, as follows.

There are two NREL stations in Idaho, one in Boise and another in Pocatello. Solar load data from these two stations produce six-month average solar radiation conversion factors of 6.38 and 6.15 kilowatt hours per square meter per day (kWh/m2/day), respectively.

- If the stream you are examining is in the Boise region, use the solar radiation conversion factor based on data from the Boise NREL station.
- For streams in the Pocatello region, use the conversion factor based on data from the Pocatello NREL station.
- For streams in the Twin Falls region, we use a hybrid conversion factor that is an average between those from the Boise and Pocatello stations (6.27 kWh/m2/day).
- For streams in northern Idaho (Coeur d'Alene Region and eastern Lewiston Region), use data from the NREL station in Spokane, Washington, and Kalispell, Missoula, or Helena, Montana, that is closest to the stream. These solar load conversion factors vary from 5.5 kWh/m2/day for Kalispell and Missoula to 5.7 kWh/m2/day for Spokane and Helena.
- For streams in the western portions of the Lewiston region, use the conversion factor from the NREL station at Pendleton, Oregon (6.1 kWh/m2/day).
- In the Henry's Lake/Island Park area of eastern Idaho, we may use a hybrid factor based on the factors for the Helena and Pocatello stations.
- In the Salmon River Basin, we may use a hybrid factor based on the factors for the Boise and Missoula stations.

The load capacity for a stream under PNV is essentially the solar load allowed under the shade targets specified for the segments we have delineated within that stream. In the load analysis table, the load capacity is calculated and displayed in the Potential Summer Load column (the third to last column) in the loading table. (This is called a *summer* load because it represents just the six-month period from April to September). We also need to know the amount of the existing load, which is discussed in more detail below, to determine how far off the stream is from its target load or load capacity. The difference between existing and potential solar load, whenever the existing load is greater, is the load reduction necessary to bring the stream back into compliance with water quality standards. This value—the difference between existing and potential load—is found in the second to last column in the load analysis table.

As mentioned previously, the solar loads used are spring through early fall averages so an average load for the six-month period from April through September is used. The effective shade calculations are based on a six-month period from April through September as well. These months coincide with the time of year that stream temperatures are increasing and when deciduous vegetation is in leaf. These six months are a critical time period when elevated temperatures may adversely affect beneficial uses such as spring and fall salmonid spawning and when cold water aquatic life criteria may be exceeded. Late July and early August are when the highest yearly stream temperatures typically occur. Solar gains can affect the highest temperatures reached in the summer, and solar loading affects stream temperatures important to salmonid spawning in both spring and fall. Thus, solar loading in these streams is evaluated from spring (April) to early fall (September).

2.3.4 Estimates of Existing Loads

Existing loads are determined using the estimates of existing shade made by interpreting aerial photograph. As with target shade levels, existing shade levels are converted to solar loads by multiplying the fraction of open stream (percent open) by the solar radiation recorded on a flat plate collector at the closest NREL weather station (or a hybrid representing data from more than one station). Like load capacities (potential loads), existing loads are presented in the load analysis tables on an area basis ($kWh/m^2/day$) and as a total load (kWh/day).

Existing and potential total loads are summed for the entire stream. These total loads are shown at the bottom of their respective columns in each table. Additionally, subtotals can be added for portions of stream examined (such as for Assessment units), in a single load analysis table. The difference between potential load and existing load is also summed for the entire table. For segments where existing load exceeds potential load, this difference is the excess load, which is displayed in the second to last column in the load analysis table. The “Lack of Shade” percentage represents the difference between existing shade and target shade, and is shown in the last column on the right in the load analysis table. An average “Lack of Shade” percentage is calculated at the bottom of that column.

Following is one example of the calculations that you need to perform (or recognize them when performed automatically by the load analysis table) for each stream segment in a load analysis table (see Table 6).

- If a stream segment were experiencing 60% effective shade, then 40% of the solar radiation is reaching the stream surface (on a clear day).
- Forty percent of the average solar load of 6.38 kWh/m2/day (the conversion factor) for the Boise region (substitute other conversion factors depending on region) equals 2.55 kWh/m2/day reaching the stream surface in that segment.
- If the segment were 1000 meters (m) long and 10m wide (area = 10,000 m2), then the existing load to the entire segment would be 25,520 kWh/day (2.552kWh/m2/day x 10,000 m2).

- If the target shade for that same segment were 80%, then only 20% or 12,760 kWh/day should be reaching the stream segment under target conditions (i.e., the potential load, or load capacity, would be 12,760 kWh/day).
- Thus, the segment would lack 20% shade and have an excess solar load of 12,760 kWh/day.

Table 6. Example of Load Calculations in a Load Analysis Table (table has been split for viewing on this page).

Segment Length (meters)	Existing Shade (fraction)	Existing Summer Load (kWh/m^2/day)	Potential Shade (fraction)	Potential Summer Load (kWh/m^2/day)	Potential Load minus Existing load (kWh/m^2/day)
1000	0.6	2.552	0.8	1.276	-1.28

Existing Stream Width (m)	Natural Stream Width (m)	Existing Segment Area (m^2)	Existing Summer Load (kWh/day)	Natural Segment Area (m^2)	Potential Summer Load (kWh/day)	Potential Load minus Existing Load (kWh/day)	Lack of Shade (%)	**Any Stream**
10.00	10.00	10000	25520	10000	12760	-12760	-20	Any Vegetation
	Total	**10,000**	**25,520**	**10,000**	**12,760**	**-12,760**	**-20**	

2.4 Load Allocation

When a temperature TMDL is based on potential natural vegetation, the goal is to achieve the same loading as would exist under background conditions, so the load allocation essentially represents the desire to achieve background conditions. However, in order to reach that goal, load allocations are assigned to nonpoint source activities as one group that have affected or may affect riparian vegetation and shade. Load allocations are therefore stream reach-specific as opposed to being activity-specific, and are dependent upon the target load for a given reach. For each stream, a completed load analysis table shows the target shade percentage (Potential Shade), which is converted to a potential summer heat load (Potential Summer Load). That is the load capacity of the stream and it is the load amount necessary to achieve background conditions. There is no margin for further removal of shade from the stream by any activity without exceeding its load capacity. Additionally, because PNV temperature TMDLs are dependent upon background conditions for achieving water quality standards, all tributaries to the waters examined need to be at natural heat loads in order to prevent excess heat loads to the waters examined.

After completing all the load analysis tables for a TMDL, we use another table to show the total existing, total target, and total excess heat loads (kWh/day) experienced by each water body examined. This table also shows the percentage of the total existing load that is in excess (excess load ÷ total existing load x 100), and the average "Lack of Shade" percentage for each stream. An example of such a table is shown in Table 6. The values in this table (except for % existing that is excess) are the totals and averages obtained from the last row of the load analysis table for each stream examined, and are used to compare streams' load characteristics with each other. The size of a stream influences the size of the excess load. Compared to smaller streams, large streams have greater existing and target loads just by virtue of their larger surface area. These tables are designed to list the tributaries in order of the amount of their excess loads from highest to

lowest; therefore, large tributaries tend to be listed first and small tributaries tend to be listed last (but not always). Of the streams included in the example in Table 6, Marsh Creek is the largest stream (with a target load is over 1.9 million kWh/day, far larger than any other target load in the table) and East Fork (EF) Rock Creek is the smallest.

Table 6. Example of a Table Showing Excess Solar Loads and Percent Reductions Required for All Tributaries.

Water Body	Total Existing Load (kWh/day)	Total Target Load (kWh/day)	Total Excess Load (kWh/day)	% of Existing Load That Is Excess	Average Lack of Shade (%)
Marsh Creek	2,989,840	1,964,516	1,025,324	34	-34
SF Rock Creek	658,087	451,282	206,805	31	-44
EF Rock Creek	249,094	57,452	191,642	77	-57
Howell Canyon	323,083	162,081	161,001	50	-30
Rock Creek	528,114	392,974	135,140	26	-42

Although the overall load analysis focuses on total heat loads for streams in the TMDL, it is important to note that differences between existing shade and target shade, as specified in the last column of each load analysis table and depicted in "Lack of Shade" Figures (discussed below), are the key to successfully restoring waters to conditions that achieve water quality standards.

A certain amount of excess load, and hence, percentage reduction required, is potentially created only by the difference between existing shade and target shade that is inherent in the load analysis. Because existing shade is reported as an integer that represents an entire 10% class interval, but target shade is reported as a specific integer, there is usually a difference between them. To clarify this potential difference, consider these two examples:

- Example1. Say a particular stream segment has a shade target of 86% based on its vegetation type and natural bankfull width. If existing shade for that stream segment were at the target level of 86%, it would only be recorded as 80% existing shade in the load analysis because 86% falls into the 80% existing shade class. In this example, a difference of 6% would be automatically included in the load analysis, even though no difference exists.
- Example 2. On the other hand, if existing shade were only at 80%, not at the target of 86%, then the 6% difference would be real.

To be conservative, these automatically included differences between existing shade (in classes) and specific targets (in integers) are always considered a lack of shade, not an overabundance of shade as they might in fact be (albeit by the small amount of 9% or less).

2.5 Figures Depicting Existing Shade, Target Shade, and Lack of Shade

To depict the shade levels for the different stream segments, we create figures in the layout view in ArcMap. Examining them shows the relationships among the existing, target, and lack of shade percentages determined for the streams in the analysis and can highlight areas where attention may be needed most. Examples are shown in Figure 8, Figure 9, and Figure 10.

Following are the major steps for making these figures.

- Start with the layers already created from the aerial photograph interpretation.
- NOTE: If an assessed subbasin is too large to easily show all the streams in a single figure, make multiple figures with each focused on a different portion of the subbasin
- Include a title stating which subbasin or streams are depicted in the figure should be included.
- Indicate which type of shade level (existing, target, or lack) is depicted – typically, this is included with the legend.
- Add a north arrow, scale bar, and legend for reference.
- It is also important to add labels with the shade percentage values because the colors used to differentiate between separate shade classes may not be easily discernable to all who print or view them.

For existing shade figures (such as the example in Figure 9), the actual aerial photograph can be shown below the assessed streams layer, and field verification site locations can be shown as markers on the layer. For target and lack of shade figures (Figure 8 and Figure 10), the stream layers come from copies of the existing shade layer that have been changed to display either the target or lack of shade values from the attribute table. In our examples, the target and lack of shade figures use a painted relief background for contrast and visual interest rather than the aerial photo.

The displayed target shade levels typically are broken up into five or six groups (e.g., 0% or “NoTarget” or “Dry”, 1 to 40%, 41 to 60%, 61 to 80%, and 81 to 100%, where applicable). Because there can be a large number of specific target values, drawing a unique color for each one can become cumbersome. Aggregating them into groups makes it easier for presentation. Dry sections of stream can be given an arbitrary value like “999” in the attribute table to set them off from the actual shade percentages. In those cases, it is important to make sure the label for these sections is changed from “999” to “dry” and that in the labels showing the exact shade percentage values along the streams, the labels for the dry section are turned off.

The lack of shade layer also typically is broken up into five or six classes (e.g., -100 to -61%, -60 to -41%, -40 to -21%, -20 to -1%, plus “Meets Target” and “Dry”). The “Meets Target” class consists of all the “Lack of Shade” values that are at 0 or greater (e.g., where existing shade meets or exceeds target shade).

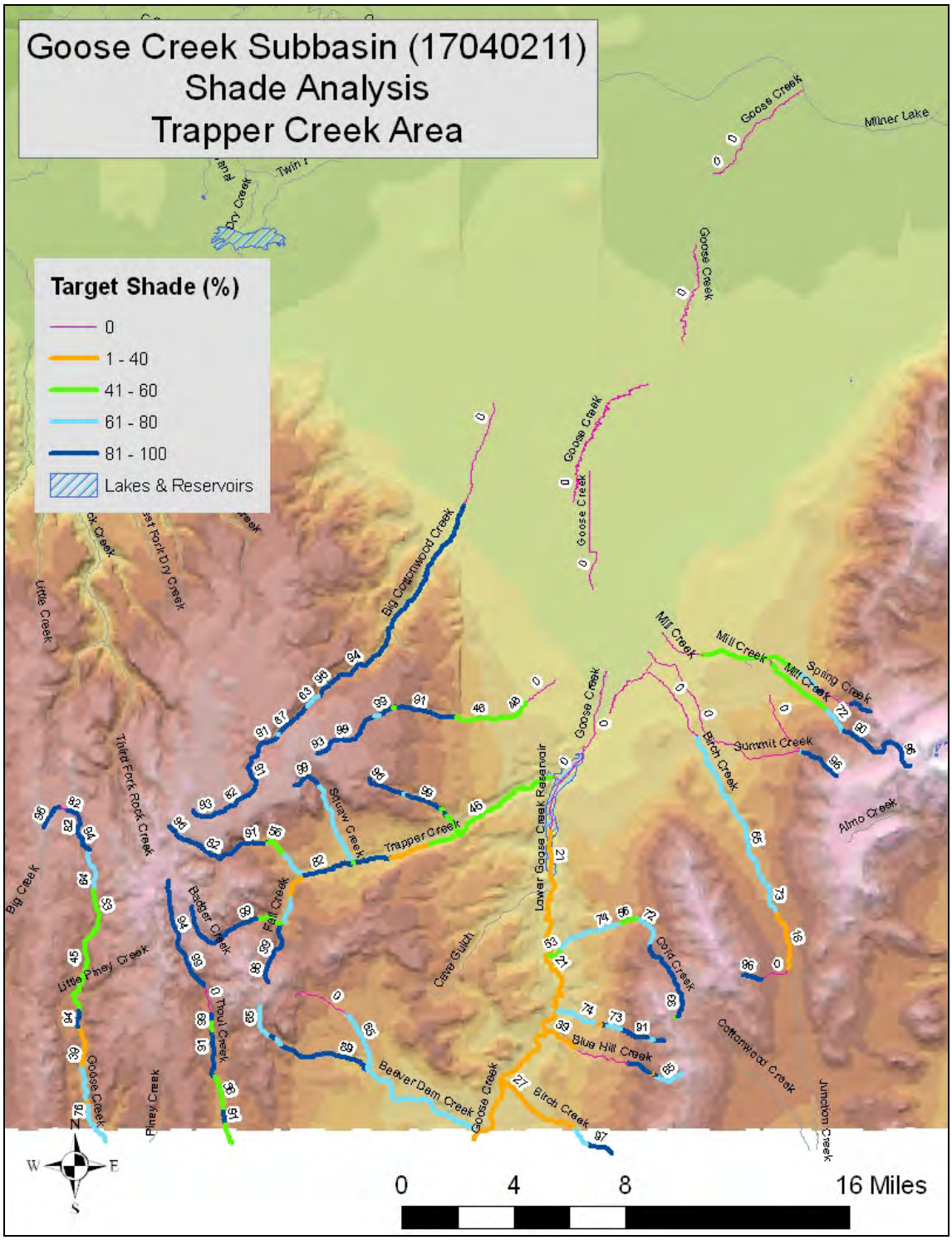


Figure 8. Example Target Shade Figure.

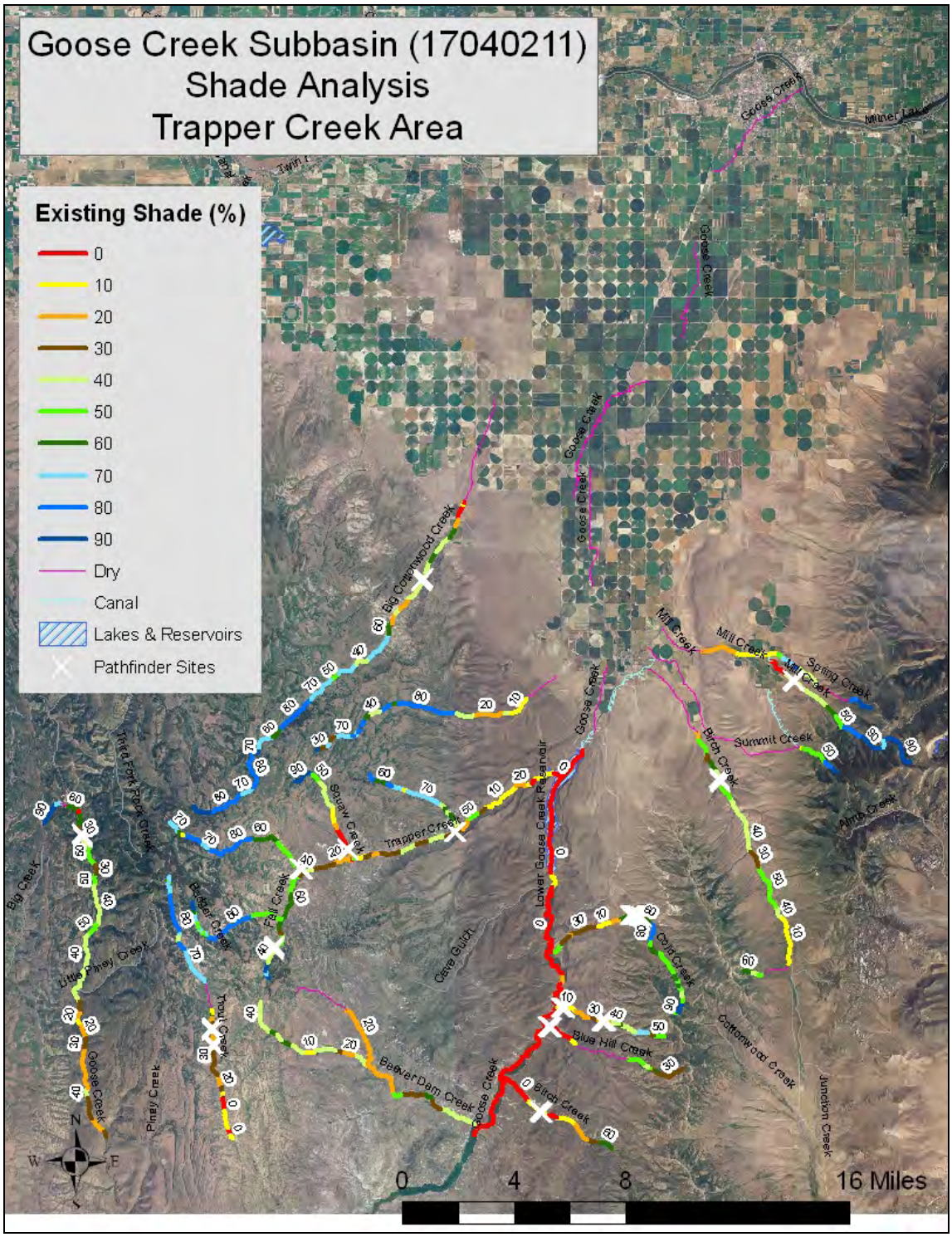


Figure 9. Example Existing Shade Figure.

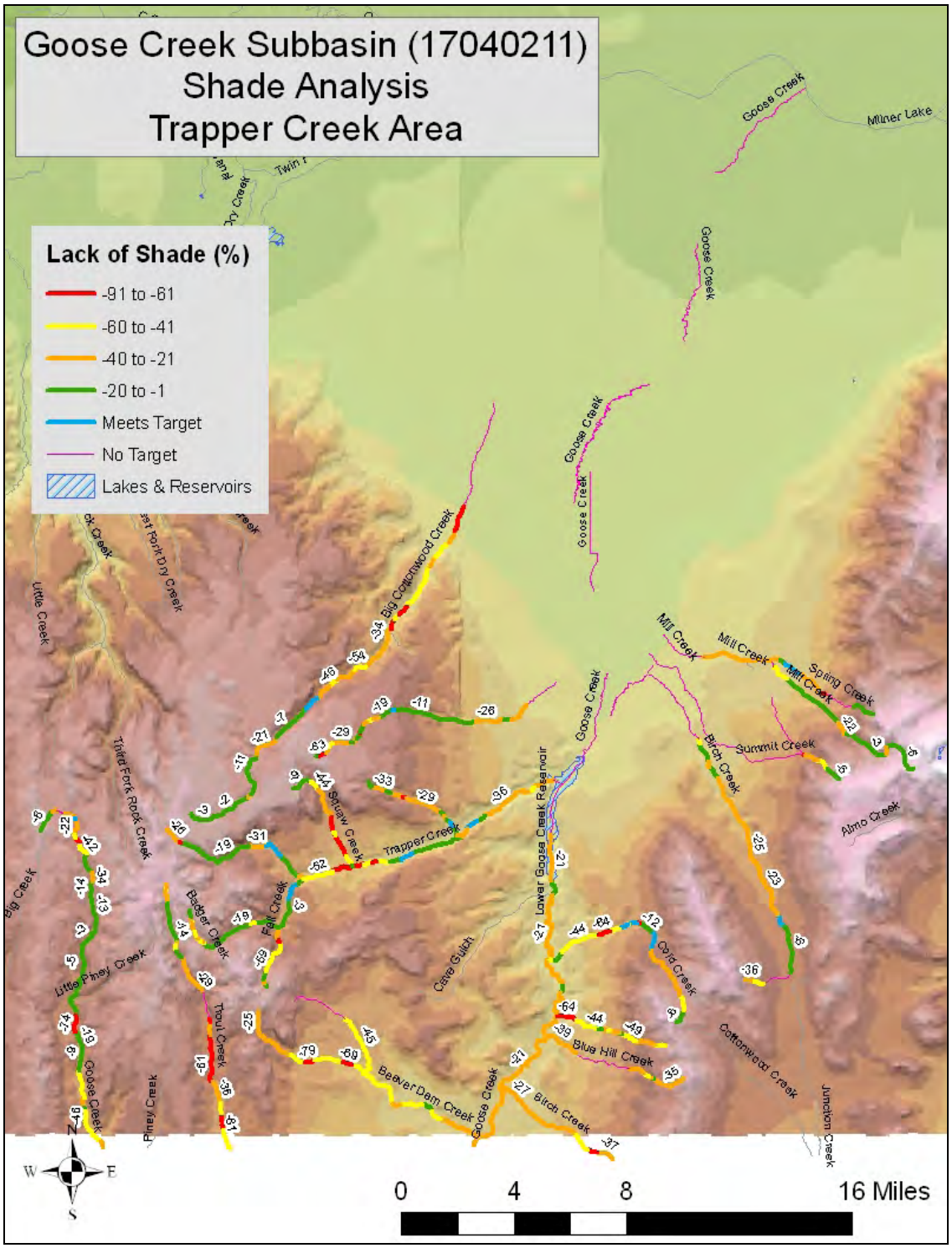


Figure 10. Example Lack of Shade Figure.

3.0 DISCUSSION

These procedures lead to a temperature TMDL for a stream based on thermal loading from a lack of effective shade. They do not necessarily address the myriad of problems associated with flow alteration and its effects on stream temperature. Nor does it address thermal loading to a stream from point source discharges. To date, we have not developed comparable techniques for addressing these other sources of excess heat to a water body.

Many streams have impoundments of various sizes to hold back water for irrigation and/or livestock watering. Certainly the creation of such a reservoir increases the surface area of the water body and exposes more area to solar radiation. However, it is unclear what effects these systems have when withdrawals from them can take place in a variety of ways. Surface withdrawals may take heated water off the top of the reservoir and thus, the downstream segment maybe warmer than normal. Some reservoirs draw from the bottom and thus colder than expected water is added to the downstream component of the stream. The act of restricting flow to the lower channel may also have consequences for water temperatures. Shallow streams with less velocity and volume will likely heat up faster and more when exposed to the same solar load as a deeper, faster moving, larger volume of water. Irrigation water that enters a field and is exposed to the sun and then returned to the stream as return flow will likely carry with it more heat energy. In the absence of individual and intensive study, it may be difficult to know what effects on water temperature are taking place in an individual stream with impoundments and water withdrawals. Currently, the PNV temperature TMDL process only takes into account the additional surface loading to impoundments, but does not penalize their existence with compensatory riparian shade targets.

Beaver ponds are natural impoundments that may have similar effects on stream heating. Many beaver ponds are deeper than stream channels above and below and can contribute cooler water to the downstream segment. Additionally, these ponds raise water tables and increase contact with hyporheic water. They also contribute to habitat complexity and refugia for fish and other aquatic organisms. But beavers can be hard on riparian vegetation, often removing sources of shade from the landscape. And beaver ponds can reduce flows to downstream segments in the short term, while potentially increasing minimum flows later on through retention. Currently, the PNV temperature TMDL does not adequately account for beaver ponds and their effects on stream temperature. Their existence would likely be recorded as a channel widening that reduces existing shade. They would likely be determined as not meeting shade targets, lacking shade, and being potential sources of excess heat loading. Only through the course of the implementation process can they be recognized as a natural phenomenon, one not in need of stream restoration.

Currently, point source discharges to streams in need of a temperature TMDL are essentially required to meet some temperature target, usually based on the water quality standards or some demonstrable background condition. A simple load allocation can be constructed based on effluent and receiving water flow and temperature. For small

discharges to large water bodies, as with any pollutant, the dilution effect can minimize the impact of warmer discharges. However, smaller streams show heating from point source discharges easily, especially during critical fall spawning periods. Municipal wastewater treatment systems receive wastewater from their community already heated by home and business water heaters. These sources of heat are difficult to control and mitigation could involve increased holding time, land application, and other avenues for controlling or dissipating heat.

There are likely other potential sources of heat to streams not addressed here. In the future, as the science of temperature TMDLs evolves, the problems associated with impoundments, withdrawals, and discharges will need to be addressed to accurately reflect the controllable and uncontrollable sources of heat to streams.

4.0 DATA STORAGE

Data used to produce PNV temperature TMDLs needs to be kept in a place that is easily accessible by employees in different offices. For all PNV temperature TMDLs produced by the State Technical Services Office (not including PNV temperature TMDLs produced by Regional Offices), data for existing shade, target shade, and the difference between the two (lack of shade) will be found in an ArcMap project stored on the shared network drive (the G drive if viewed from the state office, or J if viewed from regional offices), in a subfolder labeled with the applicable subbasin name (see G[J]: Technical Services Share/Mark Shumar/*subbasin name*). Also within the subfolder for that subbasin, there will be subfolders labeled Pathfinder, Tables, and Document. Within the Pathfinder folder, the pathfinder photographs from field verification, pathfinder reports, and other photographs of the streams and plant communities can be found. The Tables folder will include Excel tables such as all the load analysis tables for the streams, the table comparing field-verified shade to estimated existing shade, and the bankfull width table. The Document folder will contain the entire PNV temperature TMDL document, along with jpeg files of the figures used in the document. For older TMDLs produced before the Solar Pathfinder Assistant software was used, there are likely pathfinder traces made by hand from field verification sites. These traces exist in a box located in the State Technical Services Office (currently on the third floor of State Office). Also in the Technical Services Office is a file cabinet containing hard copies of documents for each PNV temperature TMDL completed by Technical Services.

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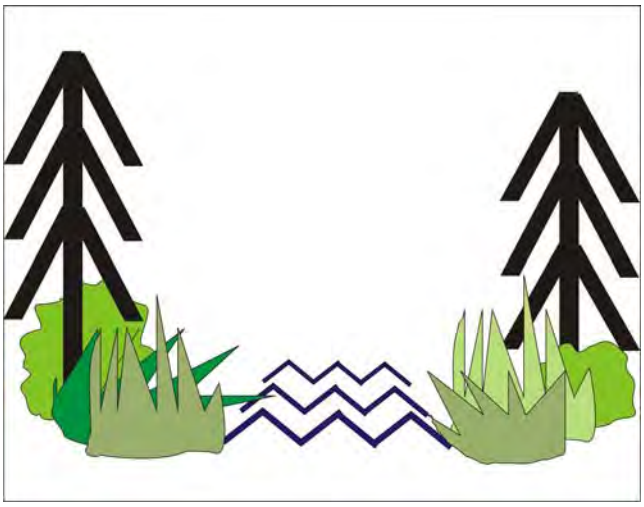
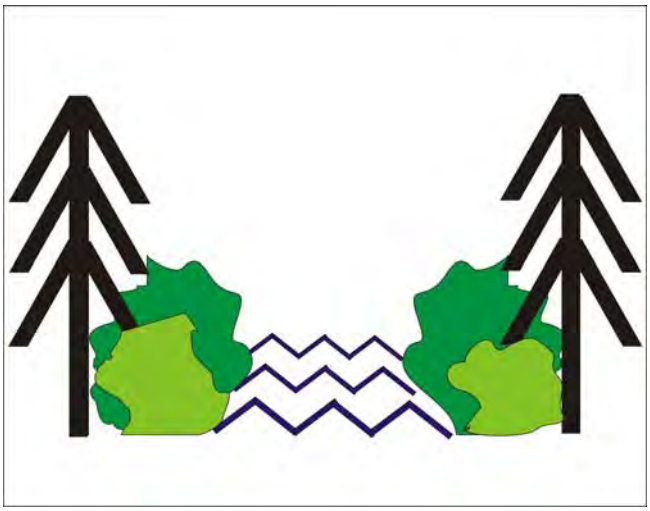
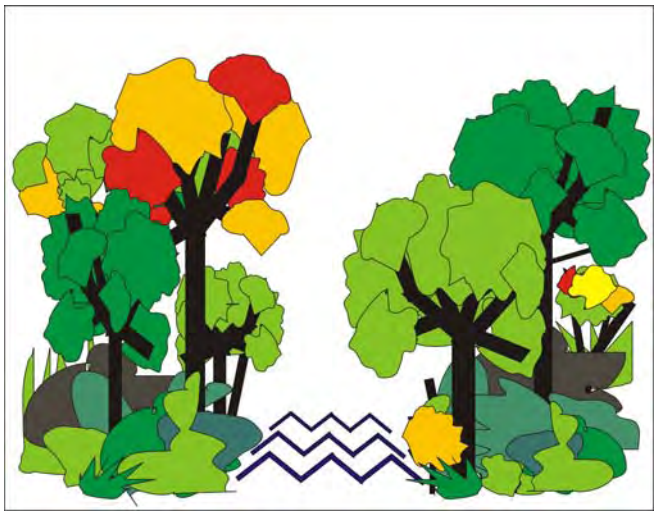
Appendix A. SHADE CURVES for TARGETS







A.1 Shade Curves for Use in Idaho TMDLs, Based on USFS Potential (Historical) Forest Conditions (Prepared by EPA)

Effective Shade Curves

This section of the appendix describes the development of effective shades curves that are most appropriate for use in Idaho TMDLs on forested areas, and also includes all the shade curves discussed along with corresponding solar loading curves. This section is based on National Forest information and conditions and was developed by Peter Leinenbach of the U.S. Environmental Protection Agency (EPA), Region 10 (Seattle).

Introduction –

This memorandum presents estimates of "System Potential" effective shade calculated for forested areas in Idaho (**Figure 1)**. These forested areas are located within two United Forest Service (USFS) Regions:

- United States Forest Service Region 1 - Three National Forests (NF) situated in northern Idaho: 1) Idaho Panhandle National Forest, 2) Clearwater National Forest, and 3) Nez Perce National Forest. The Idaho Panhandle National Forest is comprised of three individual forests: 1) Kaniksu National Forest, 2) Coeur d'Alene National Forest, and 3) St. Joe National Forest.

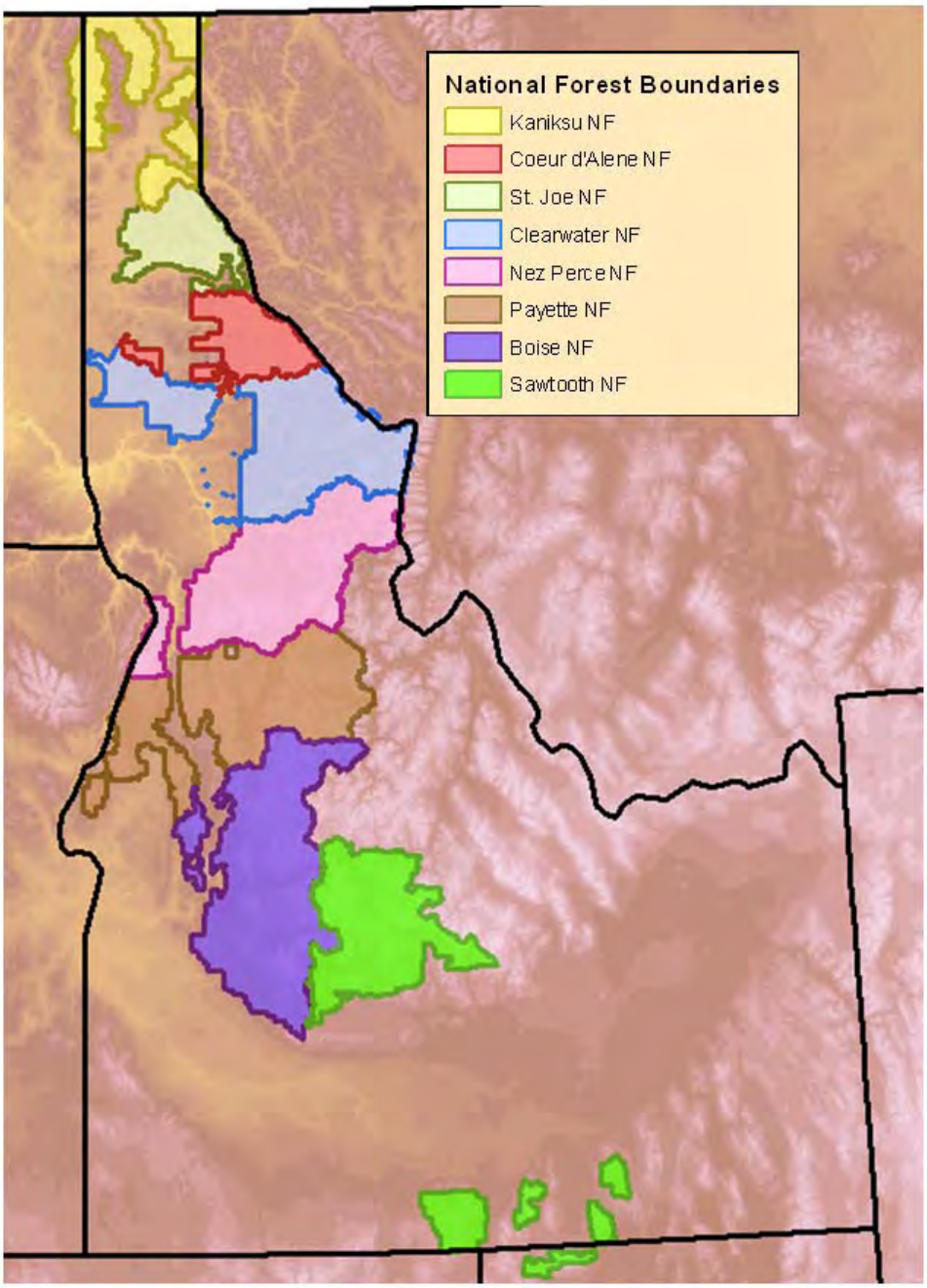
- United States Forest Service Region 4 - The Boise, Payette and Sawtooth National Forests situated in Central Idaho were also included in this effort.

It is important to point out that three National Forests within Idaho were not included in this effort: 1) Salmon-Challis NF, 2) Targhee NF, and 3) Caribou NF. These areas were analyzed by IDEQ staff using slightly different methodologies to calculate "System Potential" effective shade. Those efforts are described in a different document.

USFS estimates of "Historical Range of Variability" (HRV) were utilized during the development of "System Potential" effective shade conditions. HRV is defined as the range of variation in spatial, structural, compositional, and temporal characteristics of ecosystem elements as affected by minor climatic fluctuations and disturbances. This range is measured using a reference period prior to intensive resource use and management. Specifically, the HRV is the baseline for comparison with current forest conditions to assess the degree of past change. Estimates of HRV for the forest were developed by each forest and were recently presented in Forest Plan Revision documents. Links to these originally documents and brief descriptions of these efforts are presented in this memorandum.

This memorandum is divided into two sections. The first part presents the datasets used as input parameters for "System Potential" landcover determination. The second section presents "System Potential Effective Shade" modeling methods and results.

Figure 1. Analysis Area.



Section One – Model Input Datasets

Datasets which describe expected forest vegetation at HRV conditions were obtained from the following Forest Plan Revision documents:

1. Idaho Panhandle NF - www.fs.fed.us/kipz/documents/ams/index.php
2. Clearwater NF and Nez Perce NF - www.fs.fed.us/cnpz/forest/documents/index.shtml
3. Boise, Payette and Sawtooth NF - www.fs.fed.us/r4/sawtooth/arevision/revision.htm.

Spatial Distribution –

Idaho Panhandle National Forest (IPNF) - HRV data was calculated and distributed across the IPNF by four (4) "Assessment Groups" (**Table 1**), calculated from eleven (11) designated Vegetation Response Units[1] (VRU) (**Figure 2**):

- Warm/Dry (Group A) – this setting includes the warmest and driest forest sites that support forest vegetation, usually at low elevations or mid-elevations on southerly aspects.

- Moist (Group B) – this setting includes moist forest sites, usually low to mid-elevation, and includes stream bottoms and adjacent benches and toe slopes. This setting is the most productive, with favorable soil moisture and temperature regimes that favor abundant plant growth.

- Subalpine (Groups C and D) – these settings includes the moist, lower subalpine forest to the cool or cold dry sites between forest and alpine tundra. The moist end of this setting is common on northwest to east-facing slopes, riparian and poorly drained subalpine sites. The cool to cold dry sites occur at higher elevations and typically have a short growing season.

[1] Vegetation Response Units VRUs are aggregations of land having similar capabilities and potentials for management. These ecological units have similar patterns in potential natural communities; soils; hydrologic function; landform and topography; lithology; climate; air quality; and natural processes (nutrient and biomass cycling, succession, productivity, and fire regimes).

Clearwater National Forest and Nez Perce National Forests – Similarly, historical forest conditions were developed for three broad groups in the Clearwater and Nez Perce National Forests. **Table 2** presents the crosswalk illustrating how local landtype associations (LTA) and vegetation response unit (VRU) classification were used to divide each ecosection into three settings (**Figure 3**). Specifically, Bailey's ecosections were used to summarize historic vegetation information, and local land cover classifications were used to divide each section into three settings:

- Breaklands - Breaklands are mostly steep slopes at lower elevations, with warmer temperature regimes.

- Uplands - Uplands are generally above the breaklands in elevation, and have more rolling topography. They tend to be cooler and more mesic than the breaklands.

- Subalpine - The subalpine setting is above the uplands elevationally, with mixed topography, and generally colder temperatures.

Boise, Payette, and Sawtooth National Forests - HRV data was calculated and distributed across the landscape based on Potential Vegetation Zones (PVG) in these forests. The spatial distributions of these zones are presented in **Figure 4** and summary vegetation descriptions for each PVG are presented in **Table 3**.

Forest Species Composition –

Estimates of historic forest vegetation composition for each assessments unit in the Idaho Panhandle, the Clearwater/Nez Perce, and the Boise/Payette/Sawtooth National Forests are presented in **Tables 4, 5, and 6**, respectively. It is important to point out again that Historical Range of Variability (HRV) methodologies were included in the calculation of these values.

Forest Vegetation Size Class Composition –

Estimates of historic size class distribution of forest vegetation for the Idaho Panhandle National Forest, along with the Clearwater and Nez Perce National Forests, and the Boise, Payette and Sawtooth National Forests are presented in **Tables 7**, **8,** and **9** respectively. It is important to point out again that Historical Range of Variability (HRV) methodologies were included in the calculation of these values. Summary conditions associated with each size class group for these forests are presented in **Table 10**.

Forest Vegetation Height -

Tree height conditions for the individual trees which comprise each forest were calculated using a component of the Forest Vegetation Simulator (FVS), which is an individual tree growth and yield model[2]. Tree heights are calculated by the FVS based on size class information provided in **Table 10**. Two variants of this model were used during this analysis

Idaho Panhandle, Clearwater, and Nez Perce National Forests - The "Northern Idaho/Inland Empire" Height-Diameter relationship variants were used to estimate tree heights for forest vegetation in the Idaho Panhandle, Clearwater, and Nez Perce National Forests. Specifically, tree height was calculated as: HT = 4.5 + e^[a + b/(dbh+1)]; where HT is the total tree height in feet, dbh is the tree diameter at breast height, and a and b are species specific coefficients (**Table 11**) and results are presented in **Table 12**[3].

Summary height conditions for each size class group (**Table 13**) was calculated based on three input datasets: 1) species distribution (**Tables 4 and 5**), 2) size class distributions (**Tables 7 and 8**), and 3) calculated height conditions for each individual tree associated with each "Assessment Group" (**Table 12**)[4]. These results are used as input data in the shade model used to calculated "System Potential" effective shade.

Boise, Payette and Sawtooth National Forests - The "Central Idaho" Height-Diameter relationship variants were used to estimate tree heights for forest vegetation in the Boise, Payette and Sawtooth National Forests. Specifically, tree height was calculated as: HT = 4.5 + e^[b_1 + b_2/(DBH+1)] (for vegetation greater than 3.0 dbh), and HT = C_0 + C_1 * DBH (for vegetation less than 3.0 dbh). Where HT is the total tree height in feet, dbh is the tree diameter at breast height (inches), and b_1, b_2, C_0 and C_2 are species specific coefficients (**Table 14**). Results of this analysis are presented in **Table 15**.

Summary height conditions for each size class group (**Table 16**) was calculated based on three input datasets: 1) species distribution (**Table 6**), 2) size class distributions (**Table 9**), and 3) calculated height conditions for each individual tree associated with each "Assessment Group" (**Table 15**)[5]. These results are used as input data in the shade model used to calculated "System Potential" effective shade.

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[2] Obtained from http://www.fs.fed.us/fmsc/fvs/variants/ci.php

[3] dbh conditions utilized with this model were obtained from summary conditions in **Table 10**.

[4] Calculation as a weighted average of the product between vegetation size class distribution and height estimates for the size class groups for each species. The weighting factor is based on the expected species distribution for each "Assessment Group".

[5] Calculation as a weighted average of the product between vegetation size class distribution and height estimates for the size class groups for each species. The weighting factor is based on the expected species distribution for each "Assessment Group".

Forest Canopy Cover Composition –

Estimates of historic canopy cover distribution of forest vegetation for the Boise, Payette and Sawtooth National Forests are presented in **Table 17a**. Specifically, **Table 17a** displays the expected range of canopy closure for the large tree size class associated with Historical Range of Variability (HRV) analysis. Values were summarized into weighted average conditions[6] for each PVG group based on these desired ranges (**Table 17b**).

Historic canopy cover distributions for forest vegetation in the Idaho Panhandle, Clearwater and Nez Perce National Forests were not evaluate during Forest Plan Revision efforts. Fortunately, forest canopy cover distributions were developed from data products associated with the LANDFIRE project[7], developed through a series of expert workshops and a review process that engaged regional experts from around the country. Estimates of "historic" dominate forest vegetation conditions were developed based on "Biophysical Settings"[8] (BpS), which represent the dominate vegetation on the landscape prior to Euro-American settlement and are based on both the current biophysical environment and approximation of the historical disturbance regime (including fire). Numerous Biophysical Settings are located in Northern Idaho, however only a few principal BpS comprise a majority of the land surface area (**Figure 5**). Detailed information for these Biophysical Settings is presented in **Table 18**. Summary conditions presented in **Table 19** were input information in the shade model which was used to calculated "System Potential" effective shade.

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[6] Calculated as a weighted average condition of the reported range in **Table 17a**. For example, PVG 8 has an average of 61 for the "Moderate" group (average of 51 to 71), and an average of 44 for the "High" group (average of 39 to 49%). Because the summation of these two values is 105 (i.e., It is different than 100), the individual values were "weighted" based on there distribution and results are presented in **Table 17b**.

[7] LANDFIRE is a multi-partner project producing consistent and comprehensive maps and data describing vegetation, wildland fuel, and fire regimes across the United States. Data products include layers of vegetation composition and structure, surface and canopy fuel characteristics, and historical fire regimes. www.landfire.gov

[8] *Biophysical Settings (BpS)* - Vegetation response to disturbance vary by ecological or biophysical (BpS) setting. Each biophysical setting has characteristic potential natural communities, soils, hydrologic function, landform and topography, climate, air quality, and natural processes (nutrient and biomass cycling, succession, productivity, and fire regimes). Each setting also includes moisture and temperature gradient, resulting in growing conditions that are more similar within than between each setting.

Section Two – System Potential Landcover Development and Effective Shade Modeling

"System potential landcover" is necessary to achieve “system potential effective shade” and is defined for purposes of this effort as the potential near stream land cover condition which can grow and reproduce on a site, given: climate, elevation, soil properties, plant biology and hydrologic processes. It is also important to point out that “system potential landcover” does not consider management or land use as limiting factors. In essence, system potential is the design condition used in this analysis that meets the water temperature standard by minimizing human-related warming. In other words, it is an estimate of the condition where anthropogenic activities that cause stream warming are minimized. The method used to convert “System potential landcover” conditions to “system potential effective shade” estimates was accomplished through the use of a shade model which has been used in many previous Total Maximum Daily Load Studies[9].

Model input data requirements to develop estimates of “*System Potential Land Cover*” conditions for each “*Assessment Units*” (Tables 1, 2 and 3, and Figures 2, 3 and 4) include detailed descriptions of vegetation composition, including height (**Tables 13** and **16**) and canopy cover (**Tables 17b** and **19**)

Results of this analysis are presented in **Figure 6**.

[9] Developed by the Washington Department of Ecology - www.ecy.wa.gov/programs/eap/models.html

Table 1. VRU/HTG Assessment Groups in the Pend Oreille Basin (KPIZ 2003)	
Assessment Group	**Description**
Group A: VRU 1/HTG 1 (Warm/Dry), VRU 2/HTG 2 (Moderately Warm/Dry), and VRU 3/HTG 3 (Moderately Warm/ Moderately Dry).	This group contains the more warm and dry habitat types with VRU 1 being the warmest and driest to the more moderate conditions of VRU 3. These sites include warm, dry grasslands to moderately cool and dry upland sites. The dry, lower elevation open ridges are composed of mixed Douglas-fir and ponderosa pine in well-stocked and fairly open-grown conditions. Moderately moist, upland sites and dense draws also include larch and lodgepole pine, with lesser amounts of ponderosa pine. Tree regeneration occurs in patches and is largely absent in the understory, particularly in the driest sites. Annual precipitation ranges from 14” to 30”, about 75% of that falling as rain. While the growing season is fairly long, high solar input and moderately shallow soils often result in soils that dry out early in the growing season, which results in low to moderate site productivity.
Group B: VRU 4/HTG 4 (Moderately Warm/Moist), VRU 5/HTG 5 (Moderately Cool/Moist), and VRU 6/HTG 6 (Moderately Cool/Wet).	This group occupies most of the moist sites along benches and stream bottoms. The moderating effects of the inland maritime climate ecologically influence this group. This group includes the more moderate sites of VRU 4 and scattered riparian and wet sites of VRU 6. This group is widespread throughout the forest and has the most biological productivity. Precipitation is moderate to high ranging from 30” to 55” per year.
Group C: VRU 7/HTG 7 (Cool/Moist) and VRU 8/HTG 8 (Cool/Wet).	This group occurs in the moist, lower subalpine forest setting and is common on northwest to east facing slopes, riparian and poorly drained subalpine sites, and moist frost pockets. This landscape is typically bordered by warmer sites (Group B) and cool, drier subalpine sites (Group D). This group includes characteristics of each. Average precipitation is estimated between 35” and 55” per year, less than half as rain. Vegetative productivity is moderate to high as a result of the high moisture-holding capacity and nutrient productivity of loess deposits, adequate precipitation, and a good growing season.
Group D: VRU 9/HTG 9 (Cool/ Moderately Dry), HTG 10 (Cold/Moderately Dry) and HTG 11 (Cold).	This group is typified by cool and moderately dry conditions with moderate solar input. The climate is characterized by a short growing season with early summer frosts. Annual precipitation ranges from 35”-70”, mostly in the form of snow. Due to generally shallow soils (low water holding capacity), slope position, and aspect, soil moisture is often limited during late summer months. It is generally found on rolling, ridges and upper reaches of convex mountain slopes.

Figure 2. Assessment Units in the Idaho Panhandle National Forest.

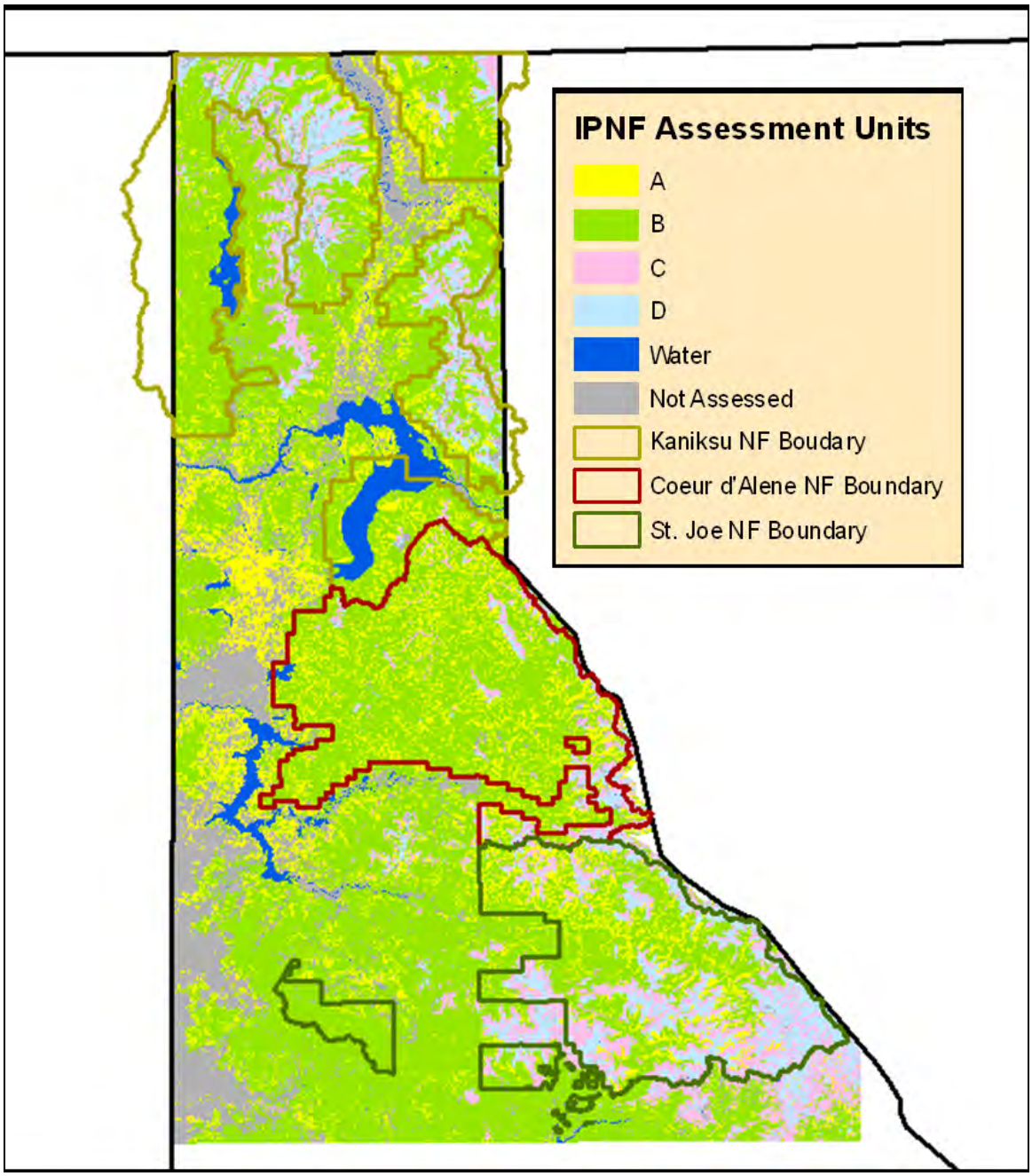


Table 2. CWNF/NPNF Historical Forest Vegetation Size Class Structure Estimates	
Ecosection Setting	
Clearwater NF	
Bitteroot Breaklands	LTA Groups 1, 2, and 3
Bitterroot Uplands	LTA Groups 4 and 5
Bitteroot Subalpine	LTA Groups 6, 7, and 8 North of the Lochsa River
Idaho Batholith Subalpine	LTA Groups 6, 7, and 8 South of the Lochsa River
Nez Perce NF	
Idaho Batholith Breaklands	VRU Groups 3, 8, 12 and 16
Idaho Batholith Uplands	VRU Groups 4, 6, 7, 10 and 17
Idaho Batholith Subalpine	VRU Groups 1, 2, 5 and 9

Figure 3. Assessment Units in the Clearwater and Nez Perce National Forests.

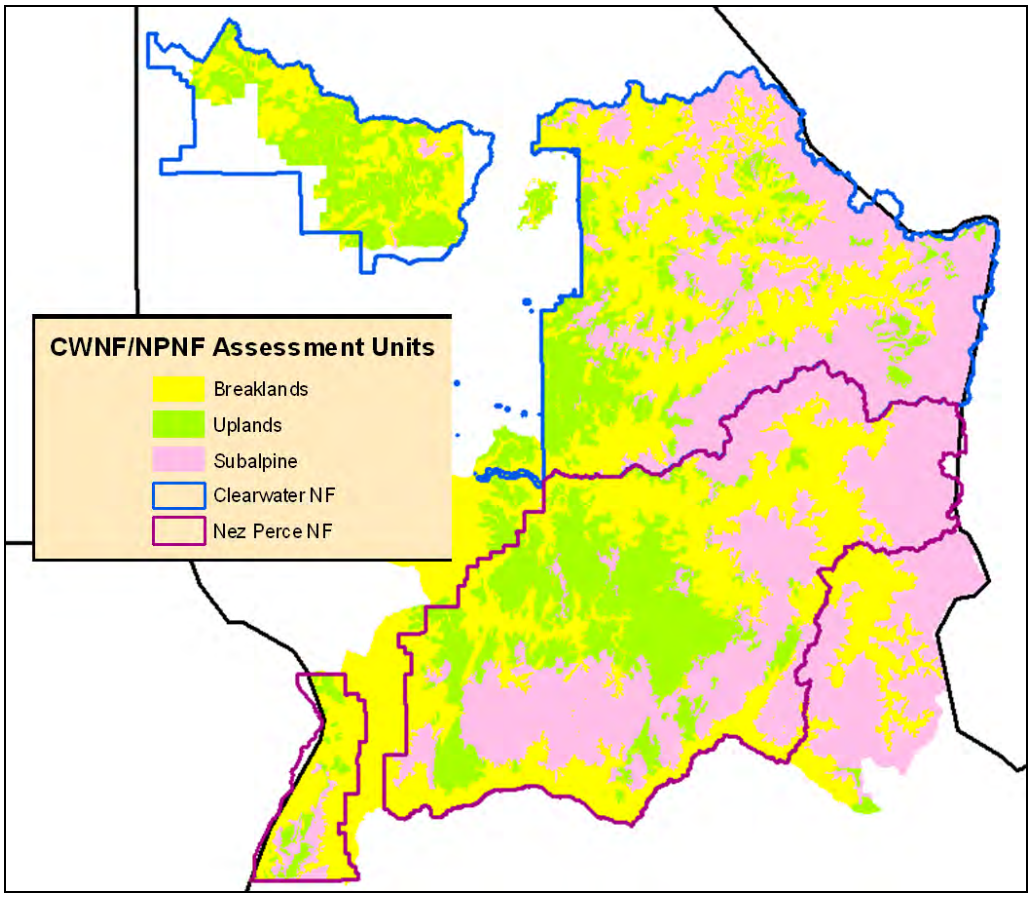


Figure 4. Potential Vegetation Zones for the Boise National Forest

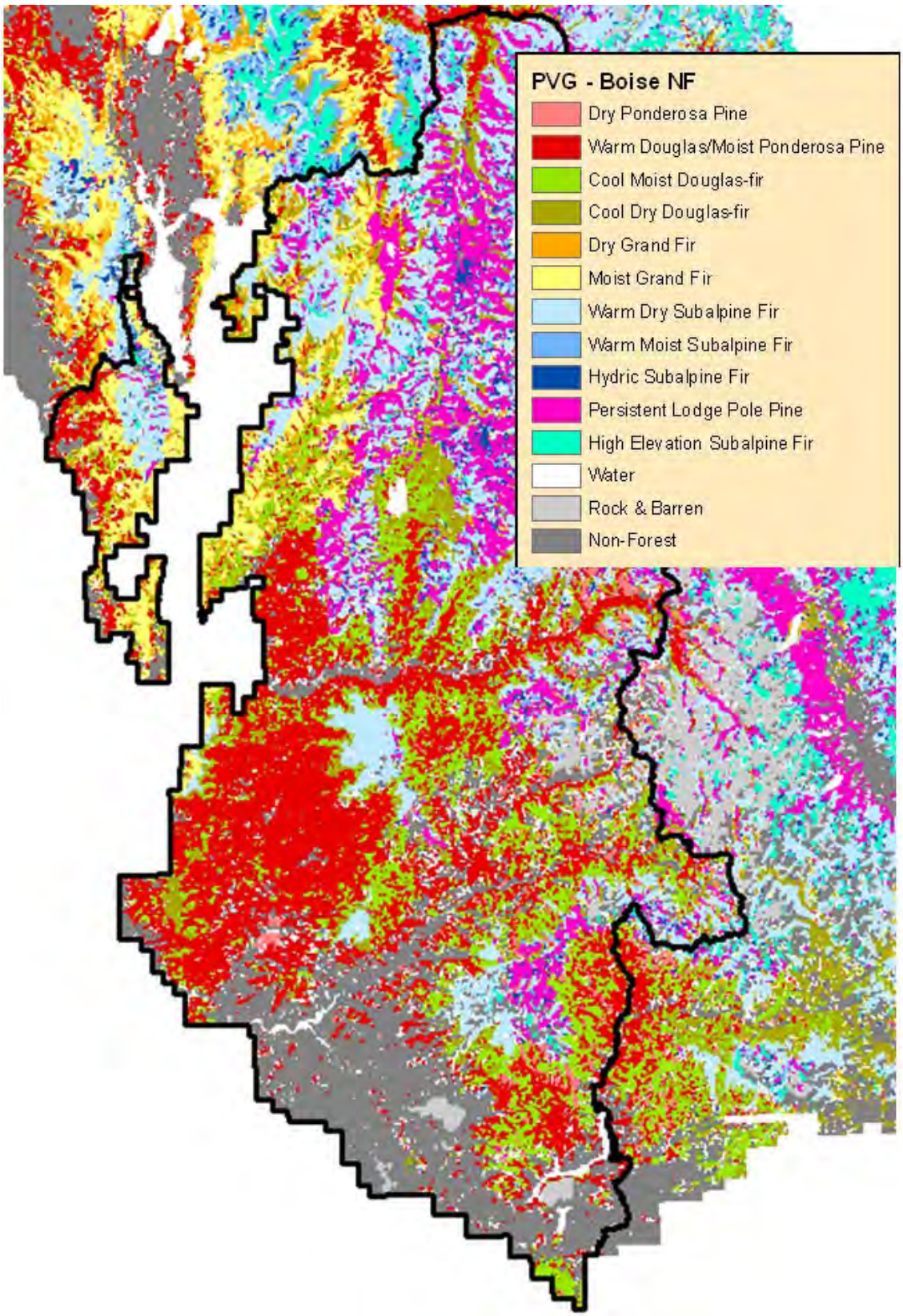


Figure 4 (Continued). Potential Vegetation Zones for the Payette National Forest

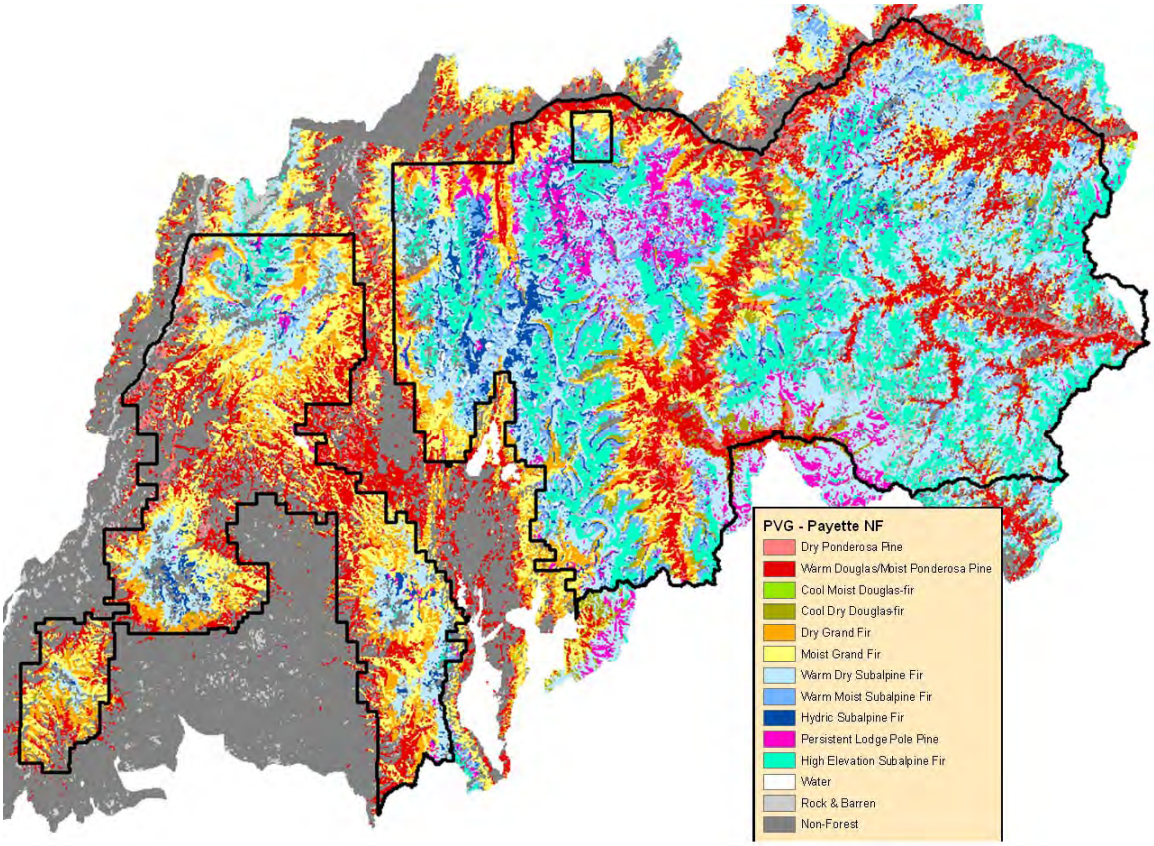


Figure 4 (Continued). Potential Vegetation Zones for the Sawtooth National Forest

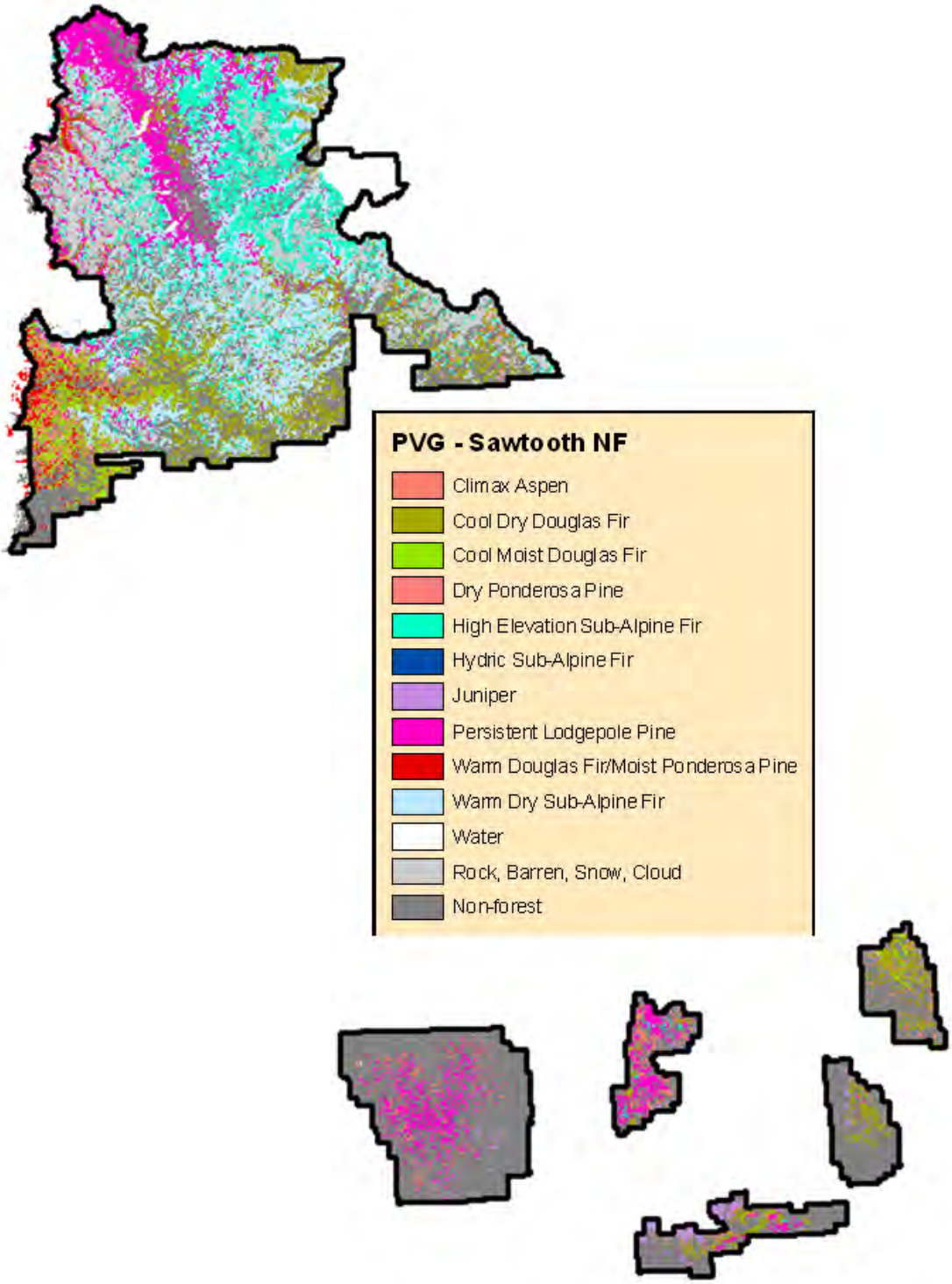


Table 3. Summary Forest Vegetation Descriptions for Potential Vegetation Groups (PVG) in the Boise, Payette and Sawtooth National Forests
PVG 1 – Dry Ponderosa Pine/Xeric Douglas-fir Group
This group represents the warm, dry extreme of the forested zone. Typically this group occurs at lower timberline down to 3,000 feet and up to 6,500 feet on steep, dry, south-facing slopes. Ponderosa pine is a dominant cover type that historically persisted due to frequent nonlethal fire. Under such conditions, open park-like stands of large, old ponderosa pine dominated the area, with occasional Douglas-fir, particularly at higher elevations. Understories are sparse and consist of low to moderately dense perennial grasses or shrubs.
PVG 2 – Warm, Dry Douglas-fir Group
This group represents warm, mild environments at low-to-middle elevations, but may extend upward to 6,500 feet on dry, southerly slopes. Ponderosa pine, particularly at lower elevations, or large ponderosa pine mixed with smaller size classes of Douglas-fir, are the dominant cover types in this group. Historically, frequent nonlethal fire maintained stands of large, park-like ponderosa pine. Douglas-fir would occur on moister aspects, particularly at higher elevations.
PVG 3 – Cool, Moist Douglas-fir Group
This group represents the cooler extremes in the Douglas-fir zone. The group can extend from 6,800 feet down to 4,800 feet following cold air. Adjacent sites are often subalpine fire. Some areas support grand fir. Ponderosa pine occurs as a minor seral species only in the warmest extremes of the group. In cold air areas, particularly where cold air accumulates to form frost pockets, lodgepole pine may dominate. In some areas, Douglas-fir in the only species capable of occupying the site. The conifer cover types that historically dominated are a combination of several factors including fire frequency and intensity, elevation, and topography. Understories in this group are primarily shrub species. Historical fire regimes were mixed, creating a diversity of vegetative combinations.
PVG 4 – Cool, Dry Douglas-fir Group
Douglas-fir is the only species that occurs throughout the entire range of the group. Lodgepole pine may be found in the areas with cold air. Quaking aspen is also a common early seral species. Where is common, it occurs at lower elevations in areas that are beyond the extent of ponderosa pine. Understories are sparse due to the cool, dry environment.
PVG 5 – Dry Grand Fir Group
The dry Grand Fir Group is found throughout the distribution of grand fire. This group is found on the Boise and Payette National Forests, and it not present in the Sawtooth National Forest. It ranges from 4,300 to 6,400 feet in elevation, often on drier upper slopes and ridges. Ponderosa pine and Douglas-fir are common cover types that appear to have been maintained by fire regimes, with open park-like stands of large ponderosa pine. Mixed species stands were likely restricted to small micro-sites that burned less frequently. Understories are similar to PVG 2.
PVG 6 – Moist Grand Fir Group
This group ranges in elevation from 3.400 to 6,500 feet and represents more moist environments in the grand fir zone. This group is only found on the Boise and Payette National Forests (It is not present in the Sawtooth National Forest). It often occurs adjacent to dry grand fire, and the two may intermix with each other depending on topography. Ponderosa pine is common at the drier extremes of the group, and lodgepole pine occurs in colder areas. Western larch may also be present as a early seral species. Cover type of Douglas-fir and Engelmann spruce also occur in this group. Understories in this group are shrubby and conspicuous herb layer is also common.

Table 3 (Continued). Summary Forest Vegetation Descriptions for Potential Vegetation Groups (PVG) in the Boise, Payette and Sawtooth National Forests
PVG 7 – Warm, Dry Subalpine Fir Group
This group is common. It represents warmer, drier environmental in the subalpine fir zone. Elevations range form 4,800 to 7,500 feet. Douglas-fir is the most common cover type throughout the group. Ponderosa pine may be found at the warmest extremes, particularly where this group grade into the Douglas-fir (in all three forests) or into the grand fir zone in the Boise and Payette National Forests. Lodgepole pine or Englemann spruce may occur at cool, moist extremes within this PVG in the Boise and Payette National Forests, but they rarely dominate. In the Sawtooth National Forest, lodgepole pine may dominate as a persistent seral species.
PVG 8 – Warm, Moist Subalpine Fir Group
This group occurs primarily in the Payette National Forest, and is only a minor/rare component in the Boise and Sawtooth National Forests. Elevations range from 5,00 to 7,200 feet but may follow cooler air down to 4,500 feet. This group occurs on moist, protected areas such as stream terraces, to slopes, and steep, northerly aspects. Cover types include lodgepole pine, western larch, Douglas-fir, and Engelmann spruce. The presence of these and combinations depend on site conditions and past disturbances. Dense shrubs are common in the understory.
PVG 9 – Hydric Subalpine Fir Group
This group does not occur in the Sawtooth National Forest, as conditions are generally too dry. In addition, this group is only a minor component in the Boise National Forest. Seasonally high water tables control this group and the extent may be small in some areas depending on the presence of these conditions. Elevations range from 9,000 to as low as 4,500 feet in frost pockets and along cold air drainages. This group most commonly occurs on wet toe slopes, stream terraces, seep areas, and old bogs. Cover types are lodgepole pine, followed by Engelmann spruce and subalpine fire. Early seral conditions usually support lodgepole pine because this species can tolerate intermittent high water tables and cold air that accumulates In severe frost-prone areas, lodgepole pine can persist for long periods. In other areas with better cold air drainage, Englemann spruce and subalpine fir rapidly establish under the lodgepole pine. Understories in this group are primarily dominated by herbs and grasses.
PVG 10 – Persistent Lodgepole Pine Group
This group is common throughout the subalpine fire zone. It represents cold, dry subalpine fire sites that range in elevation from over 9,200 down to 5,200 feet in frost-pockets. Lodgepole pine is the dominate cover type, through small amounts of their species may occasionally occur. Understories can be sparse.
PVG 11 – High Elevation Subalpine Fir Group
This group occurs at the highest elevations of the subalpine fir zone and generally represents the upper timberline conditions. It often grades into krummholz or alpine communities. Whitebark pine is a major seral species in this group. Engelmann spruce and subalpine fire are the climax co-dominates. In some areas, whitebark pine serves as a cover for Engelmann spruce-subalpine fire establishment. Understories are primarily forbs and grasses tolerant of freezing temperature that can occur any time during the growing season.

Table 4. IPNF Historical Forest Vegetation Composition Estimates									
Assessment Group	**PP**	**WP**	**WL**	**DF**	**GF/WH**	**WRC**	**LP**	**SAF**	**WBP**
Kaniksu NF									
Warm/Dry (Group A)	67%	- -	10%	15%	- -	- -	8%	- -	- -
Moist (Group B)	1%	39%	27%	13%	5%	7%	4%	5%	- -
Cool/Moist (Group C)	- -	13%	12%	1%	- -	- -	12%	63%	- -
Cool/Dry (Group D)	- -	- -	- -	- -	- -	- -	18%	63%	19%
Coeur d'Alene NF									
Warm/Dry (Group A)	33%	- -	5%	60%	- -	- -	2%	- -	- -
Moist (Group B)	1%	56%	10%	20%	7%	2%	4%	- -	- -
Cool/Moist (Group C)	- -	20%	3%	5%	- -	- -	13%	59%	- -
Cool/Dry (Group D)	- -	- -	- -	- -	- -	- -	22%	66%	12%
St. Joe NF									
Warm/Dry (Group A)	22%	- -	10%	67%	- -	- -	1%	- -	- -
Moist (Group B)	2%	40%	20%	11%	10%	8%	9%	- -	- -
Cool/Moist (Group C)	- -	11%	12%	5%	- -	- -	20%	52%	- -
Cool/Dry (Group D)	- -	- -	- -	- -	- -	- -	25%	60%	15%

Table 5. CWNF/NPNF Historical Forest Vegetation Composition Estimates							
Assessment Group	**PP[10] Mix**	**DF**	**LP**	**WL/ DF**	**WP (GF/C)**	**S-F Mix**	**SAF (w/WBP)**
Clearwater NF							
Breaklands (Warm/Dry)	13%	15%	- -	15%	28%	28%	- -
Uplands (Mesic)	9%	5%	- -	37%	29%	20%	- -
Subalpine (Cold) North of Lochsa River (Bailey's Ecosection M333)	- -	- -	31%	23%	5%	18%	23%
Subalpine (Cold) South of Lochsa River (Bailey's Ecosection M332)	- -	- -	48%	2%	- -	16%	34%
Nez Perce NF							
Breaklands (Warm/Dry)	36%	29%	14%	5%	6%	3%	- -
Uplands (Mesic)	24%	27%	22%	5%	14%	3%	- -
Subalpine (Cold) (Bailey's Ecosection M332)	- -	26%	26%	3%	- -	7%	33%

[10] Descriptions of these vegetation groups were obtained from the document "Historical Vegetation Types of the Interior Colombia River Basin" USFS, J. Losensky, 1994. For purposes of calculating system potential landcover estimates, the following rule set was used to summarize vegetation groups – Use dominate vegetation as defined by greater than 50%, and if no dominate vegetation presented than use an average condition of described vegetation. **PP-Mix** – (CT2) In northern Idaho 25% (or more) by volume was ponderosa pine. **DF** – (CT3) In northern Idaho 60% or more by volume is Douglas fir. Associates on warmer sites are ponderosa pine, on moist site are lodgepole pine, larch, grand fir, western red cedar, and Englemann spruce, subalpine fir, and lodgepole pine on upper elevation sites. **LP** – (CT7) In Idaho stands contain 50% or more lodgepole pine by volume. Grand fir, Engelmann spruce, Douglas-fir, white pine and larch are the most common associates. **WL/DF** – (CT5) In Idaho stands of 75% (or more) is larch–fir (by volume). The type is typically on slightly drier sites than the white pine type and usually fewer species are present. Occasionally grand fir is a major component. **WP (GF/C)** – (CT6) In Idaho it is stands with at least 15% or more by volume white pine. White pine generally made up more than a third of the stand volume with extremes in the 80% level. Common associates ware Douglas-fir, larch, and grand fir with variable amounts of spruce, red cedar and hemlock. **S-F Mix** – (CT8) In Idaho stands contain 50% or more Englemann spruce by volume with less than 15% white pine. Subalpine fir, was common component along with grand fir, lodgepole pine and minor amounts of Douglas-fir. **SAF (w/WBP)** – (CT9) Principal components are subalpine fir, mountain hemlock, Shasta rid fir, lodgepole pine, whitebark pine, western white pine, and alpine larch.

Table 6. Boise, Payette and Sawtooth National Forests Vegetation Composition Summary Conditions[11].

Assessment Group	Aspen	LP	PP	WL	WBP	DF	ES	GF	SAF
PVG 1	--	--	99%	--	--	1%	--	--	--
PVG 2	--	--	87%	--	--	13%	--	--	--
PVG 3	6%	--	34%	--	--	59%	--	--	--
PVG 4	9%	15%	--	--	--	76%	--	--	--
PVG 5	--	--	87%	1%	--	12%	--	1%	--
PVG 6	--	3%	34%	23%	--	21%	1%	17%	2%
PVG 7	9%	38%	--	--	--	31%	4%	--	18%
PVG 8	--	30%	--	13%	--	30%	14%	--	14%
PVG 9	--	35%	--	--	--	--	32%	--	33%
PVG 10	--	100%	--	--	--	--	--	--	--
PVG 11	--	23%	--	--	42%	--	11%	--	25%

[11] Calculated as the weighted average of the average for reported values (Values are presented below).

Historical Forest Vegetation Composition in the Boise, Payette and Sawtooth National Forests.

Assessment Group	Aspen	LP	PP	WL	WBP	DF	ES	GF	SAF
PVG 1	--	--	96 – 99	--	--	0 – 2	--	--	--
PVG 2	--	--	81 – 87	--	--	10 – 16	--	--	--
PVG 3	1 – 11	--	26 – 41	--	--	47 – 69	--	--	--
PVG 4	4 – 13	10 – 20	--	--	--	66 – 81	--	--	--
PVG 5	--	--	80 – 88	0 – 1	--	7 – 17	--	0 – 1	--
PVG 6	--	1 – 5	23 - 41	15 – 29	--	15 – 25	0 – 2	9 - 23	0 – 3
PVG 7	6 - 11	28 – 42	--	--	--	24 – 34	3 – 5	--	12 – 21
PVG 8	--	25 – 34	--	9 - 16	--	23 - 37	10 – 17	--	11 – 17
PVG 9	--	29 – 37	--	--	--	--	28 - 33	--	29 – 33
PVG 10	--	82 – 94	--	--	--	--	--	--	--
PVG 11	--	18 - 25	--	--	32 - 47	--	8 - 13	--	18 – 29

Table 7. IPNF Historical Forest Vegetation Size Class Structure Estimates						
Assessment Group	**% of Area**	**Shrub/Seed/ SAP**	**Small/ Pole**	**Medium/ Immature**	**Large/ Mature**	**"Oldest"**
Kaniksu NF						
Warm/Dry (Group A)	11%	21%	10%	13%	16%	41%
Moist (Group B)	62%	22%	13%	22%	22%	20%
Cool/Moist (Group C)	19%	21%	12%	22%	24%	21%
Cool/Dry (Group D)	7%	22%	13%	22%	23%	20%
Coeur d'Alene NF						
Warm/Dry (Group A)	14%	21%	16%	16%	22%	25%
Moist (Group B)	77%	21%	12%	21%	25%	21%
Cool/Moist (Group C)	5%	20%	12%	22%	26%	20%
Cool/Dry (Group D)	4%	22%	13%	22%	25%	18%
St. Joe NF						
Warm/Dry (Group A)	4%	25%	22%	23%	18%	12%
Moist (Group B)	54%	20%	12%	20%	26%	22%
Cool/Moist (Group C)	29%	20%	18%	21%	22%	19%
Cool/Dry (Group D)	12%	22%	21%	19%	20%	18%

Table 8. CWNF/NPNF Historical Forest Vegetation Size Class Structure Estimates					
Assessment Group	**% of Area**	**Shrub/Seed/ Sap**	**Small/ Pole**	**Large/ Mature**	**"Oldest"**
Clearwater NF					
Breaklands (Warm/Dry)	34%	21%	22%	21%	37%
Uplands (Mesic)	17%	23%	21%	19%	37%
Subalpine (Cold) North of Lochsa River	28%	27%	23%	21%	29%
Subalpine (Cold) South of Lochsa River	21%	18%	32%	29%	21%
Nez Perce NF					
Breaklands (Warm/Dry)	37%	13%	24%	27%	37%
Uplands (Mesic)	23%	16%	27%	27%	30%
Subalpine (Cold)	41%	18%	32%	29%	21%

Table 9. Historical Forest Vegetation Size Class Distribution Summary Conditions in the Boise, Payette and Sawtooth National Forests.				
Assessment Group	Sapling	Small	Medium	Large
PVG 1	11%	16%	27%	46%
PVG 2	5%	14%	23%	58%
PVG 3	10%	29%	39%	22%
PVG 4	11%	26%	43%	20%
PVG 5	4%	13%	18%	65%
PVG 6	9%	27%	37%	27%
PVG 7	16%	24%	39%	20%
PVG 8	18%	27%	35%	20%
PVG 9	16%	23%	31%	30%
PVG 10	15%	46%	19%	20%
PVG 11	16%	23%	41%	20%

Table 10. Summary size class information associated with Range of Variability Analysis

Summary Information							Target		
IPNF[12]			CWNF/NPNF[13]		BNF/PNF/SNF[14]		IPNF	CWNF NPNF	BNF PNF SNF
Size Class	Year Class	dbh	Size Class	Year Class	Size Class	dbh	dbh	dbh	dbh
Seed/Sap	0 - 40	0–5	0 – 6" dbh	1 - 40	Seed/Sap	0.1 – 5	3"	3"	3"
Small	40 – 70	5–10	6 – 14" dbh	41 – 100	Small	5 – 12	8"	10"	9"
Medium	70 - 100	10–15	- -	- -	Medium	12 – 20	13"	- -	16"
Large	100 +	> 15	Mature	101 - 150	Large	> 20	19"	19"	24"
"Oldest"[15]	- -	- -	Over-mature	150 +	- -	- -	24"	24"	- -

[12] Source - http://www.fs.fed.us/kipz/documents/plmp/CER/documents/Appendix_B.pdf

[13] Source - http://www.fs.fed.us/cnpz/forest/documents/sup_docs/forveg_050106_hrv_overview.htm

[14] Source - Obtained from Appendix A of the Final Forest Plan Revision for the Boise, Payette, and Sawtooth National Forests (http://www.fs.fed.us/r4/sawtooth/arevision/revision.htm).

[15] This category was described and presented in Table 7 but was not separated out in the summary discussion associated with the IPNF Range of Variability Analysis documentation. This class is assigned the same value as the NPNF "Over-mature" category.

Table 11. Coefficients for the height-diameter relationship equation in the NI Variant.		
Common Name	Coefficient a	Coefficient b
Western white pine	5.19988	-9.26718
Western larch	4.97407	-6.78347
Douglas-fir	4.81519	-7.29306
Grand fir	5.00233	-8.19365
Western hemlock	4.97331	-8.19730
Western red cedar	4.89564	-8.39057
Lodgepole pine	4.62171	-5.32481
Engelmann spruce	4.92190	-8.30289
Subalpine fir	4.76537	-7.61062
Ponderosa pine	4.92880	-9.32795
Mountain hemlock	4.77951	-9.31743
Whitebark pine	4.97407	-6.78347
Limber pine	4.19200	-5.16510
Subalpine larch	4.76537	-7.61062
Pinyon pine	4.19200	-5.16510
Rocky Mountain Juniper	4.19200	-5.16510
Pacifice Yew	4.19200	-5.16510
Quaking Aspen	4.44210	-6.54050
Cottonwood	4.44210	-6.54050
Rocky Mountain maple	4.44210	-6.54050
Paper birch	4.44210	-6.54050
Other hardwoods	4.44210	-6.54050
Other softwoods	4.77951	-9.31743

Table 12. Height (feet) based on Height-Diameter Relationships in the NI Variant.

Common Name	dbh (Inches)					
	3	8	10	13	19	24
Western white pine	22	69	83	98	119	130
Western larch	31	73	83	94	108	115
Douglas-fir	24	59	68	78	90	97
Grand fir	24	64	75	87	103	112
Western hemlock	23	63	73	85	100	109
Western red cedar	21	57	67	78	92	100
Lodgepole pine	31	61	67	74	82	87
Engelmann spruce	22	59	69	80	95	103
Subalpine fir	22	55	63	73	85	91
Ponderosa pine	18	54	64	75	91	100
Mountain hemlock	16	47	56	66	79	87
Whitebark pine	31	73	83	94	108	115
Limber pine	23	42	46	50	56	58
Subalpine larch	22	55	63	73	85	91
Pinyon pine	23	42	46	50	56	58
Rocky Mountain Juniper	23	42	46	50	56	58
Pacific Yew	23	42	46	50	56	58
Quaking Aspen	21	46	51	58	66	70
Cottonwood	21	46	51	58	66	70
Rocky Mountain maple	21	46	51	58	66	70
Paper birch	21	46	51	58	66	70
Other hardwoods	21	46	51	58	66	70
Other softwoods	16	47	56	66	79	87

Table 13. Vegetation Height Summary Condition for Kaniksu National Forest.					
	Vegetation Size Class Groups				
Alpha Code – Common Name	*Sapping*	*Small*	*Medium*	*Large*	*Oldest*
Group A (Warm/Dry)					
PP - Ponderosa Pine	2.5	3.6	6.6	9.8	27.4
WP - Western White Pine	- -	- -	- -	- -	- -
WL - Western Larch	0.7	0.7	1.2	1.7	4.7
DF - Douglas Fir	0.8	0.9	1.5	2.2	5.9
GF/WH - Grand Fir/ Western Hemlock	- -	- -	- -	- -	- -
WRC - Western Red Cedar	- -	- -	- -	- -	- -
LP - Lodgepole Pine	0.5	0.5	0.8	1.1	2.8
SAF - Subalpine Fir	- -	- -	- -	- -	- -
WBP - White Bark Pine	- -	- -	- -	- -	- -
Group A Height Sub-Totals	4.5	5.7	10.1	14.7	40.9
Total					**76**
Group B (Moist)					
PP - Ponderosa Pine	0.0	0.1	0.2	0.2	0.2
WP - Western White Pine	1.9	3.5	8.4	10.2	10.1
WL - Western Larch	1.8	2.5	5.6	6.4	6.2
DF - Douglas Fir	0.7	1.0	2.2	2.6	2.5
GF/WH - Grand Fir/ Western Hemlock	0.3	0.4	0.9	1.1	1.1
WRC - Western Red Cedar	0.3	0.5	1.2	1.4	1.4
LP - Lodgepole Pine	0.3	0.3	0.7	0.7	0.7
SAF - Subalpine Fir	0.2	0.4	0.8	0.9	0.9
WBP - White Bark Pine	- -	- -	- -	- -	- -
Group B Height Sub-Totals	5.6	8.7	20.0	23.5	23.1
Total					**81**

Table 13 (Continued). Vegetation Height Summary Condition for Kaniksu NF.					
	Vegetation Size Class Groups				
Alpha Code – Common Name	*Sapping*	*Small*	*Medium*	*Large*	*Oldest*
Group C (Cool/Moist)					
PP - Ponderosa Pine	- -	- -	- -	- -	- -
WP - Western White Pine	0.6	1.1	2.8	3.7	3.5
WL - Western Larch	0.8	1.0	2.5	3.1	2.9
DF - Douglas Fir	0.1	0.1	0.2	0.2	0.2
GF/WH - Grand Fir/ Western Hemlock	- -	- -	- -	- -	- -
WRC - Western Red Cedar	- -	- -	- -	- -	- -
LP - Lodgepole Pine	0.8	0.9	2.0	2.4	2.2
SAF - Subalpine Fir	2.9	4.1	10.1	12.8	12.0
WBP - White Bark Pine	- -	- -	- -	- -	- -
Group C Height Sub-Totals	5.1	7.2	17.5	22.2	20.9
Total					**73**
Group D (Cool/Dry)					
PP - Ponderosa Pine	- -	- -	- -	- -	- -
WP - Western White Pine	- -	- -	- -	- -	- -
WL - Western Larch	- -	- -	- -	- -	- -
DF - Douglas Fir	- -	- -	- -	- -	- -
GF/WH - Grand Fir/ Western Hemlock	- -	- -	- -	- -	- -
WRC - Western Red Cedar	- -	- -	- -	- -	- -
LP - Lodgepole Pine	1.2	1.4	2.9	3.4	3.1
SAF - Subalpine Fir	3.1	4.5	10.1	12.3	11.5
WBP - White Bark Pine	1.3	1.8	3.9	4.7	4.4
Group D Height Sub-Totals	5.6	7.7	16.9	20.4	19.0
Total					**70**

Table 13 (Continued). Vegetation Height Summary Condition for Coeur d'Alene NF.					
	Vegetation Size Class Groups				
Alpha Code – Common Name	*Sapping*	*Small*	*Medium*	*Large*	*Oldest*
Group A (Warm/Dry)					
PP - Ponderosa Pine	1.2	2.8	4.0	6.6	8.2
WP - Western White Pine	- -	- -	- -	- -	- -
WL - Western Larch	0.3	0.6	0.7	1.2	1.4
DF - Douglas Fir	3.1	5.7	7.5	11.9	14.5
GF/WH - Grand Fir/ Western Hemlock	- -	- -	- -	- -	- -
WRC - Western Red Cedar	- -	- -	- -	- -	- -
LP - Lodgepole Pine	0.1	0.2	0.2	0.4	0.4
SAF - Subalpine Fir	- -	- -	- -	- -	- -
WBP - White Bark Pine	- -	- -	- -	- -	- -
Group A Height Sub-Totals	4.8	9.3	12.4	20.1	24.6
Total					**71**
Group B (Moist)					
PP - Ponderosa Pine	0.0	0.1	0.2	0.2	0.2
WP - Western White Pine	2.6	4.7	11.5	16.6	15.2
WL - Western Larch	0.7	0.9	2.0	2.7	2.4
DF - Douglas Fir	1.0	1.4	3.3	4.5	4.1
GF/WH - Grand Fir/ Western Hemlock	0.3	0.5	1.3	1.8	1.6
WRC - Western Red Cedar	0.1	0.1	0.3	0.5	0.4
LP - Lodgepole Pine	0.3	0.3	0.6	0.8	0.7
SAF - Subalpine Fir	- -	- -	- -	- -	- -
WBP - White Bark Pine	- -	- -	- -	- -	- -
Group B Height Sub-Totals	5.0	8.0	19.1	27.1	24.7
Total					**84**

Table 13 (Continued). Vegetation Height Summary Condition for Coeur d'Alene NF.					
	Vegetation Size Class Groups				
Alpha Code – Common Name	*Sapping*	*Small*	*Medium*	*Large*	*Oldest*
Group C (Cool/Moist)					
PP - Ponderosa Pine	- -	- -	- -	- -	- -
WP - Western White Pine	0.9	1.7	4.3	6.2	5.2
WL - Western Larch	0.2	0.3	0.6	0.8	0.7
DF - Douglas Fir	0.2	0.4	0.9	1.2	1.0
GF/WH - Grand Fir/ Western Hemlock	- -	- -	- -	- -	- -
WRC - Western Red Cedar	- -	- -	- -	- -	- -
LP - Lodgepole Pine	0.8	0.9	2.1	2.8	2.3
SAF - Subalpine Fir	2.6	3.9	9.4	13.0	10.7
WBP - White Bark Pine	- -	- -	- -	- -	- -
Group C Height Sub-Totals	4.7	7.1	17.3	24.0	19.8
Total					**73**
Group D (Cool/Dry)					
PP - Ponderosa Pine	- -	- -	- -	- -	- -
WP - Western White Pine	- -	- -	- -	- -	- -
WL - Western Larch	- -	- -	- -	- -	- -
DF - Douglas Fir	- -	- -	- -	- -	- -
GF/WH - Grand Fir/ Western Hemlock	- -	- -	- -	- -	- -
WRC - Western Red Cedar	- -	- -	- -	- -	- -
LP - Lodgepole Pine	1.5	1.7	3.6	4.5	3.4
SAF - Subalpine Fir	3.2	4.7	10.5	14.0	10.8
WBP - White Bark Pine	0.8	1.1	2.5	3.2	2.5
Group D Height Sub-Totals	5.5	7.6	16.6	21.7	16.7
Total					**68**

Table 13 (Continued). Vegetation Height Summary Condition for St. Joe NF.					
	Vegetation Size Class Groups				
Alpha Code – Common Name	*Sapping*	*Small*	*Medium*	*Large*	*Oldest*
Group A (Warm/Dry)					
PP - Ponderosa Pine	1.0	2.6	3.8	3.6	2.6
WP - Western White Pine	- -	- -	- -	- -	- -
WL - Western Larch	0.8	1.6	2.2	1.9	1.4
DF - Douglas Fir	4.1	8.8	12.0	10.9	7.8
GF/WH - Grand Fir/ Western Hemlock	- -	- -	- -	- -	- -
WRC - Western Red Cedar	- -	- -	- -	- -	- -
LP - Lodgepole Pine	0.1	0.1	0.2	0.1	0.1
SAF - Subalpine Fir	- -	- -	- -	- -	- -
WBP - White Bark Pine	- -	- -	- -	- -	- -
Group A Height Sub-Totals	5.9	13.1	18.1	16.6	11.9
Total					**66**
Group B (Moist)					
PP - Ponderosa Pine	0.1	0.1	0.3	0.5	0.4
WP - Western White Pine	1.8	3.3	7.8	12.3	11.4
WL - Western Larch	1.2	1.7	3.7	5.6	5.0
DF - Douglas Fir	0.5	0.8	1.7	2.6	2.3
GF/WH - Grand Fir/ Western Hemlock	0.5	0.8	1.7	2.6	2.4
WRC - Western Red Cedar	0.3	0.5	1.2	1.9	1.8
LP - Lodgepole Pine	0.6	0.7	1.3	1.9	1.7
SAF - Subalpine Fir	- -	- -	- -	- -	- -
WBP - White Bark Pine	- -	- -	- -	- -	- -
Group B Height Sub-Totals	5.0	7.9	17.9	27.5	25.1
Total					**83**

Table 13 (Continued). Vegetation Height Summary Condition for St. Joe NF.					
	Vegetation Size Class Groups				
Alpha Code – Common Name	*Sapping*	*Small*	*Medium*	*Large*	*Oldest*
Group C (Cool/Moist)					
PP - Ponderosa Pine	- -	- -	- -	- -	- -
WP - Western White Pine	0.5	1.4	2.3	2.9	2.7
WL - Western Larch	0.7	1.6	2.4	2.8	2.6
DF - Douglas Fir	0.2	0.5	0.8	1.0	0.9
GF/WH - Grand Fir/ Western Hemlock	- -	- -	- -	- -	- -
WRC - Western Red Cedar	- -	- -	- -	- -	- -
LP - Lodgepole Pine	1.3	2.2	3.1	3.6	3.3
SAF - Subalpine Fir	2.3	5.1	7.9	9.7	9.0
WBP - White Bark Pine	- -	- -	- -	- -	- -
Group C Height Sub-Totals	5.0	10.8	16.5	20.0	18.5
Total					**71**
Group D (Cool/Dry)					
PP - Ponderosa Pine	- -	- -	- -	- -	- -
WP - Western White Pine	- -	- -	- -	- -	- -
WL - Western Larch	- -	- -	- -	- -	- -
DF - Douglas Fir	- -	- -	- -	- -	- -
GF/WH - Grand Fir/ Western Hemlock	- -	- -	- -	- -	- -
WRC - Western Red Cedar	- -	- -	- -	- -	- -
LP - Lodgepole Pine	1.7	3.2	3.5	4.1	3.9
SAF - Subalpine Fir	2.9	6.9	8.3	10.2	9.8
WBP - White Bark Pine	1.0	2.3	2.7	3.2	3.1
Group D Height Sub-Totals	5.7	12.4	14.5	17.5	16.8
Total					**67**

Table 13 (Continued). Vegetation Height Summary Condition for Clearwater NF.				
	Vegetation Size Class Groups			
Alpha Code – Common Name	*"Sapping"*	*"Small"*	*"Mature"*	*"Oldest"*
Breaklands (Warm/Dry)				
PP Mix - Ponderosa Pine	0.5	1.8	2.5	4.8
DF - Douglas fir	0.8	2.2	2.8	5.4
LP – Lodgepole Pine	- -	- -	- -	- -
WL/DF – Western larch / Douglas fir	0.9	2.5	3.1	5.9
WBP (GF/C) – Whitebark Pine (Grand Fir/Cedar)	1.3	2.9	3.4	6.3
S-F Mix (Engelmann Spruce)	1.3	4.3	5.6	10.7
SAF (w/WBP)- Subalpine Fir with Whitebark Pine	- -	- -	- -	- -
Breaklands Height Sub-Totals	4.7	13.7	17.5	33.0
Total				**69**
Uplands (Mesic)				
PP Mix - Ponderosa Pine	0.4	1.2	1.6	3.3
DF - Douglas fir	0.3	0.7	0.9	1.8
LP – Lodgepole Pine	- -	- -	- -	- -
WL/DF – Western larch / Douglas fir	2.4	5.9	6.9	14.5
WBP (GF/C) – Whitebark Pine (Grand Fir/Cedar)	1.5	2.9	3.2	6.6
S-F Mix (Engelmann Spruce)	1.0	2.9	3.6	7.6
SAF (w/WBP)- Subalpine Fir with Whitebark Pine	- -	- -	- -	- -
Uplands Height Sub-Totals	5.5	13.5	16.2	33.8
Total				**69**

Table 13 (Continued). Vegetation Height Summary Condition for Clearwater NF.				
	Vegetation Size Class Groups			
Alpha Code – Common Name	*"Sapping"*	*"Small"*	*"Mature"*	*"Oldest"*
Subalpine (Cold) – North of Lochsa Rover				
PP Mix - Ponderosa Pine	- -	- -	- -	- -
DF - Douglas fir	- -	- -	- -	- -
LP – Lodgepole Pine	2.6	4.8	5.4	7.8
WL/DF – Western larch / Douglas fir	1.7	4.0	4.8	7.1
WBP (GF/C) – Whitebark Pine (Grand Fir/Cedar)	0.3	0.5	0.6	0.9
S-F Mix (Engelmann Spruce)	1.1	2.9	3.6	5.4
SAF (w/WBP)- Subalpine Fir with Whitebark Pine	1.5	3.7	4.5	6.7
Subalpine North Height Sub-Totals	7.2	15.8	18.8	27.8
Total				**70**
Subalpine (Cold) – South of Lochsa Rover				
PP Mix - Ponderosa Pine	- -	- -	- -	- -
DF - Douglas fir	- -	- -	- -	- -
LP – Lodgepole Pine	3.5	6.8	7.5	15.4
WL/DF – Western larch / Douglas fir	0.1	0.3	0.4	0.8
WBP (GF/C) – Whitebark Pine (Grand Fir/Cedar)	- -	- -	- -	- -
S-F Mix (Engelmann Spruce)	0.8	2.3	2.9	6.1
SAF (w/WBP)- Subalpine Fir with Whitebark Pine	1.9	4.9	6.0	12.6
Subalpine South Height Sub-Totals	6.3	14.3	16.8	34.8
Total				**72**

Table 13 (Continued). Vegetation Height Summary Condition for Nez Perce NF.				
	Vegetation Size Class Groups			
Alpha Code – Common Name	*"Sapping"*	*"Small"*	*"Mature"*	*"Oldest"*
Breaklands (Warm/Dry)				
PP Mix - Ponderosa Pine	0.8	5.4	8.9	13.2
DF - Douglas fir	0.9	4.6	7.1	10.3
LP – Lodgepole Pine	0.5	2.2	3.1	4.5
WL/DF – Western larch / Douglas fir	0.2	0.9	1.3	1.9
WBP (GF/C) – Whitebark Pine (Grand Fir/Cedar)	0.2	1.1	1.7	2.5
S-F Mix (Engelmann Spruce)	0.1	0.5	0.8	1.1
SAF (w/WBP)- Subalpine Fir with Whitebark Pine	- -	- -	- -	- -
Breaklands Height Sub-Totals	2.7	14.7	23.0	33.5
Total				**74**
Uplands (Mesic)				
PP Mix - Ponderosa Pine	0.7	4.1	5.8	7.3
DF - Douglas fir	1.1	5.0	6.5	7.9
LP – Lodgepole Pine	1.1	4.0	4.8	5.8
WL/DF – Western larch / Douglas fir	0.2	1.0	1.3	1.6
WBP (GF/C) – Whitebark Pine (Grand Fir/Cedar)	0.6	2.9	3.9	4.8
S-F Mix (Engelmann Spruce)	0.1	0.6	0.8	0.9
SAF (w/WBP)- Subalpine Fir with Whitebark Pine	- -	- -	- -	- -
Uplands Height Sub-Totals	3.7	17.6	23.1	28.4
Total				**73**

Table 13 (Continued). Vegetation Height Summary Condition for Nez Perce NF.				
	Vegetation Size Class Groups			
Alpha Code – Common Name	*"Sapping"*	*"Small"*	*"Mature"*	*"Oldest"*
Subalpine (Cold)				
PP Mix - Ponderosa Pine	- -	- -	- -	- -
DF - Douglas fir	1.2	5.7	6.8	5.2
LP – Lodgepole Pine	1.5	5.6	6.2	4.6
WL/DF – Western larch / Douglas fir	0.2	0.7	0.9	0.7
WBP (GF/C) – Whitebark Pine (Grand Fir/Cedar)	- -	- -	- -	- -
S-F Mix (Engelmann Spruce)	0.3	1.6	1.9	1.5
SAF (w/WBP)- Subalpine Fir with Whitebark Pine	1.5	7.3	8.9	6.8
Subalpine Height Sub-Totals	4.6	20.9	24.7	18.7
Total				**69**

Table 14. Coefficients for the height-diameter relationship equation in the CI Variant.				
Alpha Code - Common Name	B_1	B_2	C_0	C_1
WP - western white pine	5.19988	-9.26718	1.74189	4.17687
WL - western larch	5.16306	-9.25656	5.30838	6.41536
DF - Douglas-fir	4.94866	-9.75378	3.0599	6.42592
GF - grand fir	5.02706	-11.21681	2.77647	5.59435
WH - western hemlock	5.02706	-11.21681	2.77647	5.59435
RC - western redcedar	5.16306	-9.25656	5.30838	6.41536
LP - lodgepole pine	4.80016	-6.51738	0.74322	9.23147
ES - Engelmann spruce	5.09964	-10.79269	2.88424	5.39267
SAF - subalpine fir	4.91417	-9.36400	2.74231	5.35911
PP - ponderosa pine	4.99300	-12.43000	1.74189	4.17687
OT - other species	4.80016	-6.51738	0.74322	9.23147
WBP - Whitebark pine[16]	4.97407	-6.78347	- -	- -

Table 15. Height (feet) based on Height-Diameter Relationship for the CI Variant.				
	dbh (Inches)			
Alpha Code - Common Name	*3* *("Sapling")*	*9* *("Small")*	*16* *("Medium")*	*24* *("Large")*
WP - western white pine	14	76	110	130
WL - western larch	25	74	106	125
DF - Douglas-fir	22	69	94	108
GF - grand fir	20	54	83	102
WH - western hemlock	20	54	83	102
RC - western redcedar	25	74	106	125
LP - lodgepole pine	28	68	87	98
ES - Engelmann spruce	19	60	91	111
SAF - subalpine fir	19	58	83	98
PP - ponderosa pine	14	47	75	94
OT - other species	28	68	87	98
WBP - Whitebark pine	31	78	102	115

[16] Was not available within the Southern Idaho Variants documentation - Obtained from the Northern Idaho Variant documentation (http://www.fs.fed.us/fmsc/fvs/variants/ni.php)

Table 16. Vegetation Height Summary Conditions for PVG 1 and 2.

Alpha Code - Common Name	*Vegetation Size Class Groups* "Sapling"	"Small"	"Medium"	"Large"
PVG 1				
OT - other species (Aspen)	- -	- -	- -	- -
LP - lodgepole pine	- -	- -	- -	- -
PP - ponderosa pine	1.6	7.7	19.8	42.9
WL - western larch	- -	- -	- -	- -
WBP - Whitebark pine	- -	- -	- -	- -
DF - Douglas-fir	0.0	0.1	0.3	0.5
ES - Engelmann spruce	- -	- -	- -	- -
GF - grand fir	- -	- -	- -	- -
SAF - subalpine fir	- -	- -	- -	- -
PVG 1 Group Height Sub-totals	2	8	20	43
Total				**73**
PVG 2				
OT - other species (Aspen)	- -	- -	- -	- -
LP - lodgepole pine	- -	- -	- -	- -
PP - ponderosa pine	0.6	5.7	15.2	47.3
WL - western larch	- -	- -	- -	- -
WBP - Whitebark pine	- -	- -	- -	- -
DF - Douglas-fir	0.1	1.3	2.9	8.4
ES - Engelmann spruce	- -	- -	- -	- -
GF - grand fir	- -	- -	- -	- -
SAF - subalpine fir	- -	- -	- -	- -
PVG 2 Group Height Sub-totals	1	7	18	56
Total				**82**

Table 16 (Continued). Vegetation Height Summary Conditions for PVG 3 and 4.				
	Vegetation Size Class Groups			
Alpha Code - Common Name	"Sapling"	"Small"	"Medium"	"Large"
PVG 3				
OT - other species (Aspen)	0.2	1.2	2.1	1.3
LP - lodgepole pine	- -	- -	- -	- -
PP - ponderosa pine	0.5	4.7	10.1	7.1
WL - western larch	- -	- -	- -	- -
WBP - Whitebark pine	- -	- -	- -	- -
DF - Douglas-fir	1.3	12.1	21.8	14.1
ES - Engelmann spruce	- -	- -	- -	- -
GF - grand fir	- -	- -	- -	- -
SAF - subalpine fir	- -	- -	- -	- -
PVG 3 Group Height Sub-totals	2	18	34	23
Total				**77**
PVG 4				
OT - other species (Aspen)	0.3	1.6	3.3	1.7
LP - lodgepole pine	0.5	2.8	5.8	3.0
PP - ponderosa pine	- -	- -	- -	- -
WL - western larch	- -	- -	- -	- -
WBP - Whitebark pine	- -	- -	- -	- -
DF - Douglas-fir	1.8	13.8	30.6	16.4
ES - Engelmann spruce	- -	- -	- -	- -
GF - grand fir	- -	- -	- -	- -
SAF - subalpine fir	- -	- -	- -	- -
PVG 4 Group Height Sub-totals	3	18	40	21
Total				**81**

Table 16 (Continued). Vegetation Height Summary Conditions for PVG 5 and 6.				
	Vegetation Size Class Groups			
Alpha Code - Common Name	"Sapling"	"Small"	"Medium"	"Large"
PVG 5				
OT - other species (Aspen)	- -	- -	- -	- -
LP - lodgepole pine	- -	- -	- -	- -
PP - ponderosa pine	0.5	5.3	11.6	53.0
WL - western larch	0.0	0.0	0.1	0.4
WBP - Whitebark pine	- -	- -	- -	- -
DF - Douglas-fir	0.1	1.1	2.1	8.7
ES - Engelmann spruce	- -	- -	- -	- -
GF - grand fir	0.0	0.0	0.1	0.3
SAF - subalpine fir	- -	- -	- -	- -
PVG 5 Group Height Sub-totals	1	7	14	62
Total				**83**
PVG 6				
OT - other species (Aspen)	- -	- -	- -	- -
LP - lodgepole pine	0.1	0.6	1.0	0.8
PP - ponderosa pine	0.4	4.3	9.2	8.5
WL - western larch	0.5	4.6	8.9	7.8
WBP - Whitebark pine	- -	- -	- -	- -
DF - Douglas-fir	0.4	4.0	7.2	6.1
ES - Engelmann spruce	0.0	0.2	0.3	0.3
GF - grand fir	0.3	2.5	5.1	4.6
SAF - subalpine fir	0.0	0.2	0.5	0.4
PVG 6 Group Height Sub-totals	2	16	32	29
Total				**79**

Table 16 (Continued). Vegetation Height Summary Conditions for PVG 7 and 8.				
	Vegetation Size Class Groups			
Alpha Code - Common Name	"Sapling"	"Small"	"Medium"	"Large"
PVG 7				
OT - other species (Aspen)	0.4	1.5	3.1	1.8
LP - lodgepole pine	1.8	6.2	13.0	7.4
PP - ponderosa pine	- -	- -	- -	- -
WL - western larch	- -	- -	- -	- -
WBP - Whitebark pine	- -	- -	- -	- -
DF - Douglas-fir	1.1	5.2	11.5	6.7
ES - Engelmann spruce	0.1	0.6	1.6	1.0
GF - grand fir	- -	- -	- -	- -
SAF - subalpine fir	0.5	2.5	5.8	3.5
PVG 7 Group Height Sub-totals	4	16	35	20
Total				**75**
PVG 8				
OT - other species (Aspen)	- -	- -	- -	- -
LP - lodgepole pine	1.5	5.5	9.0	5.8
PP - ponderosa pine	- -	- -	- -	- -
WL - western larch	0.6	2.5	4.6	3.1
WBP - Whitebark pine	- -	- -	- -	- -
DF - Douglas-fir	1.2	5.7	9.8	6.5
ES - Engelmann spruce	0.5	2.2	4.3	3.0
GF - grand fir	- -	- -	- -	- -
SAF - subalpine fir	0.5	2.2	4.0	2.8
PVG 8 Group Height Sub-totals	4	18	32	21
Total				**75**

Table 16 (Continued). Vegetation Height Summary Conditions for PVG 9 and 10.				
	Vegetation Size Class Groups			
Alpha Code - Common Name	"Sapling"	"Small"	"Medium"	"Large"
PVG 9				
OT - other species (Aspen)	- -	- -	- -	- -
LP - lodgepole pine	1.6	5.5	9.4	10.3
PP - ponderosa pine	- -	- -	- -	- -
WL - western larch	- -	- -	- -	- -
WBP - Whitebark pine	- -	- -	- -	- -
DF - Douglas-fir	- -	- -	- -	- -
ES - Engelmann spruce	1.0	4.5	9.1	10.7
GF - grand fir	- -	- -	- -	- -
SAF - subalpine fir	1.0	4.4	8.4	9.7
PVG 9 Group Height Sub-totals	4	14	27	31
Total				**76**
PVG 10				
OT - other species (Aspen)	- -	- -	- -	- -
LP - lodgepole pine	4.3	31.0	16.6	19.6
PP - ponderosa pine	- -	- -	- -	- -
WL - western larch	- -	- -	- -	- -
WBP - Whitebark pine	- -	- -	- -	- -
DF - Douglas-fir	- -	- -	- -	- -
ES - Engelmann spruce	- -	- -	- -	- -
GF - grand fir	- -	- -	- -	- -
SAF - subalpine fir	- -	- -	- -	- -
PVG 11 Group Height Sub-totals	4	31	17	20
Total				**72**

Table 16 (Continued). Vegetation Height Summary Conditions for PVG 11.				
	Vegetation Size Class Groups			
Alpha Code - Common Name	"Sapling"	"Small"	"Medium"	"Large"
PVG 11				
OT - other species (Aspen)	- -	- -	- -	- -
LP - lodgepole pine	1.0	3.6	8.0	4.4
PP - ponderosa pine	- -	- -	- -	- -
WL - western larch	- -	- -	- -	- -
WBP - Whitebark pine	2.1	7.6	17.2	9.6
DF - Douglas-fir	- -	- -	- -	- -
ES - Engelmann spruce	0.3	1.6	4.1	2.5
GF - grand fir	- -	- -	- -	- -
SAF - subalpine fir	0.7	3.4	8.3	4.9
PVG 11 Group Height Sub-totals	4	16	38	21
Total				**79**

Table 17a. Historical Forest Canopy Cover Distribution in the Boise, Payette and Sawtooth National Forests.

Assessment Group	Low (10 to 39% CC)	Moderate (40 to 69% CC)	High (70 to 100 CC)
PVG 1	80 – 100%	0 – 20%	0%
PVG 2	74 – 94%	6 – 26%	0%
PVG 3	5 – 25%	75 – 95%	0%
PVG 4	0 – 14%	87 – 100%	0%
PVG 5	25 – 45%	55 – 75%	0%
PVG 6	0 – 20%	80 – 100%	0%
PVG 7	0 – 14%	86 – 100%	0%
PVG 8	0%	51 – 71%	39 – 49%
PVG 9	0%	51 – 71%	39 – 49%
PVG 10	0%	81 – 100%	0 - 19%
PVG 11	0 – 16%	84 - 100%	0%

Table 17b. Canopy Cover Summary Conditions for the Boise, Payette and Sawtooth National Forests.

Assessment Group	Low (10 to 39% CC)	Moderate (40 to 69% CC)	High (70 to 100 CC)
PVG 1	90%	10%	0%
PVG 2	84%	16%	0%
PVG 3	15%	85%	0%
PVG 4	7%	93%	0%
PVG 5	35%	65%	0%
PVG 6	10%	90%	0%
PVG 7	7%	93%	0%
PVG 8	0%	58%	42%
PVG 9	0%	58%	42%
PVG 10	0%	90%	10%
PVG 11	8%	92%	0%

Figure 5. Landfire Program Biophysical Settings.

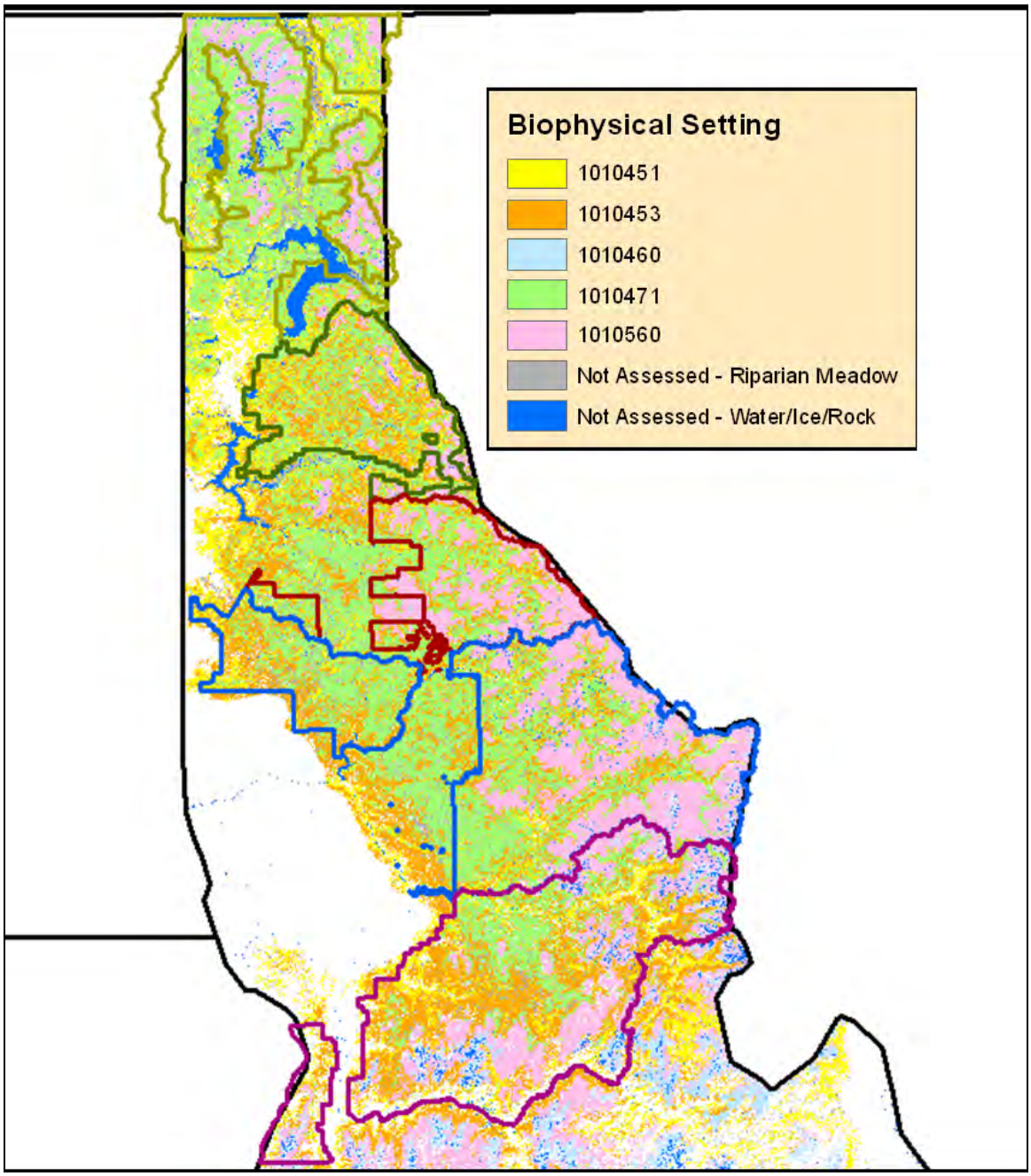


Table 18. Description of Vegetation Composition, Size Class Distribution for principal Biophysical Settings in Northern Idaho – Landfire Program.

Biophysical Setting – 1010451

Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Ponderosa Pine-Douglas-fir

Vegetation Description - The mixed conifer zone in the Northern Rockies is broad, and represents a moisture gradient that affects fire regimes and species dominance. The Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland system was thus split into three BpS to represent differences in species dominance and fire regimes. **1010451** represents the drier sites and is dominated by ponderosa pine and Douglas-fir with a very frequent, low severity fire regime. 1010452 is dominated by western larch and represents slightly more mesic sites. The fire regime is dominated by moderately frequent, mixed severity fires. 1010453 is dominated by grand fir and represents more mesic, cool sites with longer mixed severity fire regimes.

This BpS generally occupies moderate environmental settings between more xeric ponderosa pine or shrub communities at lower elevations and moist grand fir or Douglas-fir communities at higher elevations. Ponderosa pine is generally the dominant species on southerly aspects and drier sites, with Douglas-fir dominating on northerly aspects. Southerly aspects support relatively open stands. Northerly aspects support more closed stands. On mesic sites with longer fire return intervals, Douglas-fir often co-dominates the upper canopy layers. In the absence of fire, Douglas-fir and grand fir dominate stand understories. Western larch and lodgepole pine may also be present and become more abundant throughout the northern range of the BpS.

Vegetation Classes

Class A – *Early Development – 10%* - Openings of grass and forbs that are created by infrequent, stand replacement fire. Seedlings and saplings of ponderosa pine, western larch, Douglas-fir and lodgepole pine may be present; grand fir would be rare in the early succession stage. On the moist end of the BpS's range, western larch will be dominant; on the drier end ponderosa pine will be dominant. Following very severe replacement fires, this class may be dominated by lodgepole pine on the moist end of the BpS's range. Canopy Cover – 0 to 100%

Class B – *Mid Development – Closed - 15%* - Pole and medium sized Douglas-fir and ponderosa pine. Larch regeneration will decrease due to shade intolerance. Grand fir as a minor component will remain or increase due to shade tolerance. Canopy Cover - 61 to 80%

Class C – *Mid Development – Open - 30%* - Pole and medium sized ponderosa pine or Douglas-fir are the dominant trees. Western larch may also be present on the moist end of the BpS's range. Canopy Cover - 0 to 60%

Class D – *Late Development – Open - 35%* - Large and very large sized ponderosa pine and Douglas-fir are the dominant trees. Western larch (on the moist end of the BpS's range) and grand fir may also be present in small proportions. Structure may be patchy depending on fire severities in previous class. Canopy Cover - 21 to 60%

Class E – *Late Development – Closed - 10%* - Large and very large diameter ponderosa pine, Douglas-fir, grand fir and western larch (on the moist end of the BpS's range). Canopy Cover - 61 to 80%

Table 18 (continued). Description of Vegetation Composition, Size Class Distribution for principal Biophysical Settings in Northern Idaho – Landfire Program.

Biophysical Setting – 1010453

Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest - Grand Fir

Vegetation Description - The mixed conifer zone in the Northern Rockies is broad, and represents a moisture gradient that affects fire regimes and species dominance. The Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland system was thus split into three BpS to represent differences in species dominance and fire regimes. 1010451 represents the drier sites and is dominated by ponderosa pine and Douglas-fir with a very frequent, low severity fire regime. 1010452 is dominated by western larch and represents slightly more mesic sites. The fire regime is dominated by moderately frequent, mixed severity fires. **1010453** is dominated by grand fir and represents more mesic, cool sites with longer mixed severity fire regimes.

This BpS is important in Bailey's section M332. Stands range from relatively open to densely stocked, and are usually dominated by a mix of early to mid seral species, including lodgepole pine and western larch, with lesser amounts of grand fir, Englemann spruce and ponderosa pine. Grand fir increases markedly during mid to late successional stages, in the absence of fire and in response to pathogens that affect other species, like bark beetles.

Vegetation Classes

Class A – *Early Development – 15%* - Post stand-replacing fire, lasting about 30yrs. This class is initially dominated by resprouting forbs and shrubs, and transitions to seedling and sapling-dominated. Lodgepole pine is a frequent early seral dominant. Douglas fir and larch are common, while ponderosa pine and grand fir are less common. Residual, large western larch often survive all but the most severe fire to serve as seed sources. Canopy Cover – 0 to 100%

Class B – *Mid Development – Closed - 15%* - Pole and immature forest (or mature lodgepole) of 30-100yrs. Tree canopy cover of 40% or more. Lodgepole pine is the most common dominant. Douglas-fir and western larch are secondary dominants. Larch may be reduced by grand fir competition, in the absence of fire. Canopy Cover - 41 to 100%

Class C – *Mid Development – Open - 25%* - Pole and immature forest (or mature lodgepole) of 30-100yrs. Canopy Cover - 0 to 40%

Class D – *Late Development – Open - 20%* - Mature forest of 100yrs+. These are usually the result of mixed severity fire, leaving an overstory of larch, Douglas fir, with some residual grand fir or ponderosa pine and lodgepole. Canopy Cover - 0 to 40%

Class E – *Late Development – Closed - 25%* - Mature forest of 100yrs or more. Canopy Cover - 41 to 100%

Table 18 (continued). Description of Vegetation Composition, Size Class Distribution for principal Biophysical Settings in Northern Idaho – Landfire Program.

Biophysical Setting – 1010460

Northern Rocky Mountain Subalpine Woodland and Parkland

Vegetation Description - Forest communities range from nearly homogeneous stands of five-needled pines on harshest, highest elevation sites to mixed species including shade tolerant firs. Historically, whitebark pine dominated on southerly aspects, while northerly aspects were dominated by alpine larch or subalpine fir and Engelmann spruce. Lodgepole pine may be present as an early succession species. Limber pine may be present in southeast and eastern ID, but in these mapping zones it is not typically a subalpine species (it favors lower treeline habitat). In this harsh windswept environment trees are often stunted and flagged from wind damage.

This BpS corresponds to cold upper subalpine and timberline habitat types. Lower subalpine forests border at lower elevations, including lodgepole pine, Douglas-fir, Engelmann spruce and subalpine fir types. Successional trajectory towards more shade tolerant species in absence of fire.

Vegetation Classes

Class A – *Early Development – 20%* - Early succession after moderately-long to long interval replacement fires, and highly variable interval mixed severity fires. Whitebark pine, limber pine and subalpine larch will typically be early pioneers. Lodgepole pine may be present. Canopy Cover – 0 to 100%

Class B – *Mid Development – Closed - 40%* - Stands dominated by small-diameter with a mix of shade tolerant and intolerant species. High elevation or harsh sites may exhibit krummholz growth form. Whitebark pine and subalpine larch will typically be early pioneers on harsh sites. Canopy Cover - 31 to 100%

Class C – *Mid Development – Open - 15%* - Stands dominated by small-diameter with a mix of shade tolerant and intolerant species. High elevation or harsh sites may exhibit krummholz growth form. Whitebark pine (especially on southerly aspects) and subalpine larch (especially on northerly aspects) will typically be early pioneers on harsh sites. Limber pine may also occur on these sites. Canopy Cover - 0 to 30%

Class D – *Late Development – Open - 5%* - Mid to large diameter mixed conifer species in small to moderate size patches generally on southerly aspects. Open canopy conditions occur on sites where soil is less developed or on wind-exposed, south-facing aspects. Whitebark pine (especially on southerly aspects) and subalpine larch (especially on northerly aspects) will typically dominate. Canopy Cover - 0 to 40%

Class E – *Late Development – Closed - 20%* - Mid to larger diameter mixed conifer species in small to moderate size patches generally on southerly aspects. Subalpine fir is likely to be encroaching upon these sites. Closed canopy conditions occur on sites that are more protected (ie, northerly aspects) or have better soil development. Canopy Cover - 41 to 100%

Table 18 (continued). Description of Vegetation Composition, Size Class Distribution for principal Biophysical Settings in Northern Idaho – Landfire Program.

Biophysical Setting – 1010471

Northern Rocky Mountain Mesic Montane Mixed Conifer Forest

Vegetation Description - Vegetation composition will vary widely geographically, but is today dominated by Douglas-fir and grand fir with other mixed conifers. Western larch, western white pine, western hemlock and western red cedar may be present. Ponderosa pine (on warmest and driest sites, such as ridge-tops), Engelmann spruce and subalpine fir (on coldest sites) and pacific yew (on the most maritime sites) may be present. Today, the decline of white pine has led to the increase of grand fir and Douglas-fir in these forests, which have a high propensity to root rot.

In the northern extent of this system, this BpS was dominated by white pine and western larch with lesser components of Douglas-fir and grand fir. Today, white pine and western larch each comprise less than five percent of the relative canopy cover in the Idaho Panhandle National Forest. Historically, white pine may have occupied >30% of the relative canopy cover, and western larch may have occupied >10%. On potassium limited soils, white pine was historically dominant (>60%).

Vegetation Classes

Class A – *Early Development – 15%* - Post-fire vegetation is shrub dominated with some seedling and sapling trees present. Establishment of western or paper birch, quaking aspen or black cottonwood is favored by fires that remove the duff layer. Canopy Cover – 0 to 100%

Class B – *Mid Development – Closed - 30%* - Pole and medium sized trees of mixed conifer species have overtopped the shrubs and dominate the site. Canopy cover is dense (will often be 100%). At 65yrs post-fire, this class succeeds to late-closed (class E). Western red cedar and western hemlock may be present in the understory. White pine, western larch, grand fir and Douglas-fir will be present in the overstory. Subalpine fir or Engelmann spruce may be important seral species on cooler sites Canopy Cover - 61 to 100%

Class C – *Mid Development – Open - 5%* - Open canopy conditions may be a result of topoedaphic conditions or disturbances. Mixed severity fires result in open, patchy stand conditions, and favor western larch and white pine. This condition will succeed to middevelopment closed (B) after 20yrs, unless mixed severity fires maintain the open condition. Seedling/sapling western red cedar and western hemlock will be present in the understory. Canopy Cover - 0 to 60%

Class D – *Late Development – Open - 10%* - Open canopy conditions are rare and may be a result of topoedaphic conditions or disturbances. Mixed severity fires result in open, patchy stand conditions. Western red cedar and western hemlock will be codominant with western white pine, western larch, and grand fir. Seedling/sapling western red cedar and grand fir will be present in the understory. After 30yrs, this condition succeeds to late-development closed (E). Canopy Cover - 0 to 60%

Class E – *Late Development – Closed - 40%* - Late-development closed conditions are multi-storied, dense canopies. Understories will tend to be depauperate due to dense overstory. Large woody debris is abundant caused by in-stand competition. Fuel loadings range from 18-40 tons/acre. This class will shift to open conditions with mixed severity fire or disease. Root rot will affect Douglas-fir and grand fir in patches. Canopy Cover - 61 to 100%

Table 18 (continued). Description of Vegetation Composition, Size Class Distribution for principal Biophysical Settings in Northern Idaho – Landfire Program.

Biophysical Setting – 1010560

Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland

Vegetation Description - Engelmann spruce and subalpine fir dominate on moist aspects with lodgepole pine comprising a greater component on dryer sites or earlier successional stages.

Vegetation Classes

Class A – *Early Development – 15%* - Early succession stage after long interval replacement fires. There can be extended periods (as long as 300yrs) of grass/seedling stage after fire replacement events. Canopy Cover – 0 to 100%

Class B – *Mid Development – Closed - 30%* - High density saplings to poles. Canopy Cover - 41 to 100%

Class C – *Mid Development – Open - 10%* - Low density saplings to poles. Primarily occurs after insects, disease or weather stress thins denser stands. Canopy Cover - 0 to 40%

Class D – *Late Development – Open - 0%* - Not used

Class E – *Late Development – Closed -45%* - Pole to larger diameter trees. Canopy Cover - 41 to 100%

Table 19. Weighted Average Canopy Cover for Biophysical Setting Groups					
Biophysical Setting 1010451 *Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Ponderosa Pine-Douglas-fir*					
Description	Composition (%)	Canopy Cover Low Range	Canopy Cover High Range	Target - 75th Percentile Value[17]	Weighted Condition[18]
Early Development	10	0	100	75	8
Mid Development Closed	15	61	80	75	11
Mid Development Open	30	0	60	45	14
Late Development Open	35	21	60	50	18
Late Development Closed	10	61	80	75	8
				Total	**57**
Biophysical Setting 1010453 *Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest - Grand Fir*					
Description	Composition (%)	Canopy Cover Low Range	Canopy Cover High Range	Target - 75th Percentile Value	Weighted Condition
Early Development	15	0	100	75	11
Mid Development Closed	15	41	100	85	13
Mid Development Open	25	0	40	30	8
Late Development Open	20	0	40	30	6
Late Development Closed	25	41	100	85	21
				Total	**59**

[17] Calculated as the 75th percentile of reported minimum and maximum values.
[18] Weighted condition = Composition times the 75th Percentile Value

Table 19 (continued). Weighted Average Canopy Cover for Biophysical Setting Groups

Biophysical Setting 1010460

Northern Rocky Mountain Subalpine Woodland and Parkland

Description	Composition (%)	Canopy Cover Low Range	Canopy Cover High Range	Target - 75th Percentile Value	Weighted Condition
Early Development	20	0	100	75	15
Mid Development Closed	40	31	100	83	33
Mid Development Open	15	0	30	23	3
Late Development Open	5	0	40	30	2
Late Development Closed	20	41	100	85	17
				Total	**70**

Biophysical Setting 1010471

Northern Rocky Mountain Mesic Montane Mixed Conifer Forest

Description	Composition (%)	Canopy Cover Low Range	Canopy Cover High Range	Target - 75th Percentile Value	Weighted Condition
Early Development	15	0	100	75	11
Mid Development Closed	30	61	100	90	27
Mid Development Open	5	0	60	45	2
Late Development Open	10	0	60	45	5
Late Development Closed	40	61	100	90	36
				Total	**81**

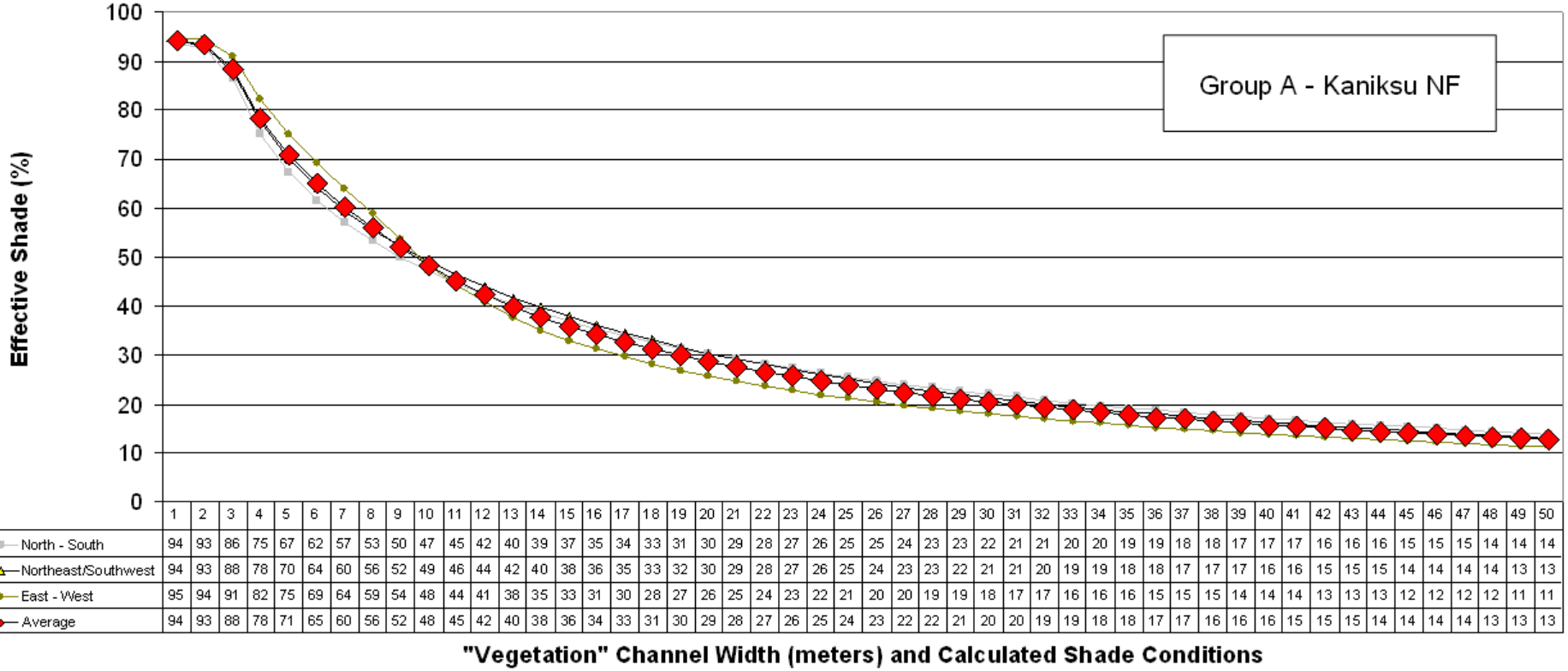
Table 19 (continued). Weighted Average Canopy Cover for Biophysical Setting Groups					
Biophysical Setting 1010560 *Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland*					
Description	Composition (%)	Canopy Cover Low Range	Canopy Cover High Range	Target - 75th Percentile Value	Weighted Condition
Early Development	15	0	100	75	11
Mid Development Closed	30	41	100	85	26
Mid Development Open	10	0	40	30	3
Late Development Open	0				0
Late Development Closed	45	41	100	85	38
				Total	**78**

Effective Shade Curves and Associated Solar Loading Curves for the Three National Forests (Kaniksu, Coeur d'Alene, and St. Joe) of the Idaho Panhandle National Forests (IPNF)

“Warm/Dry” Group A

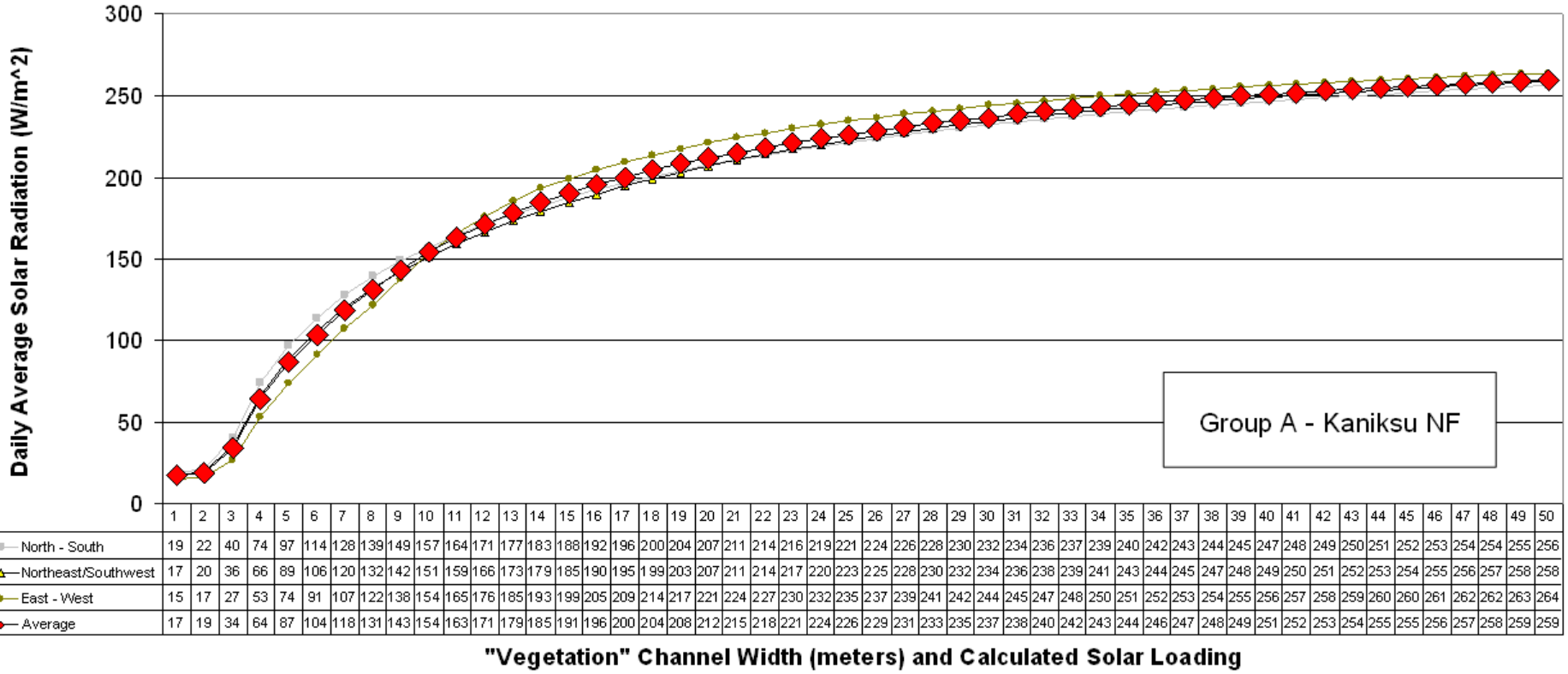
Kaniksu National Forest
(Idaho Panhandle National Forests)

Figure A.1-1. System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
Warm/Dry (Group A) - Kaniksu National Forest (IPNF)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	94	93	86	75	67	62	57	53	50	47	45	42	40	39	37	35	34	33	31	30	29	28	27	26	25	25	24	23	23	22	21	21	20	20	19	19	18	18	17	17	17	16	16	16	15	15	15	14	14	14
Northeast/Southwest	94	93	88	78	70	64	60	56	52	49	46	44	42	40	38	36	35	33	32	30	29	28	27	26	25	24	23	23	22	21	21	20	19	19	18	18	17	17	17	16	16	15	15	15	14	14	14	14	13	13
East - West	95	94	91	82	75	69	64	59	54	48	44	41	38	35	33	31	30	28	27	26	25	24	23	22	21	20	20	19	19	18	17	17	16	16	16	15	15	15	14	14	14	13	13	13	12	12	12	12	11	11
Average	94	93	88	78	71	65	60	56	52	48	45	42	40	38	36	34	33	31	30	29	28	27	26	25	24	23	22	22	21	20	20	19	19	18	18	17	17	16	16	16	15	15	15	14	14	14	14	13	13	13

Figure A.1-2. Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
Warm/Dry (Group A) - Kaniksu National Forest (IPNF)

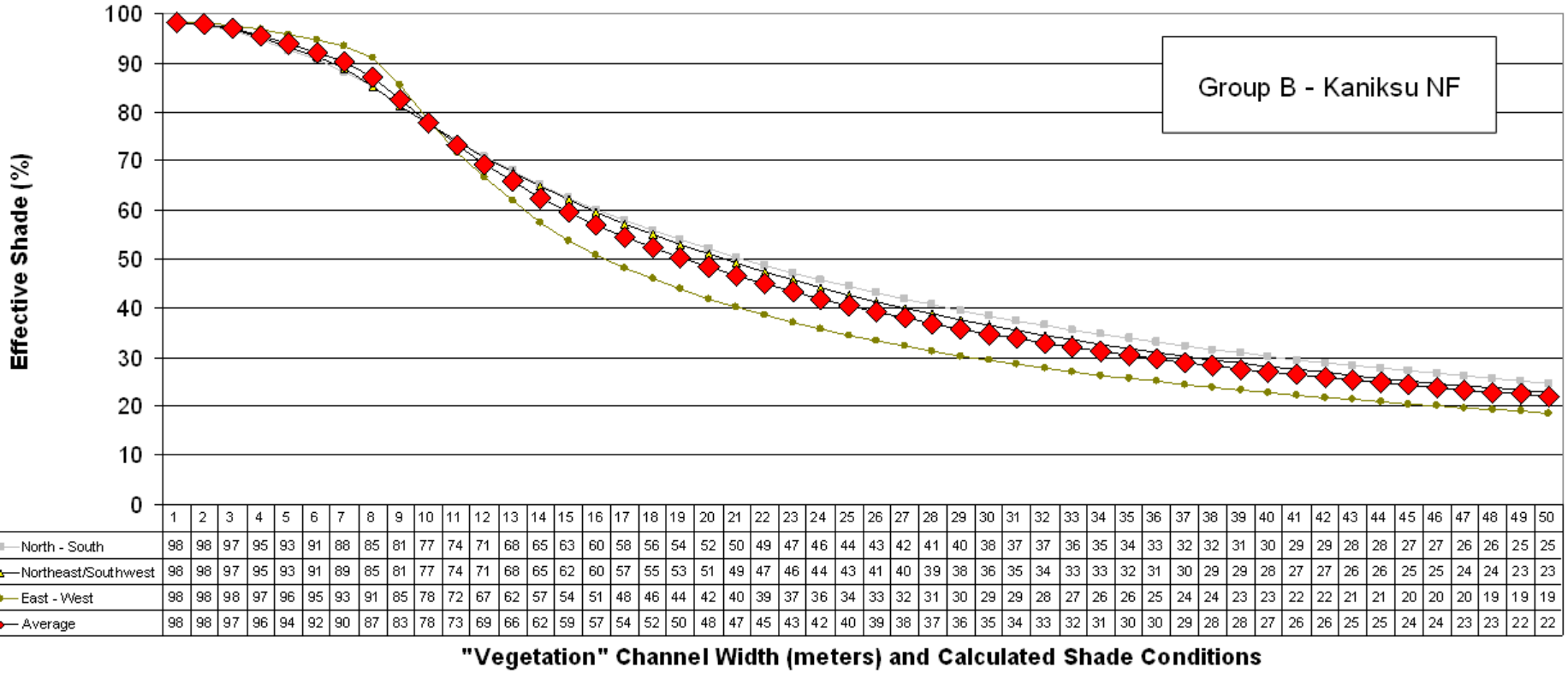


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	19	22	40	74	97	114	128	139	149	157	164	171	177	183	188	192	196	200	204	207	211	214	216	219	221	224	226	228	230	232	234	236	237	239	240	242	243	244	245	247	248	249	250	251	252	253	254	254	255	256
Northeast/Southwest	17	20	36	66	89	106	120	132	142	151	159	166	173	179	185	190	195	199	203	207	211	214	217	220	223	225	228	230	232	234	236	238	239	241	243	244	245	247	248	249	250	251	252	253	254	255	256	257	258	258
East - West	15	17	27	53	74	91	107	122	138	154	165	176	185	193	199	205	209	214	217	221	224	227	230	232	235	237	239	241	242	244	245	247	248	250	251	252	253	254	255	256	257	258	259	260	260	261	262	262	263	264
Average	17	19	34	64	87	104	118	131	143	154	163	171	179	185	191	196	200	204	208	212	215	218	221	224	226	229	231	233	235	237	238	240	242	243	244	246	247	248	249	251	252	253	254	255	255	256	257	258	259	259

“Moist” Group B

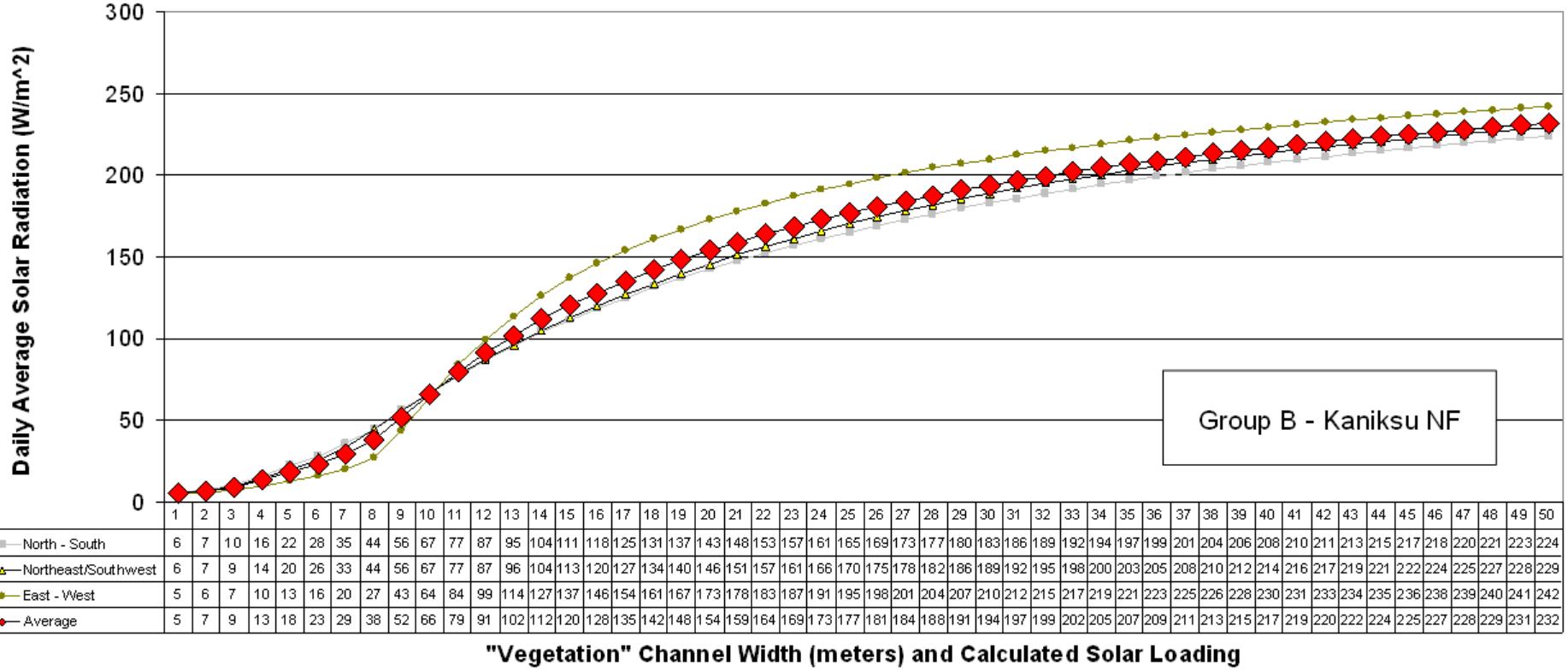
Kaniksu National Forest
(Idaho Panhandle National Forests)

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
Moist (Group B) - Kaniksu National Forest (IPNF)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	98	98	97	95	93	91	88	85	81	77	74	71	68	65	63	60	58	56	54	52	50	49	47	46	44	43	42	41	40	38	37	37	36	35	34	33	32	32	31	30	29	29	28	28	27	27	26	26	25	25
Northeast/Southwest	98	98	97	95	93	91	89	85	81	77	74	71	68	65	62	60	57	55	53	51	49	47	46	44	43	41	40	39	38	36	35	34	33	33	32	31	30	29	29	28	27	27	26	26	25	25	24	24	23	23
East - West	98	98	98	97	96	95	93	91	85	78	72	67	62	57	54	51	48	46	44	42	40	39	37	36	34	33	32	31	30	29	29	28	27	26	26	25	24	24	23	23	22	22	21	21	20	20	20	19	19	19
Average	98	98	97	96	94	92	90	87	83	78	73	69	66	62	59	57	54	52	50	48	47	45	43	42	40	39	38	37	36	35	34	33	32	31	30	30	29	28	28	27	26	26	25	25	24	24	23	23	22	22

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
Moist (Group B) - Kaniksu National Forest (IPNF)

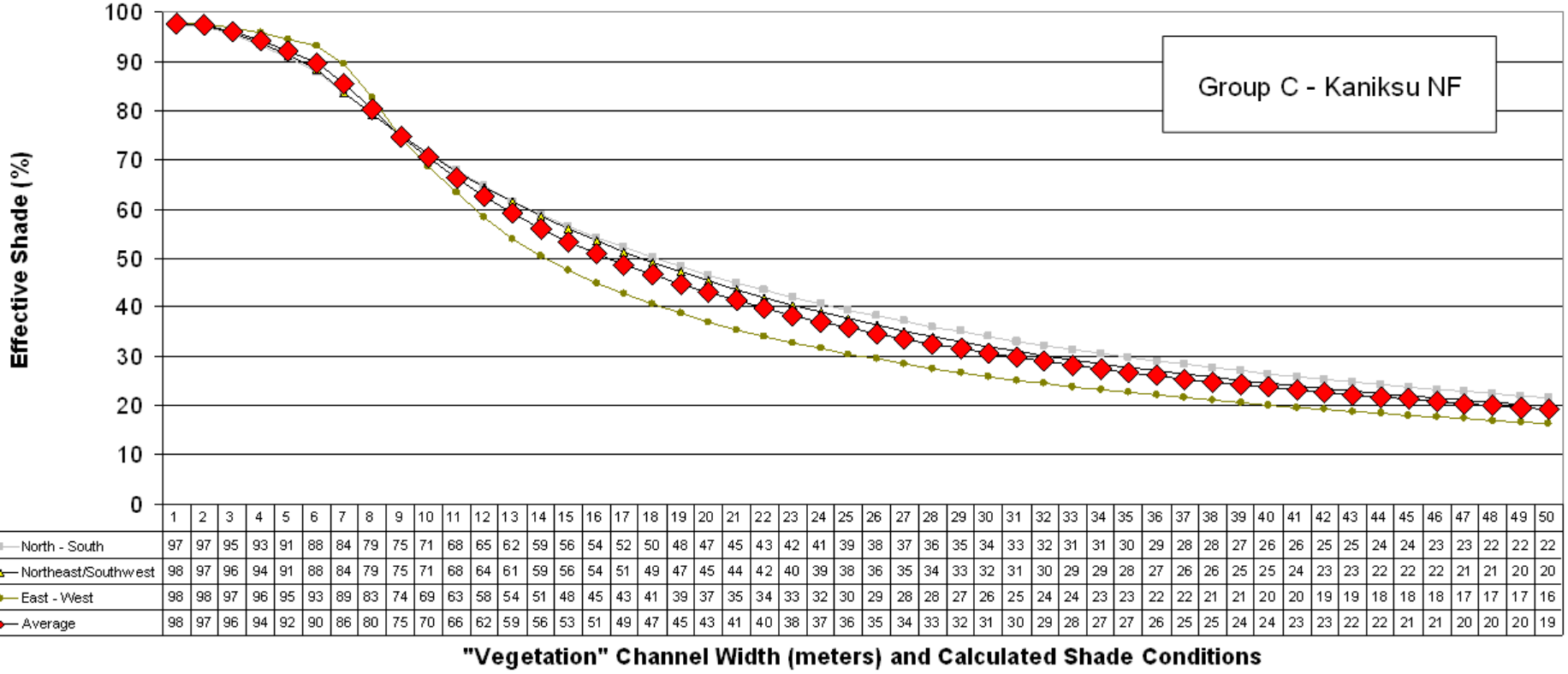


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	6	7	10	16	22	28	35	44	56	67	77	87	95	104	111	118	125	131	137	143	148	153	157	161	165	169	173	177	180	183	186	189	192	194	197	199	201	204	206	208	210	211	213	215	217	218	220	221	223	224
Northeast/Southwest	6	7	9	14	20	26	33	44	56	67	77	87	96	104	113	120	127	134	140	146	151	157	161	166	170	175	178	182	186	189	192	195	198	200	203	205	208	210	212	214	216	217	219	221	222	224	225	227	228	229
East - West	5	6	7	10	13	16	20	27	43	64	84	99	114	127	137	146	154	161	167	173	178	183	187	191	195	198	201	204	207	210	212	215	217	219	221	223	225	226	228	230	231	233	234	235	236	238	239	240	241	242
Average	5	7	9	13	18	23	29	38	52	66	79	91	102	112	120	128	135	142	148	154	159	164	169	173	177	181	184	188	191	194	197	199	202	205	207	209	211	213	215	217	219	220	222	224	225	227	228	229	231	232

“Cool/Moist” Group C

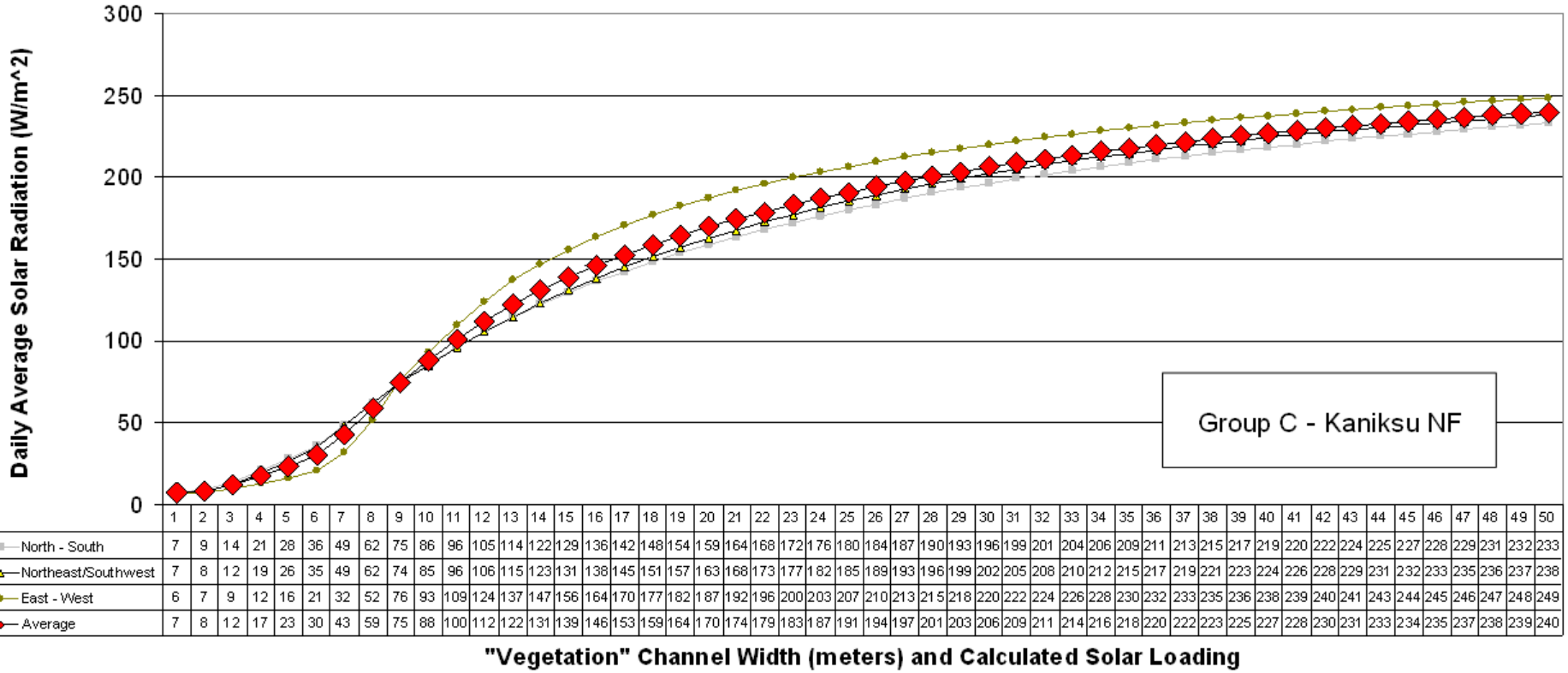
Kaniksu National Forest
(Idaho Panhandle National Forests)

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
"Cool/Moist" (Group C) – Kaniksu National Forest (IPNF)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	97	97	95	93	91	88	84	79	75	71	68	65	62	59	56	54	52	50	48	47	45	43	42	41	39	38	37	36	35	34	33	32	31	31	30	29	28	28	27	26	26	25	25	24	24	23	23	22	22	22
Northeast/Southwest	98	97	96	94	91	88	84	79	75	71	68	64	61	59	56	54	51	49	47	45	44	42	40	39	38	36	35	34	33	32	31	30	29	29	28	27	26	26	25	25	24	23	23	22	22	22	21	21	20	20
East - West	98	98	97	96	95	93	89	83	74	69	63	58	54	51	48	45	43	41	39	37	35	34	33	32	30	29	28	28	27	26	25	24	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16
Average	98	97	96	94	92	90	86	80	75	70	66	62	59	56	53	51	49	47	45	43	41	40	38	37	36	35	34	33	32	31	30	29	28	27	27	26	25	25	24	24	23	23	22	22	21	21	20	20	20	19

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
"Cool/Moist" (Group C) – Kaniksu National Forest (IPNF)

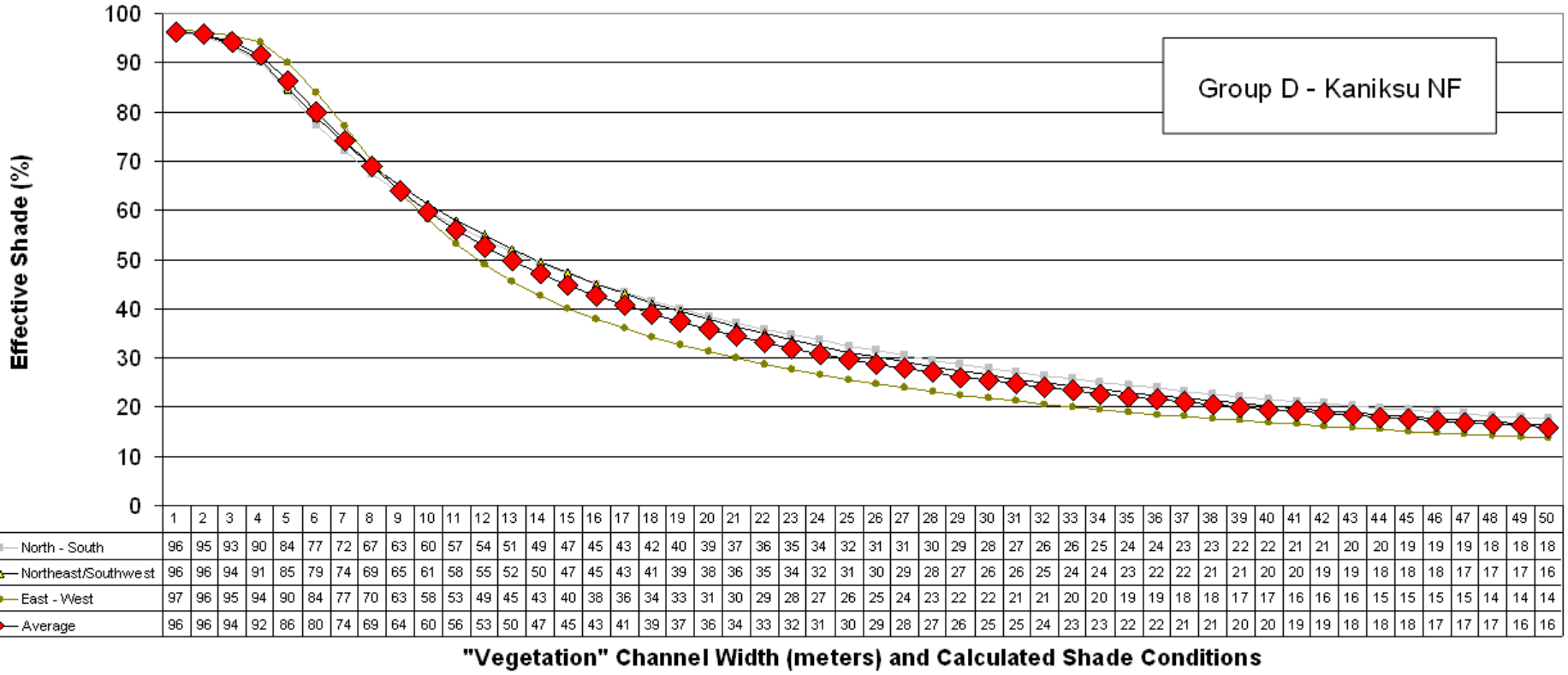


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	7	9	14	21	28	36	49	62	75	86	96	105	114	122	129	136	142	148	154	159	164	168	172	176	180	184	187	190	193	196	199	201	204	206	209	211	213	215	217	219	220	222	224	225	227	228	229	231	232	233
Northeast/Southwest	7	8	12	19	26	35	49	62	74	85	96	106	115	123	131	138	145	151	157	163	168	173	177	182	185	189	193	196	199	202	205	208	210	212	215	217	219	221	223	224	226	228	229	231	232	233	235	236	237	238
East - West	6	7	9	12	16	21	32	52	76	93	109	124	137	147	156	164	170	177	182	187	192	196	200	203	207	210	213	215	218	220	222	224	226	228	230	232	233	235	236	238	239	240	241	243	244	245	246	247	248	249
Average	7	8	12	17	23	30	43	59	75	88	100	112	122	131	139	146	153	159	164	170	174	179	183	187	191	194	197	201	203	206	209	211	214	216	218	220	222	223	225	227	228	230	231	233	234	235	237	238	239	240

“Cool/Dry” Group D

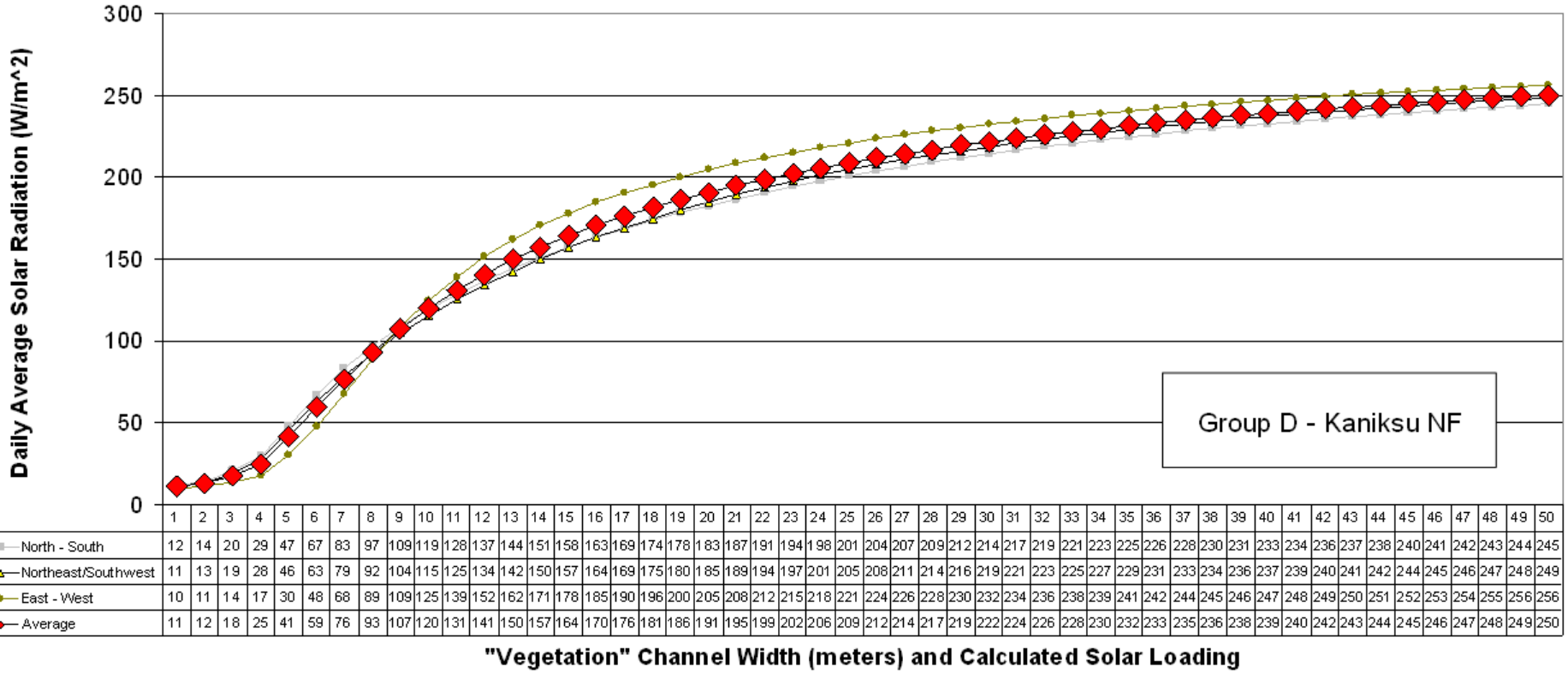
Kaniksu National Forest
(Idaho Panhandle National Forests)

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
"Cool/Dry" (Group D) – Kaniksu National Forest (IPNF)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	96	95	93	90	84	77	72	67	63	60	57	54	51	49	47	45	43	42	40	39	37	36	35	34	32	31	31	30	29	28	27	26	26	25	24	24	23	23	22	22	21	21	20	20	19	19	19	18	18	18
Northeast/Southwest	96	96	94	91	85	79	74	69	65	61	58	55	52	50	47	45	43	41	39	38	36	35	34	32	31	30	29	28	27	26	26	25	24	24	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16
East - West	97	96	95	94	90	84	77	70	63	58	53	49	45	43	40	38	36	34	33	31	30	29	28	27	26	25	24	23	22	22	21	21	20	20	19	19	18	18	17	17	16	16	16	15	15	15	15	14	14	14
Average	96	96	94	92	86	80	74	69	64	60	56	53	50	47	45	43	41	39	37	36	34	33	32	31	30	29	28	27	26	25	25	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16	16

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
"Cool/Dry" (Group D) – Kaniksu National Forest (IPNF)

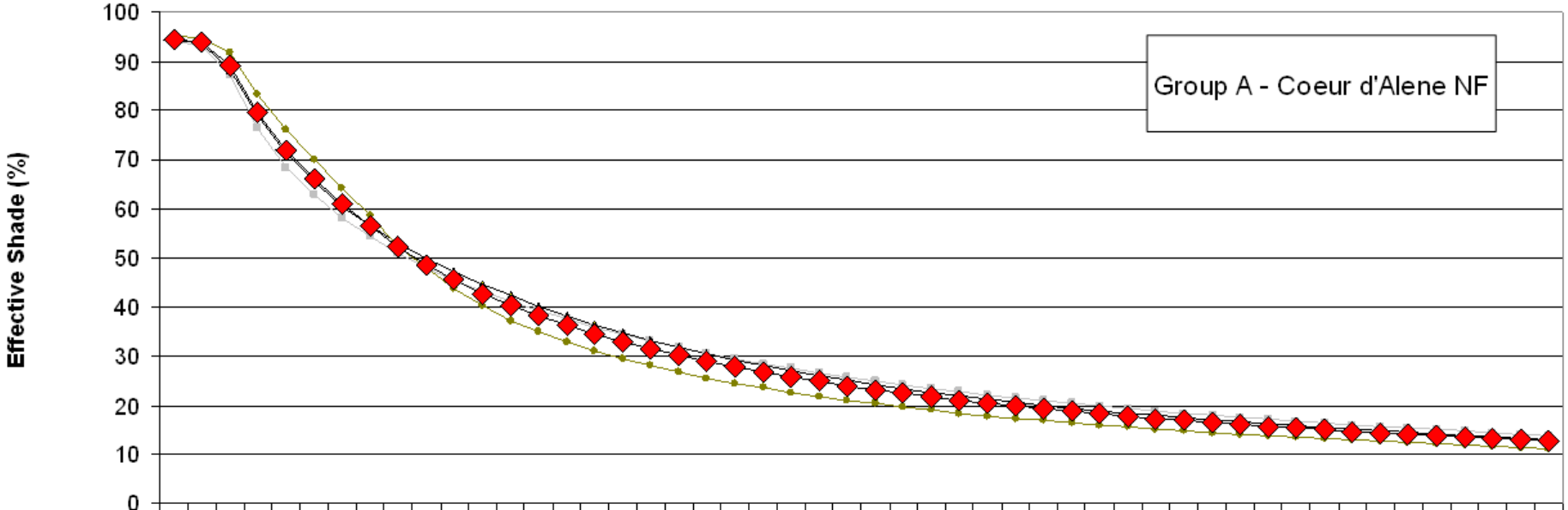


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	12	14	20	29	47	67	83	97	109	119	128	137	144	151	158	163	169	174	178	183	187	191	194	198	201	204	207	209	212	214	217	219	221	223	225	226	228	230	231	233	234	236	237	238	240	241	242	243	244	245
Northeast/Southwest	11	13	19	28	46	63	79	92	104	115	125	134	142	150	157	164	169	175	180	185	189	194	197	201	205	208	211	214	216	219	221	223	225	227	229	231	233	234	236	237	239	240	241	242	244	245	246	247	248	249
East - West	10	11	14	17	30	48	68	89	109	125	139	152	162	171	178	185	190	196	200	205	208	212	215	218	221	224	226	228	230	232	234	236	238	239	241	242	244	245	246	247	248	249	250	251	252	253	254	255	256	256
Average	11	12	18	25	41	59	76	93	107	120	131	141	150	157	164	170	176	181	186	191	195	199	202	206	209	212	214	217	219	222	224	226	228	230	232	233	235	236	238	239	240	242	243	244	245	246	247	248	249	250

“Warm/Dry” Group A

Coeur d’Alene National Forest
(Idaho Panhandle National Forests)

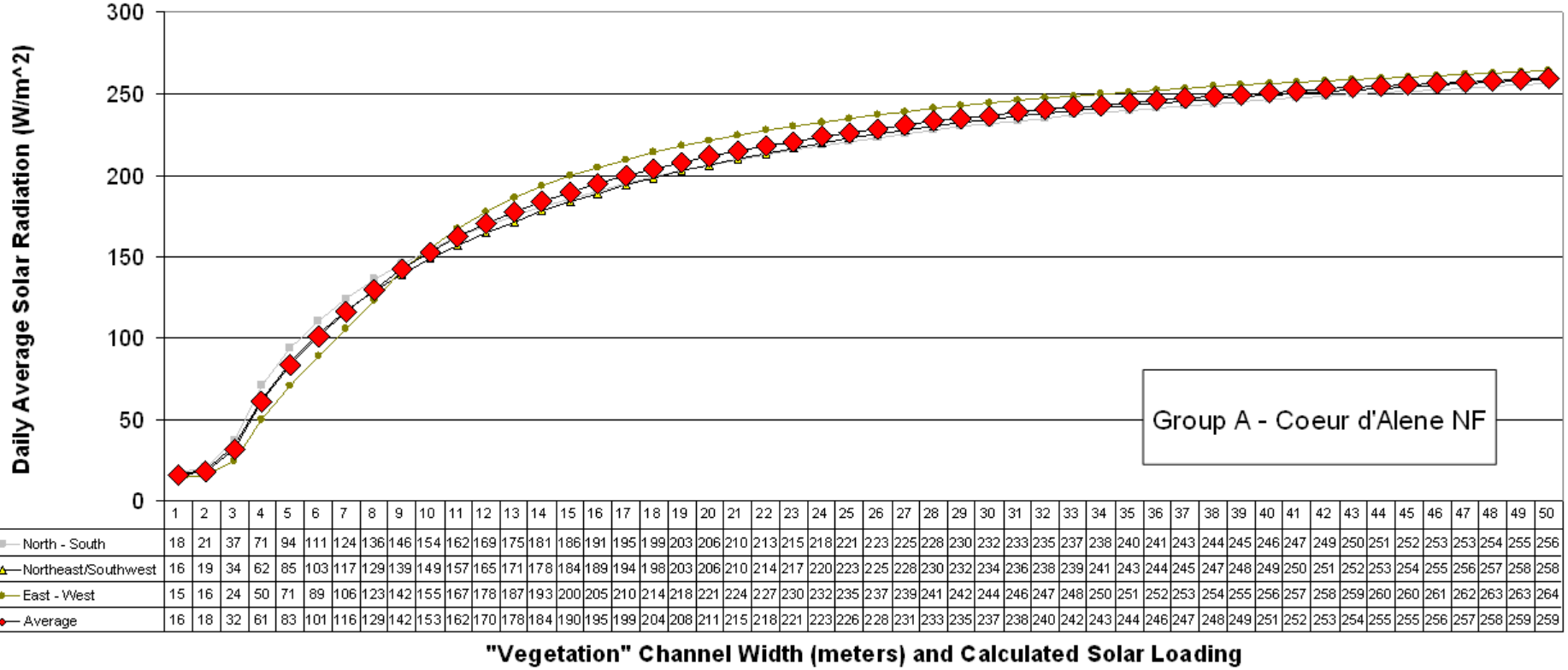
Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
Warm/Dry (Group A) – Coeur d'Alene National Forest (IPNF)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	94	93	87	76	69	63	58	54	51	48	45	43	41	39	38	36	34	33	32	31	30	28	28	27	26	25	24	23	23	22	22	21	20	20	19	19	18	18	18	17	17	16	16	16	15	15	15	14	14	14
Northeast/Southwest	94	94	88	79	71	65	61	57	53	50	47	45	42	40	38	36	35	33	32	31	29	28	27	26	25	24	23	23	22	21	21	20	19	19	18	18	17	17	17	16	16	15	15	15	14	14	14	14	13	13
East - West	95	95	92	83	76	70	64	59	52	48	44	40	37	35	33	31	29	28	27	26	25	24	23	22	21	20	20	19	18	18	17	17	16	16	16	15	15	14	14	14	13	13	13	13	12	12	12	12	11	11
Average	95	94	89	80	72	66	61	56	52	49	45	43	40	38	36	34	33	31	30	29	28	27	26	25	24	23	22	22	21	20	20	19	19	18	18	17	17	16	16	16	15	15	15	14	14	14	14	13	13	13

"Vegetation" Channel Width (meters) and Calculated Shade Conditions

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
Warm/Dry (Group A) – Coeur d'Alene National Forest (IPNF)

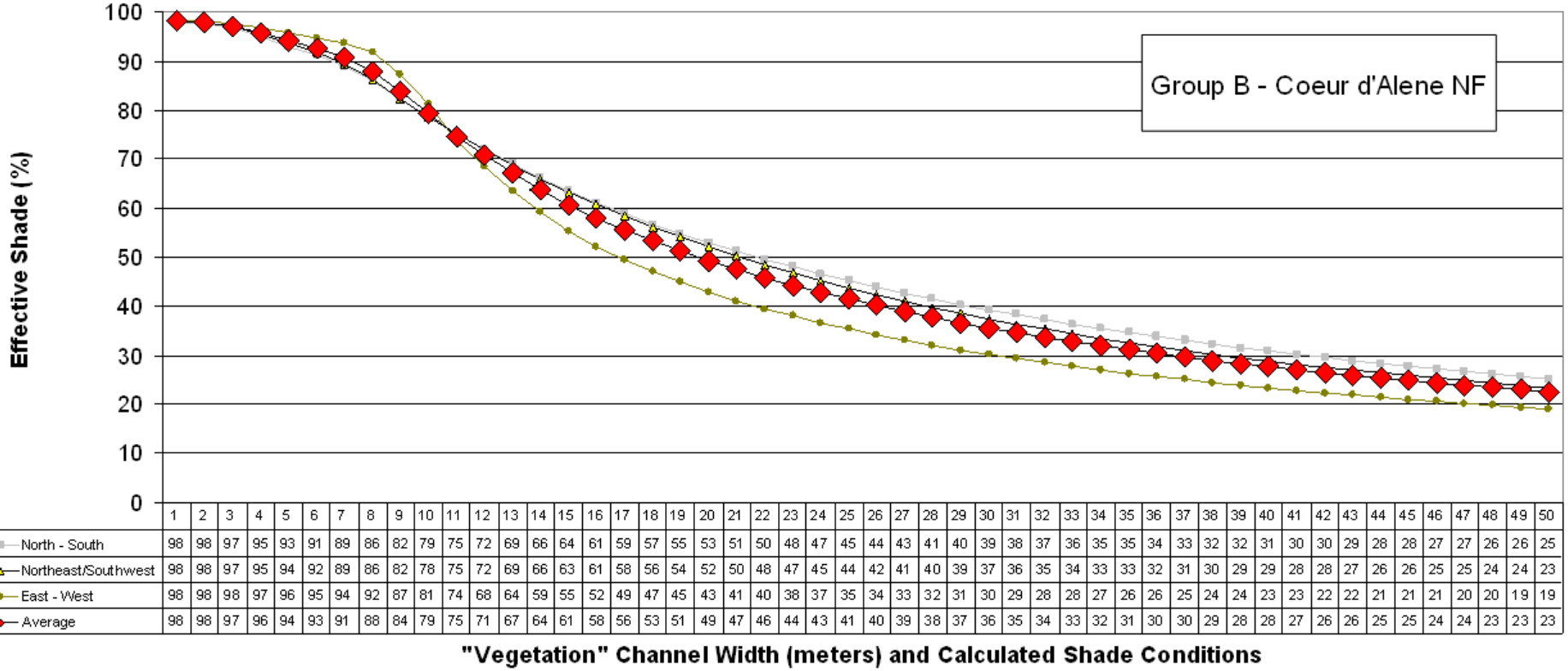


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	18	21	37	71	94	111	124	136	146	154	162	169	175	181	186	191	195	199	203	206	210	213	215	218	221	223	225	228	230	232	233	235	237	238	240	241	243	244	245	246	247	249	250	251	252	253	253	254	255	256
Northeast/Southwest	16	19	34	62	85	103	117	129	139	149	157	165	171	178	184	189	194	198	203	206	210	214	217	220	223	225	228	230	232	234	236	238	239	241	243	244	245	247	248	249	250	251	252	253	254	255	256	257	258	258
East - West	15	16	24	50	71	89	106	123	142	155	167	178	187	193	200	205	210	214	218	221	224	227	230	232	235	237	239	241	242	244	246	247	248	250	251	252	253	254	255	256	257	258	259	260	260	261	262	263	263	264
Average	16	18	32	61	83	101	116	129	142	153	162	170	178	184	190	195	199	204	208	211	215	218	221	223	226	228	231	233	235	237	238	240	242	243	244	246	247	248	249	251	252	253	254	255	255	256	257	258	259	259

“Moist” Group B

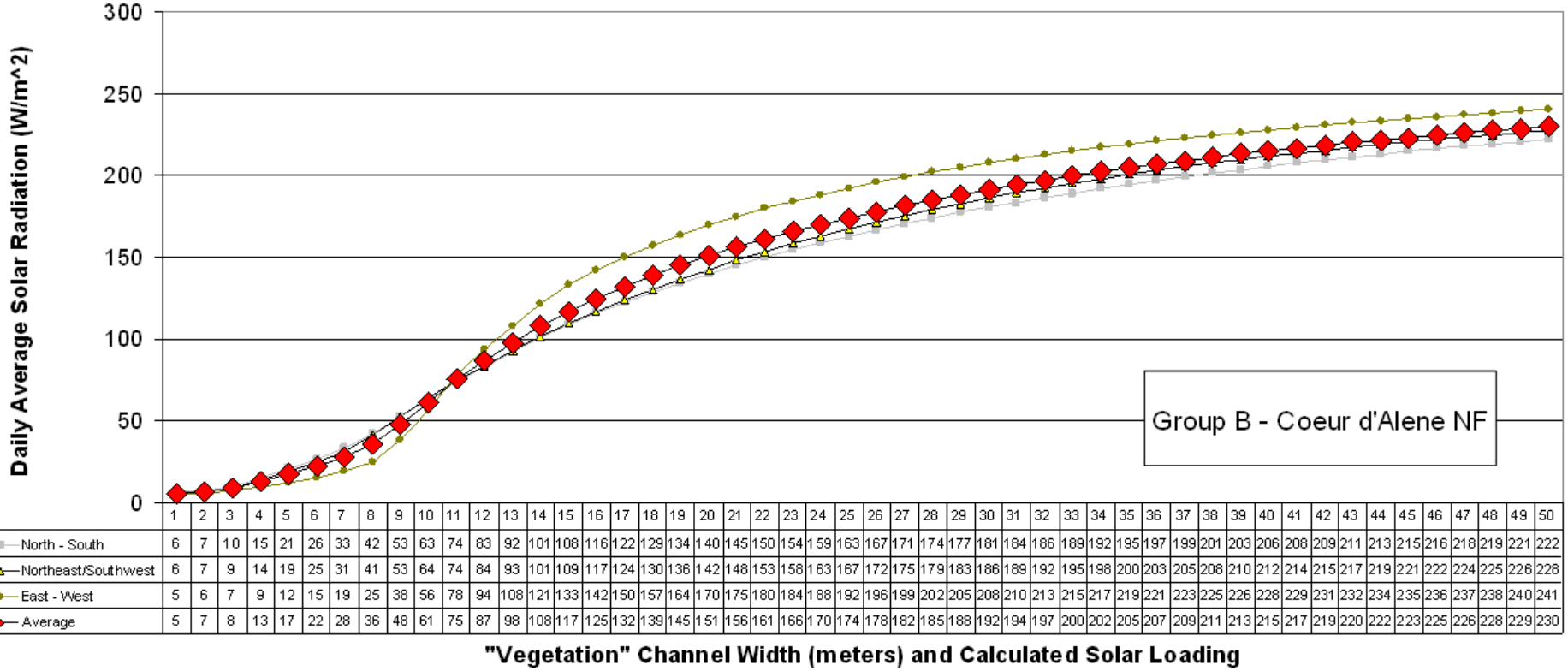
Coeur d’Alene National Forest
(Idaho Panhandle National Forests)

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
Moist (Group B) – Coeur d'Alene National Forest (IPNF)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	98	98	97	95	93	91	89	86	82	79	75	72	69	66	64	61	59	57	55	53	51	50	48	47	45	44	43	41	40	39	38	37	36	35	35	34	33	32	32	31	30	30	29	28	28	27	27	26	26	25
Northeast/Southwest	98	98	97	95	94	92	89	86	82	78	75	72	69	66	63	61	58	56	54	52	50	48	47	45	44	42	41	40	39	37	36	35	34	33	33	32	31	30	29	29	28	28	27	26	26	25	25	24	24	23
East - West	98	98	98	97	96	95	94	92	87	81	74	68	64	59	55	52	49	47	45	43	41	40	38	37	35	34	33	32	31	30	29	28	28	27	26	26	25	24	24	23	23	22	22	21	21	21	20	20	19	19
Average	98	98	97	96	94	93	91	88	84	79	75	71	67	64	61	58	56	53	51	49	47	46	44	43	41	40	39	38	37	36	35	34	33	32	31	30	30	29	28	28	27	26	26	25	25	24	24	23	23	23

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
Moist (Group B) – Coeur d'Alene National Forest (IPNF)

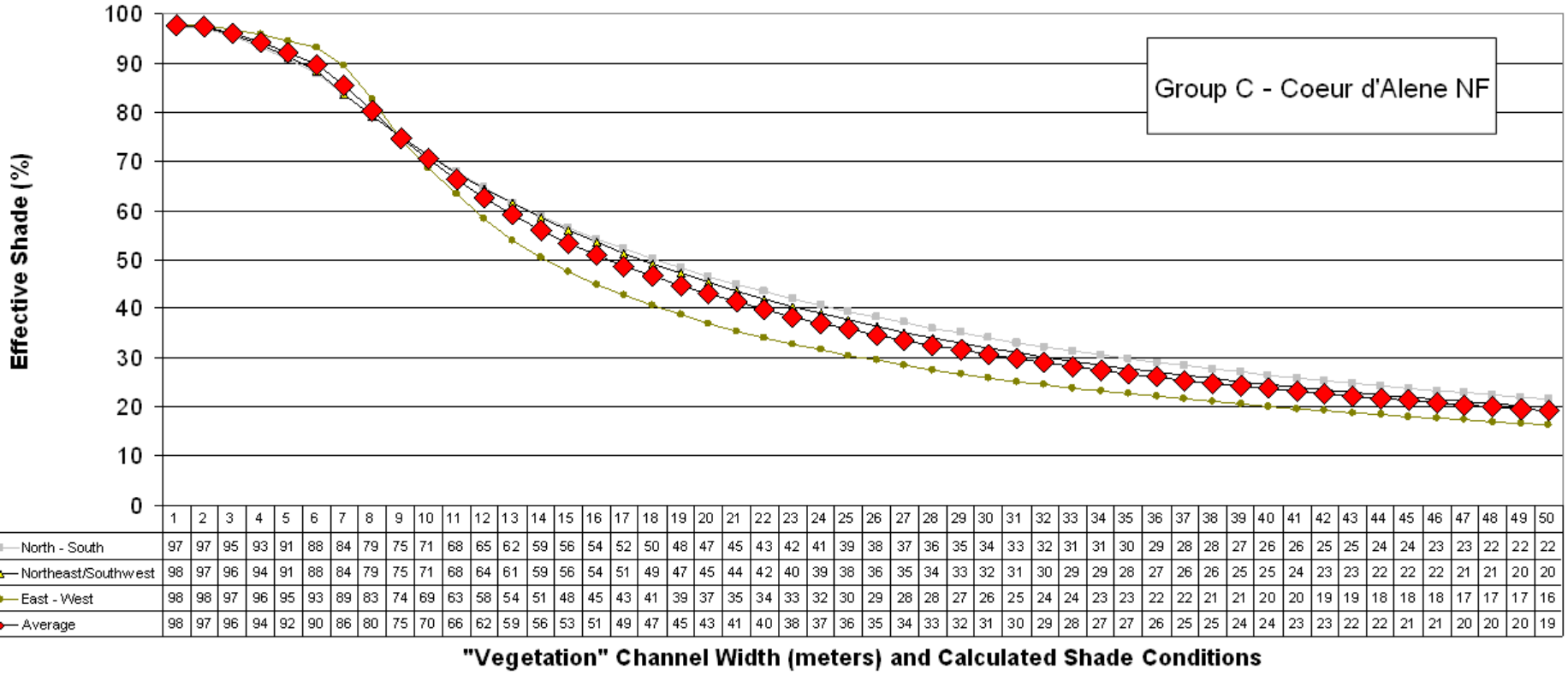


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	6	7	10	15	21	26	33	42	53	63	74	83	92	101	108	116	122	129	134	140	145	150	154	159	163	167	171	174	177	181	184	186	189	192	195	197	199	201	203	206	208	209	211	213	215	216	218	219	221	222
Northeast/Southwest	6	7	9	14	19	25	31	41	53	64	74	84	93	101	109	117	124	130	136	142	148	153	158	163	167	172	175	179	183	186	189	192	195	198	200	203	205	208	210	212	214	215	217	219	221	222	224	225	226	228
East - West	5	6	7	9	12	15	19	25	38	56	78	94	108	121	133	142	150	157	164	170	175	180	184	188	192	196	199	202	205	208	210	213	215	217	219	221	223	225	226	228	229	231	232	234	235	236	237	238	240	241
Average	5	7	8	13	17	22	28	36	48	61	75	87	98	108	117	125	132	139	145	151	156	161	166	170	174	178	182	185	188	192	194	197	200	202	205	207	209	211	213	215	217	219	220	222	223	225	226	228	229	230

“Cool/Moist” Group C

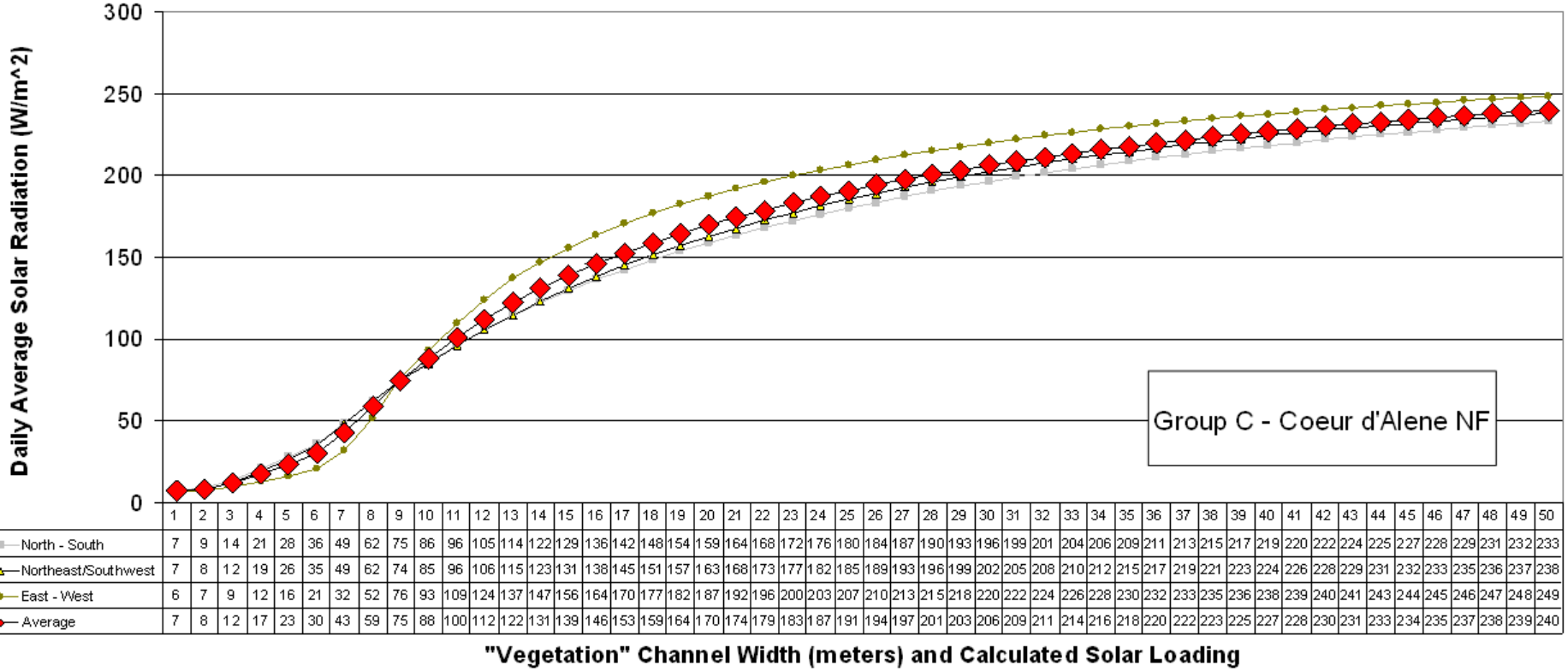
Coeur d’Alene National Forest
(Idaho Panhandle National Forests)

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
Cool/Moist (Group C) – Coeur d'Alene National Forest (IPNF)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	97	97	95	93	91	88	84	79	75	71	68	65	62	59	56	54	52	50	48	47	45	43	42	41	39	38	37	36	35	34	33	32	31	31	30	29	28	28	27	26	26	25	25	24	24	23	23	22	22	22
Northeast/Southwest	98	97	96	94	91	88	84	79	75	71	68	64	61	59	56	54	51	49	47	45	44	42	40	39	38	36	35	34	33	32	31	30	29	29	28	27	26	26	25	25	24	23	23	22	22	22	21	21	20	20
East - West	98	98	97	96	95	93	89	83	74	69	63	58	54	51	48	45	43	41	39	37	35	34	33	32	30	29	28	28	27	26	25	24	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16
Average	98	97	96	94	92	90	86	80	75	70	66	62	59	56	53	51	49	47	45	43	41	40	38	37	36	35	34	33	32	31	30	29	28	27	27	26	25	25	24	24	23	23	22	22	21	21	20	20	20	19

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
Cool/Moist (Group C) – Coeur d'Alene National Forest (IPNF)

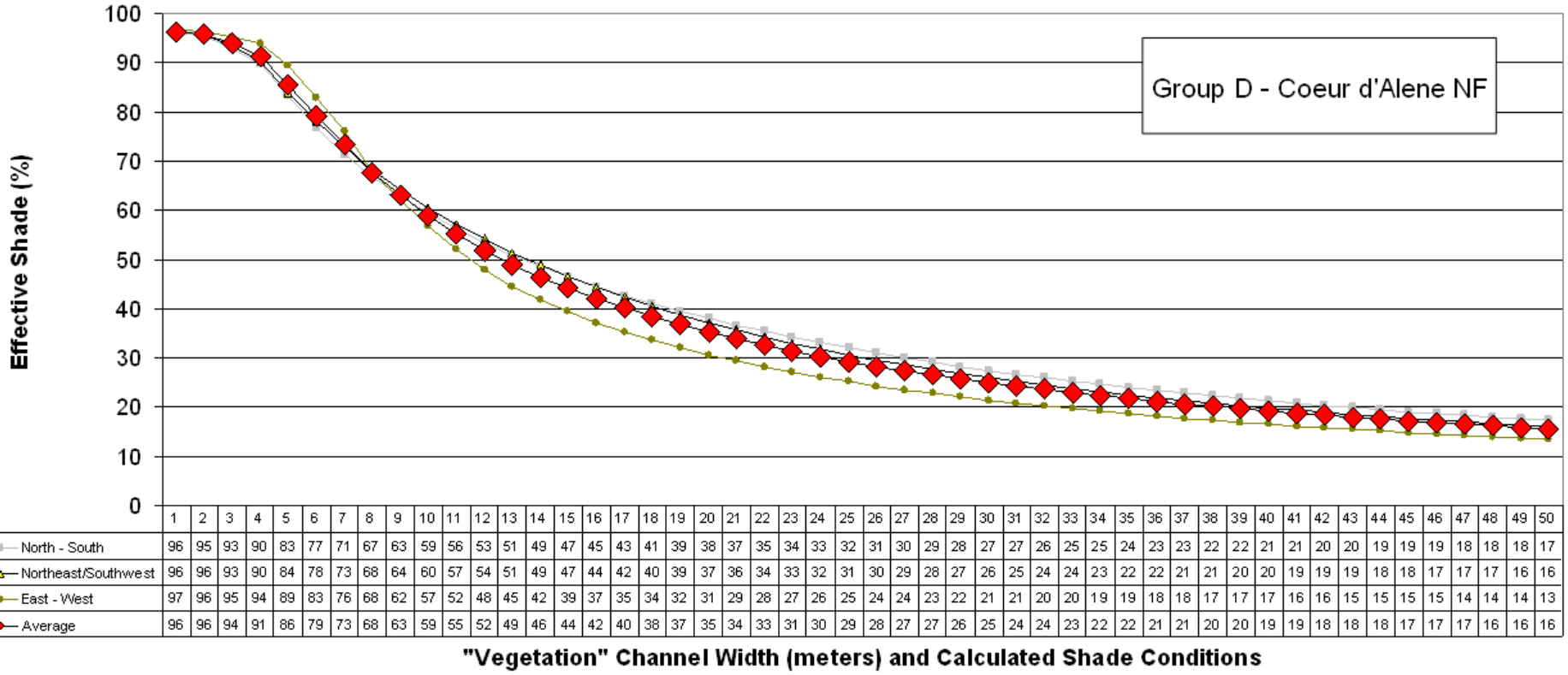


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	7	9	14	21	28	36	49	62	75	86	96	105	114	122	129	136	142	148	154	159	164	168	172	176	180	184	187	190	193	196	199	201	204	206	209	211	213	215	217	219	220	222	224	225	227	228	229	231	232	233
Northeast/Southwest	7	8	12	19	26	35	49	62	74	85	96	106	115	123	131	138	145	151	157	163	168	173	177	182	185	189	193	196	199	202	205	208	210	212	215	217	219	221	223	224	226	228	229	231	232	233	235	236	237	238
East - West	6	7	9	12	16	21	32	52	76	93	109	124	137	147	156	164	170	177	182	187	192	196	200	203	207	210	213	215	218	220	222	224	226	228	230	232	233	235	236	238	239	240	241	243	244	245	246	247	248	249
Average	7	8	12	17	23	30	43	59	75	88	100	112	122	131	139	146	153	159	164	170	174	179	183	187	191	194	197	201	203	206	209	211	214	216	218	220	222	223	225	227	228	230	231	233	234	235	237	238	239	240

“Cool/Dry” Group D

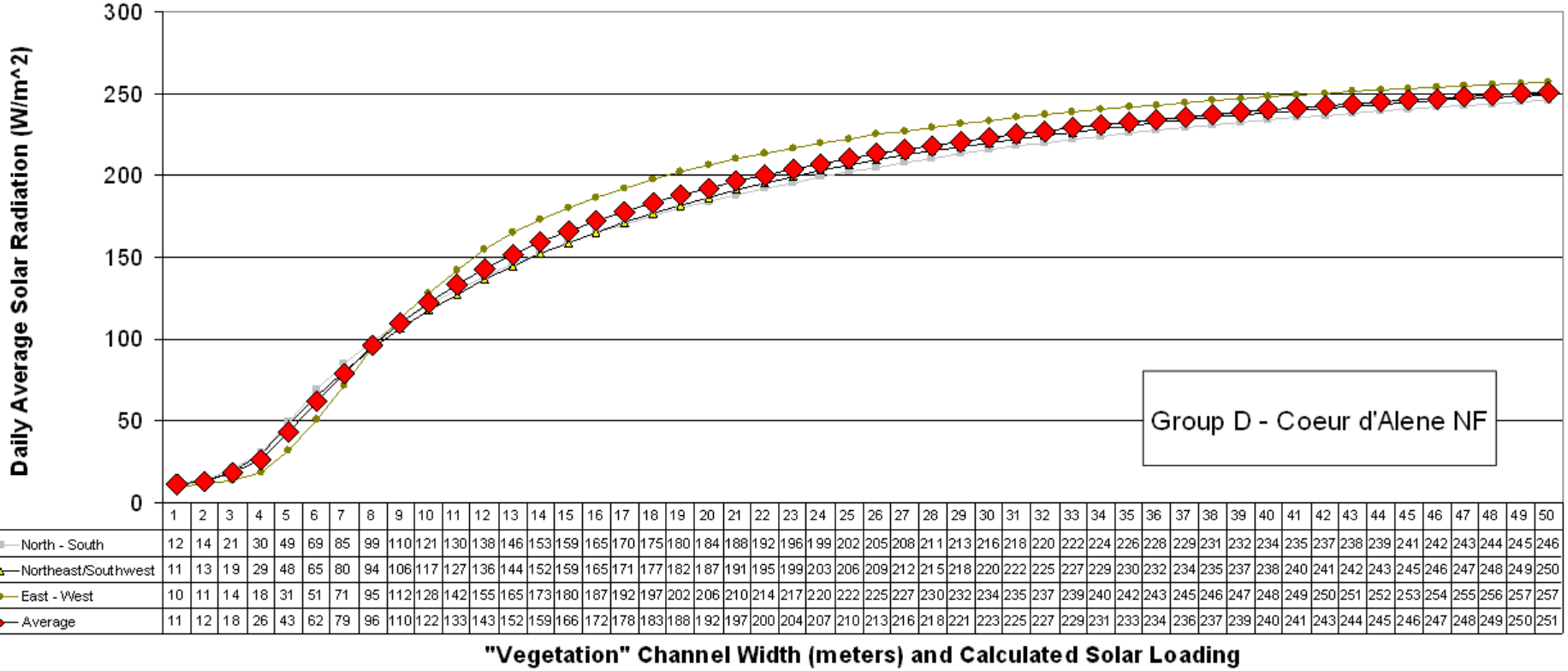
Coeur d’Alene National Forest
(Idaho Panhandle National Forests)

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
Cool/Dry (Group D) – Coeur d'Alene National Forest (IPNF)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	96	95	93	90	83	77	71	67	63	59	56	53	51	49	47	45	43	41	39	38	37	35	34	33	32	31	30	29	28	27	27	26	25	25	24	23	23	22	22	21	21	20	20	19	19	19	18	18	18	17
Northeast/Southwest	96	96	93	90	84	78	73	68	64	60	57	54	51	49	47	44	42	40	39	37	36	34	33	32	31	30	29	28	27	26	25	24	24	23	22	22	21	21	20	20	19	19	19	18	18	17	17	17	16	16
East - West	97	96	95	94	89	83	76	68	62	57	52	48	45	42	39	37	35	34	32	31	29	28	27	26	25	24	24	23	22	21	21	20	20	19	19	18	18	17	17	17	16	16	15	15	15	15	14	14	14	13
Average	96	96	94	91	86	79	73	68	63	59	55	52	49	46	44	42	40	38	37	35	34	33	31	30	29	28	27	27	26	25	24	24	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16	16	16

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
Cool/Dry (Group D) – Coeur d'Alene National Forest (IPNF)

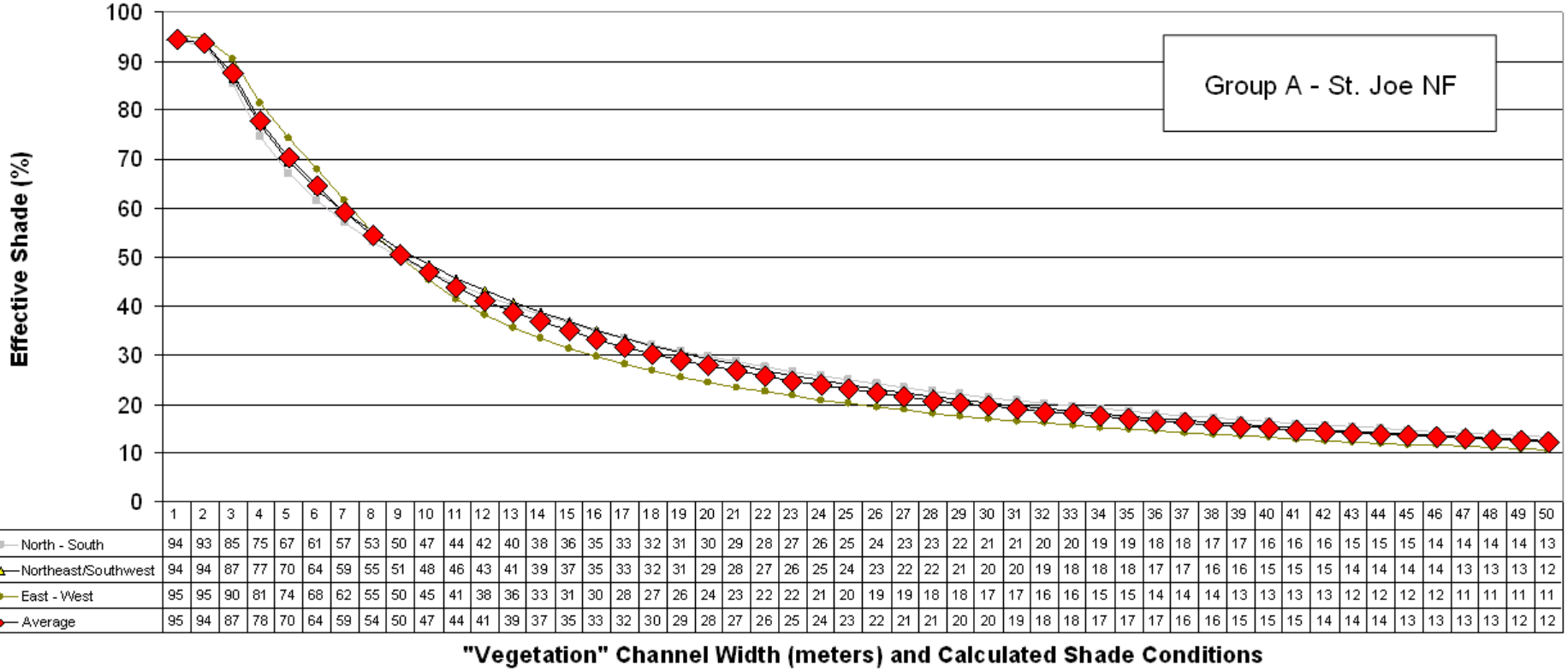


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	12	14	21	30	49	69	85	99	110	121	130	138	146	153	159	165	170	175	180	184	188	192	196	199	202	205	208	211	213	216	218	220	222	224	226	228	229	231	232	234	235	237	238	239	241	242	243	244	245	246
Northeast/Southwest	11	13	19	29	48	65	80	94	106	117	127	136	144	152	159	165	171	177	182	187	191	195	199	203	206	209	212	215	218	220	222	225	227	229	230	232	234	235	237	238	240	241	242	243	245	246	247	248	249	250
East - West	10	11	14	18	31	51	71	95	112	128	142	155	165	173	180	187	192	197	202	206	210	214	217	220	222	225	227	230	232	234	235	237	239	240	242	243	245	246	247	248	249	250	251	252	253	254	255	256	257	257
Average	11	12	18	26	43	62	79	96	110	122	133	143	152	159	166	172	178	183	188	192	197	200	204	207	210	213	216	218	221	223	225	227	229	231	233	234	236	237	239	240	241	243	244	245	246	247	248	249	250	251

“Warm/Dry” Group A

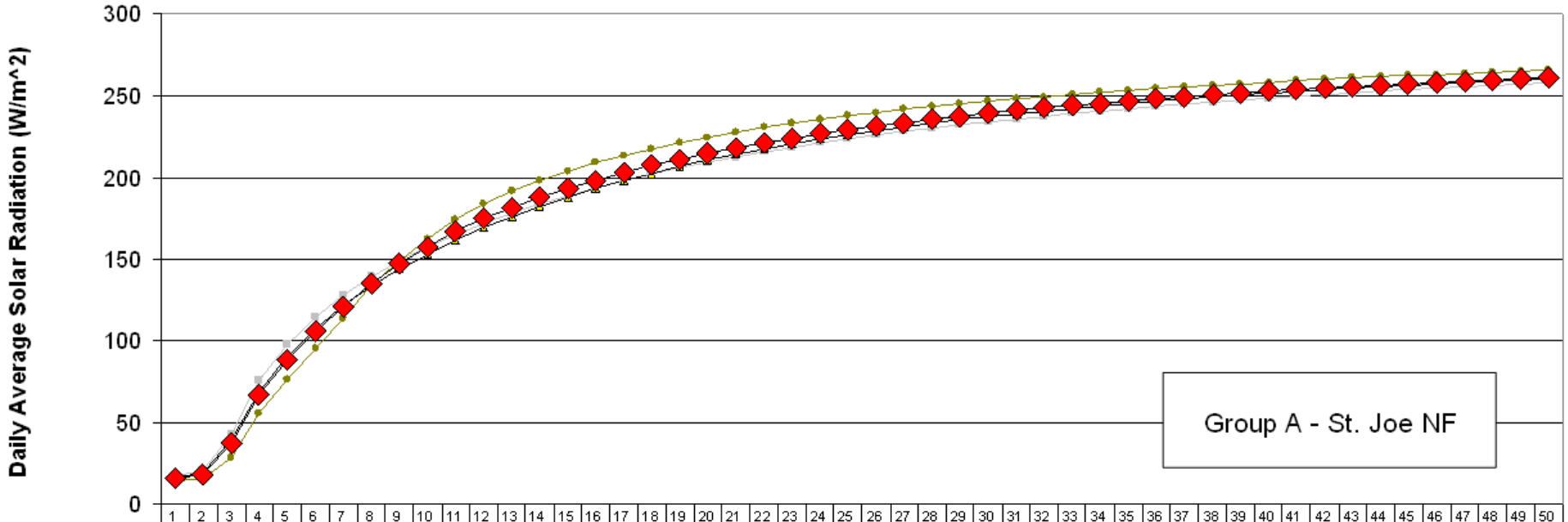
St. Joe National Forest
(Idaho Panhandle National Forest)

Figure A.1-1. System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
"Warm/Dry" (Group A) – St. Joe National Forest (IPNF)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	94	93	85	75	67	61	57	53	50	47	44	42	40	38	36	35	33	32	31	30	29	28	27	26	25	24	23	23	22	21	21	20	20	19	19	18	18	17	17	16	16	16	15	15	15	14	14	14	14	13
Northeast/Southwest	94	94	87	77	70	64	59	55	51	48	46	43	41	39	37	35	33	32	31	29	28	27	26	25	24	23	22	22	21	20	20	19	18	18	18	17	17	16	16	15	15	15	14	14	14	14	13	13	13	12
East - West	95	95	90	81	74	68	62	55	50	45	41	38	36	33	31	30	28	27	26	24	23	22	22	21	20	19	19	18	18	17	17	16	16	15	15	14	14	14	13	13	13	13	12	12	12	12	11	11	11	11
Average	95	94	87	78	70	64	59	54	50	47	44	41	39	37	35	33	32	30	29	28	27	26	25	24	23	22	21	21	20	20	19	18	18	17	17	17	16	16	15	15	15	14	14	14	13	13	13	13	12	12

Figure A.1-2. Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
"Warm/Dry" (Group A) – St. Joe National Forest (IPNF)



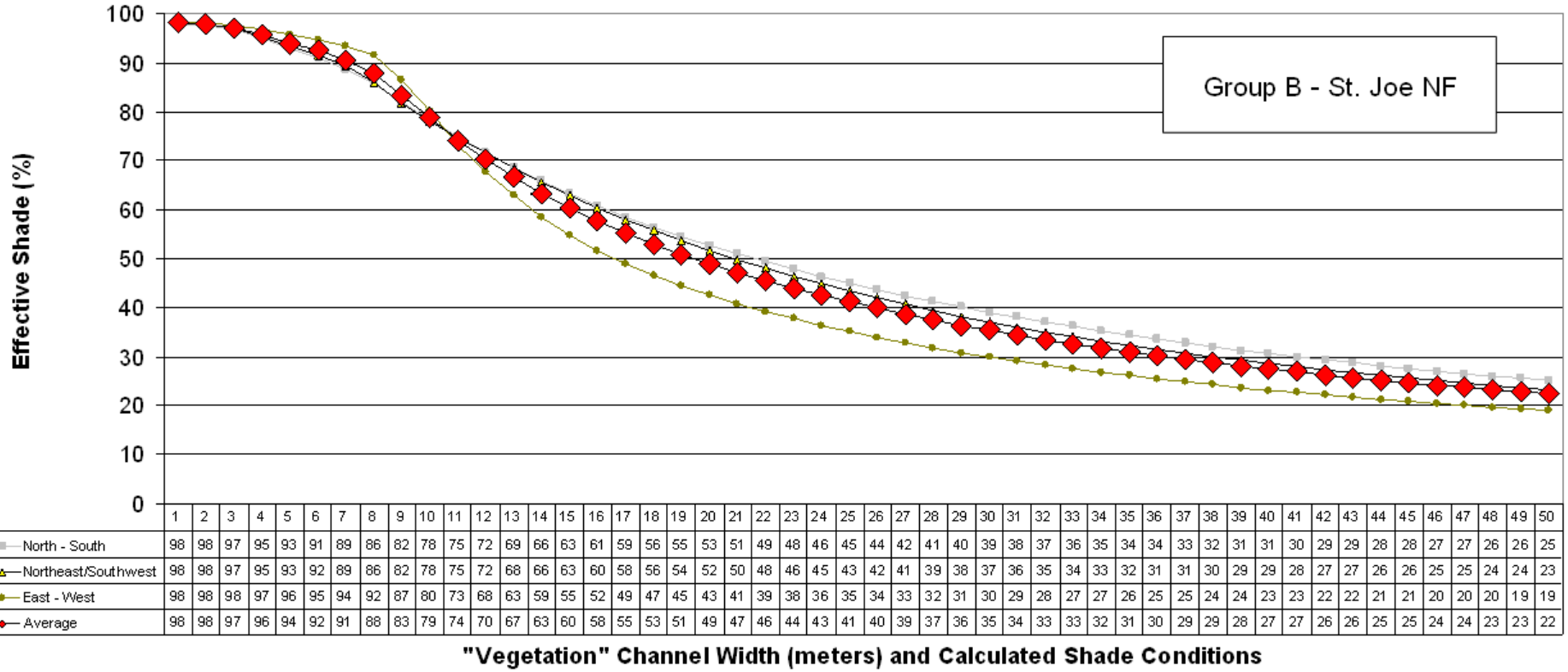
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	18	21	43	76	98	114	128	139	149	158	165	172	178	184	189	194	198	202	206	209	212	215	218	221	223	226	228	230	232	234	236	238	239	241	242	244	245	246	247	249	250	251	252	253	254	255	255	256	257	258
Northeast/Southwest	16	19	40	69	91	108	122	134	144	153	162	169	176	182	188	193	198	202	207	210	214	217	220	223	226	229	231	233	235	237	239	241	242	244	245	247	248	249	250	251	252	254	255	255	256	257	258	259	260	260
East - West	15	16	29	55	76	95	114	134	149	162	174	184	191	198	204	209	214	218	221	225	228	230	233	235	238	240	242	243	245	247	248	249	251	252	253	254	255	256	257	258	259	260	261	261	262	263	264	264	265	266
Average	16	19	37	67	88	106	121	136	147	158	167	175	182	188	194	199	203	207	211	215	218	221	224	227	229	231	233	236	237	239	241	243	244	245	247	248	249	251	252	253	254	255	256	257	257	258	259	260	260	261

"Vegetation" Channel Width (meters) and Calculated Solar Loading

“Moist” Group B

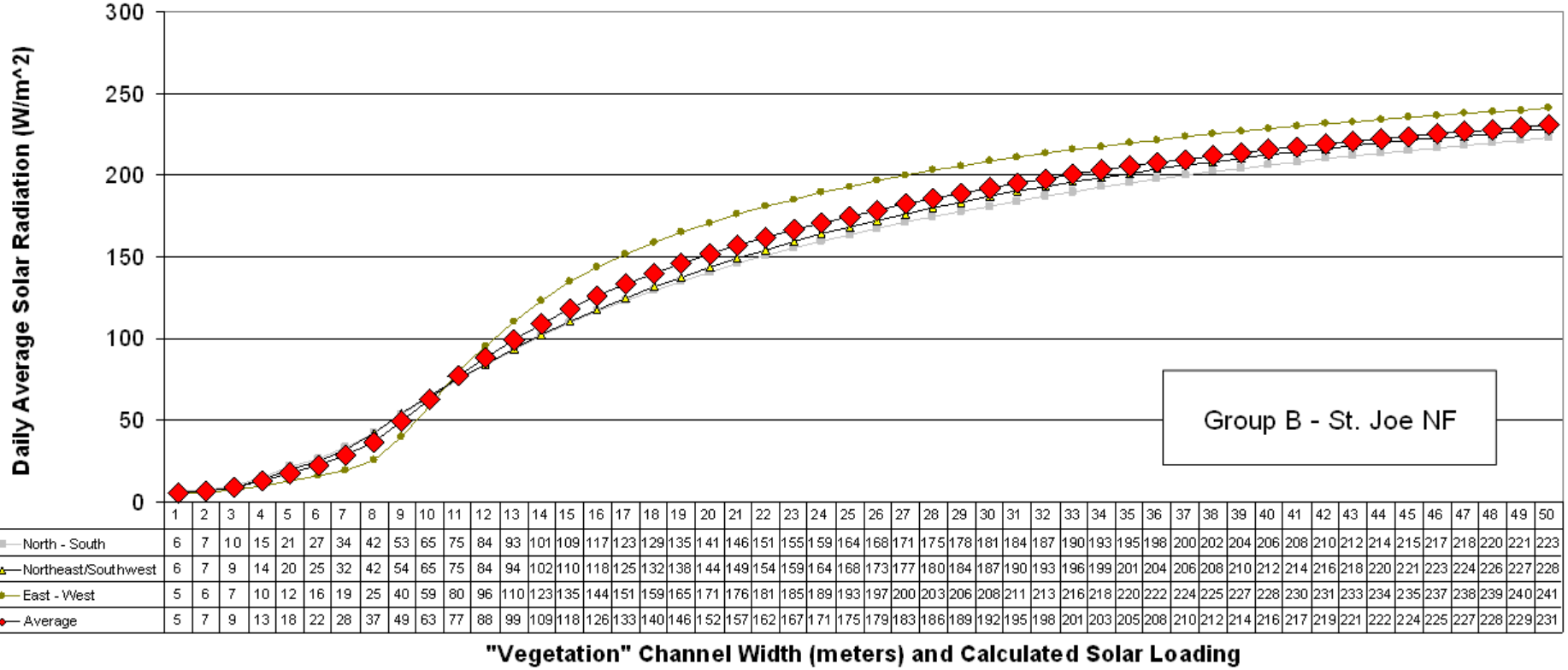
St. Joe National Forest
(Idaho Panhandle National Forests)

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
"Moist" (Group B) – St. Joe National Forest (IPNF)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	98	98	97	95	93	91	89	86	82	78	75	72	69	66	63	61	59	56	55	53	51	49	48	46	45	44	42	41	40	39	38	37	36	35	34	34	33	32	31	31	30	29	29	28	28	27	27	26	26	25
Northeast/Southwest	98	98	97	95	93	92	89	86	82	78	75	72	68	66	63	60	58	56	54	52	50	48	46	45	43	42	41	39	38	37	36	35	34	33	32	31	31	30	29	29	28	27	27	26	26	25	25	24	24	23
East - West	98	98	98	97	96	95	94	92	87	80	73	68	63	59	55	52	49	47	45	43	41	39	38	36	35	34	33	32	31	30	29	28	27	27	26	25	25	24	24	23	23	22	22	21	21	20	20	20	19	19
Average	98	98	97	96	94	92	91	88	83	79	74	70	67	63	60	58	55	53	51	49	47	46	44	43	41	40	39	37	36	35	34	33	33	32	31	30	29	29	28	27	27	26	26	25	25	24	24	23	23	22

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
"Moist" (Group B) – St. Joe National Forest (IPNF)

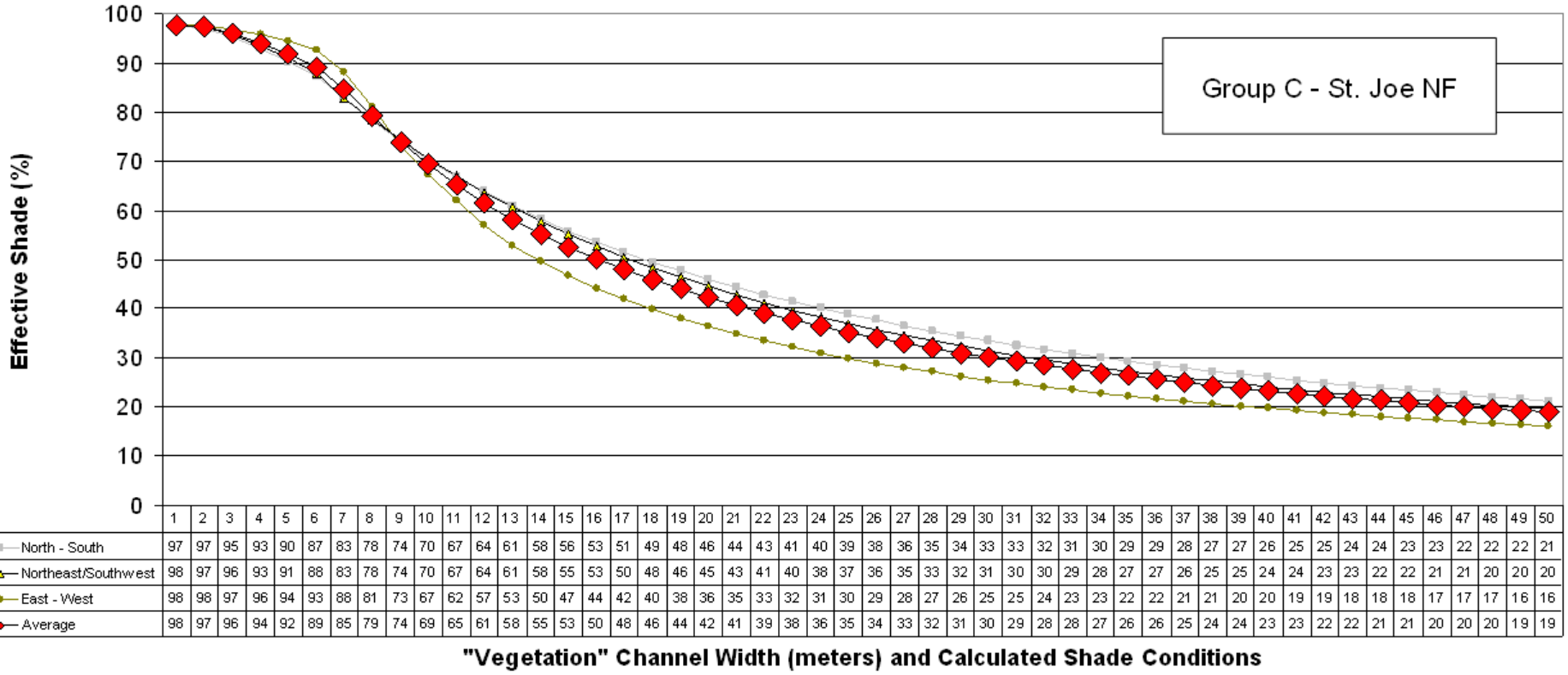


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	6	7	10	15	21	27	34	42	53	65	75	84	93	101	109	117	123	129	135	141	146	151	155	159	164	168	171	175	178	181	184	187	190	193	195	198	200	202	204	206	208	210	212	214	215	217	218	220	221	223
Northeast/Southwest	6	7	9	14	20	25	32	42	54	65	75	84	94	102	110	118	125	132	138	144	149	154	159	164	168	173	177	180	184	187	190	193	196	199	201	204	206	208	210	212	214	216	218	220	221	223	224	226	227	228
East - West	5	6	7	10	12	16	19	25	40	59	80	96	110	123	135	144	151	159	165	171	176	181	185	189	193	197	200	203	206	208	211	213	216	218	220	222	224	225	227	228	230	231	233	234	235	237	238	239	240	241
Average	5	7	9	13	18	22	28	37	49	63	77	88	99	109	118	126	133	140	146	152	157	162	167	171	175	179	183	186	189	192	195	198	201	203	205	208	210	212	214	216	217	219	221	222	224	225	227	228	229	231

“Cool/Moist” Group C

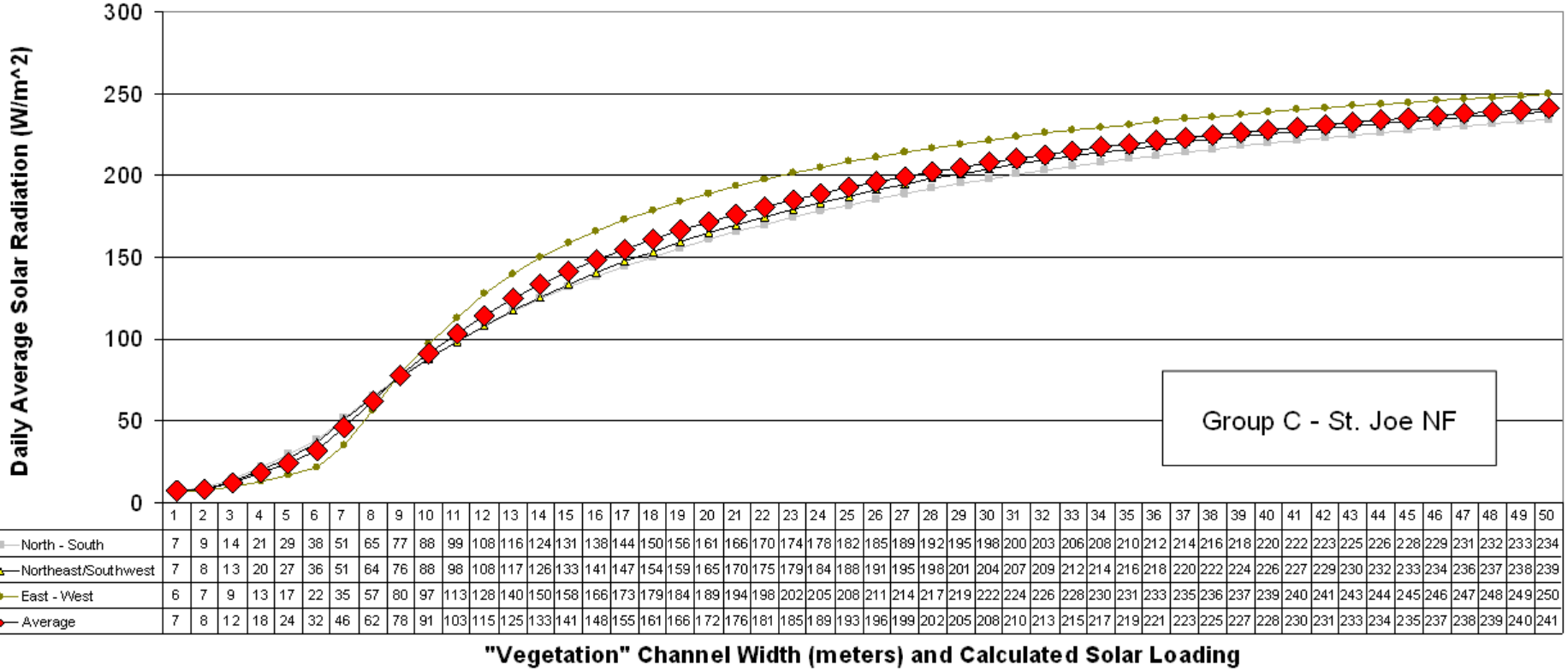
St. Joe National Forest
(Idaho Panhandle National Forest)

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
"Cool/Moist" (Group C) – St. Joe National Forest (IPNF)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	97	97	95	93	90	87	83	78	74	70	67	64	61	58	56	53	51	49	48	46	44	43	41	40	39	38	36	35	34	33	33	32	31	30	29	29	28	27	27	26	25	25	24	24	23	23	22	22	22	21
Northeast/Southwest	98	97	96	93	91	88	83	78	74	70	67	64	61	58	55	53	50	48	46	45	43	41	40	38	37	36	35	33	32	31	30	30	29	28	27	27	26	25	25	24	24	23	23	22	22	21	21	20	20	20
East - West	98	98	97	96	94	93	88	81	73	67	62	57	53	50	47	44	42	40	38	36	35	33	32	31	30	29	28	27	26	25	25	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16	16
Average	98	97	96	94	92	89	85	79	74	69	65	61	58	55	53	50	48	46	44	42	41	39	38	36	35	34	33	32	31	30	29	28	28	27	26	26	25	24	24	23	23	22	22	21	21	20	20	20	19	19

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
"Cool/Moist" (Group C) – St. Joe National Forest (IPNF)

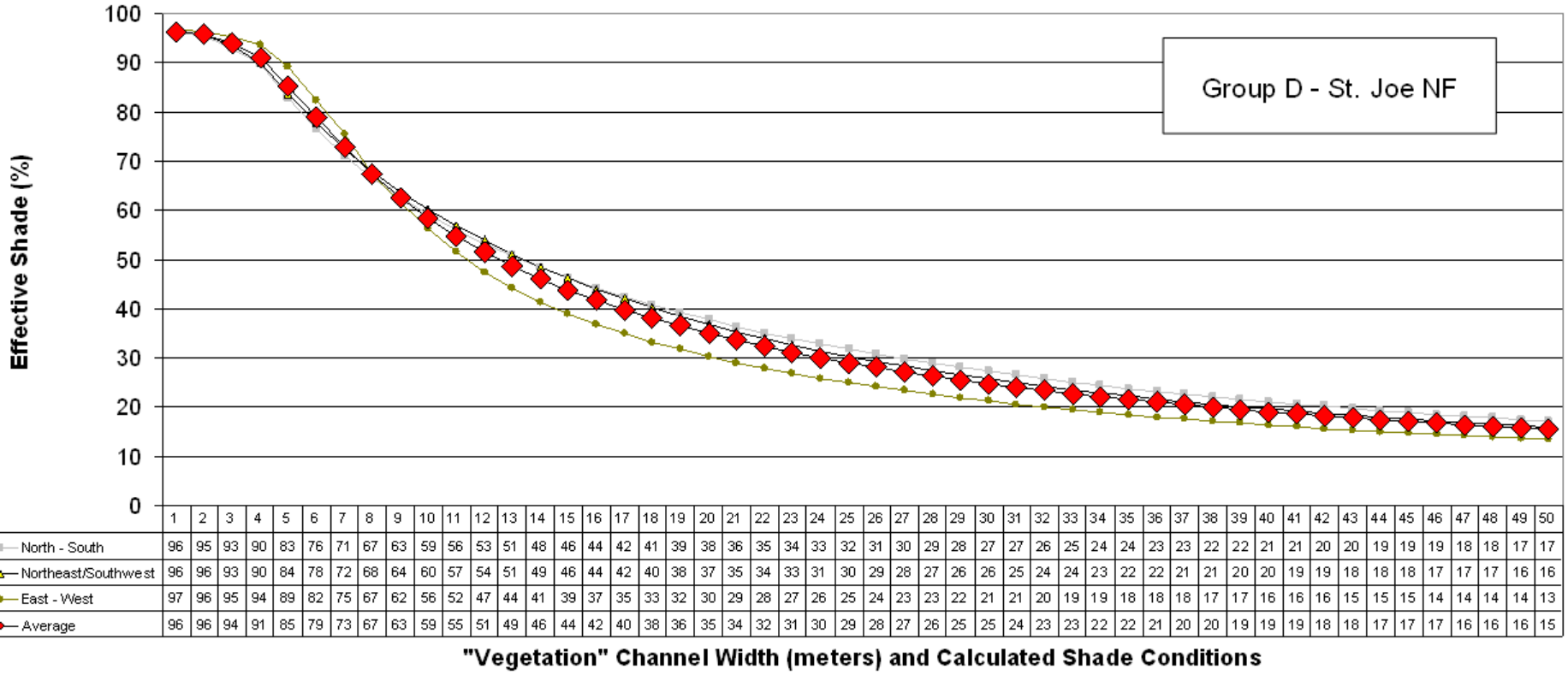


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	7	9	14	21	29	38	51	65	77	88	99	108	116	124	131	138	144	150	156	161	166	170	174	178	182	185	189	192	195	198	200	203	206	208	210	212	214	216	218	220	222	223	225	226	228	229	231	232	233	234
Northeast/Southwest	7	8	13	20	27	36	51	64	76	88	98	108	117	126	133	141	147	154	159	165	170	175	179	184	188	191	195	198	201	204	207	209	212	214	216	218	220	222	224	226	227	229	230	232	233	234	236	237	238	239
East - West	6	7	9	13	17	22	35	57	80	97	113	128	140	150	158	166	173	179	184	189	194	198	202	205	208	211	214	217	219	222	224	226	228	230	231	233	235	236	237	239	240	241	243	244	245	246	247	248	249	250
Average	7	8	12	18	24	32	46	62	78	91	103	115	125	133	141	148	155	161	166	172	176	181	185	189	193	196	199	202	205	208	210	213	215	217	219	221	223	225	227	228	230	231	233	234	235	237	238	239	240	241

“Cool/Dry” Group D

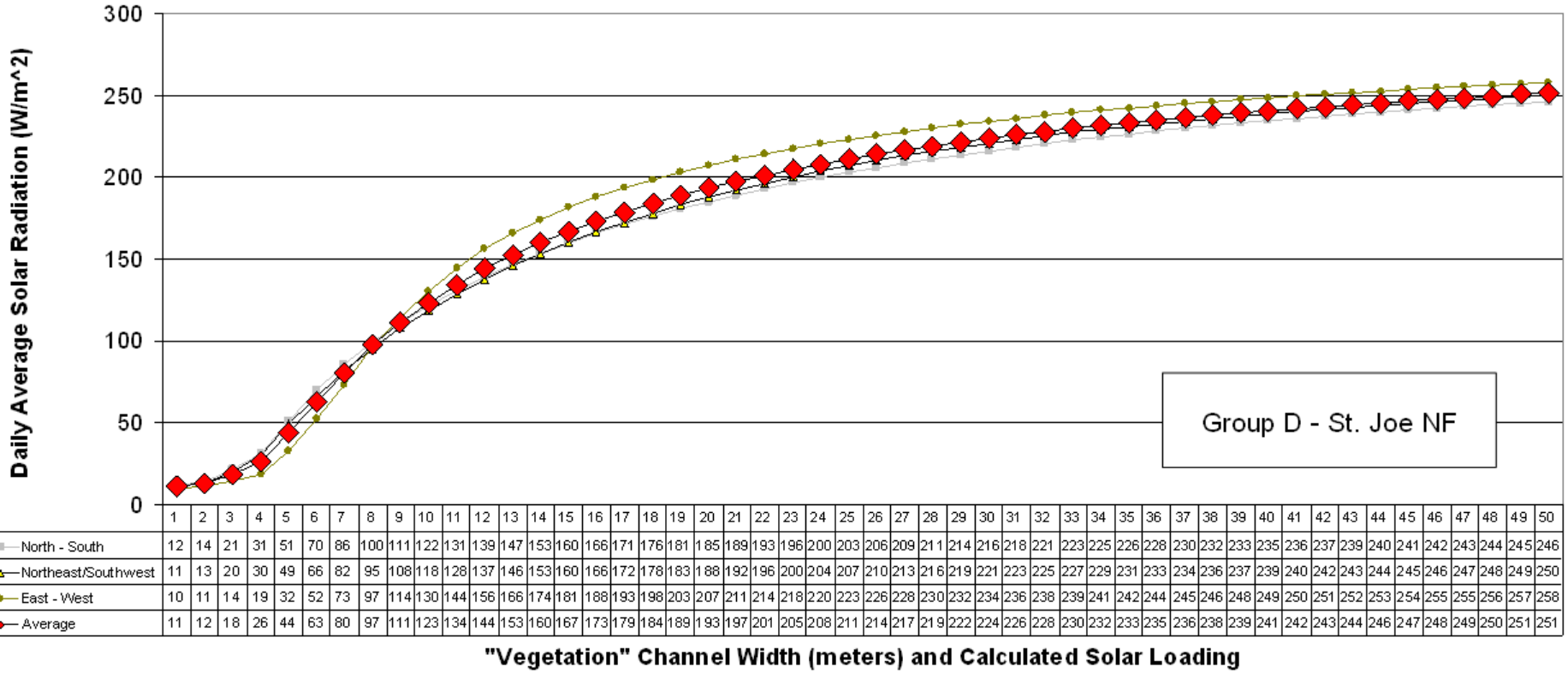
St. Joe National Forest
(Idaho Panhandle National Forests)

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
"Cool/Dry" (Group D) – St. Joe National Forest (IPNF)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	96	95	93	90	83	76	71	67	63	59	56	53	51	48	46	44	42	41	39	38	36	35	34	33	32	31	30	29	28	27	27	26	25	24	24	23	23	22	22	21	21	20	20	19	19	19	18	18	17	17
Northeast/Southwest	96	96	93	90	84	78	72	68	64	60	57	54	51	49	46	44	42	40	38	37	35	34	33	31	30	29	28	27	26	26	25	24	24	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16	16
East - West	97	96	95	94	89	82	75	67	62	56	52	47	44	41	39	37	35	33	32	30	29	28	27	26	25	24	23	23	22	21	21	20	19	19	18	18	18	17	17	16	16	16	15	15	15	14	14	14	14	13
Average	96	96	94	91	85	79	73	67	63	59	55	51	49	46	44	42	40	38	36	35	34	32	31	30	29	28	27	26	25	25	24	23	23	22	22	21	20	20	19	19	19	18	18	17	17	17	16	16	16	15

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
"Cool/Dry" (Group D) – St. Joe National Forest (IPNF)



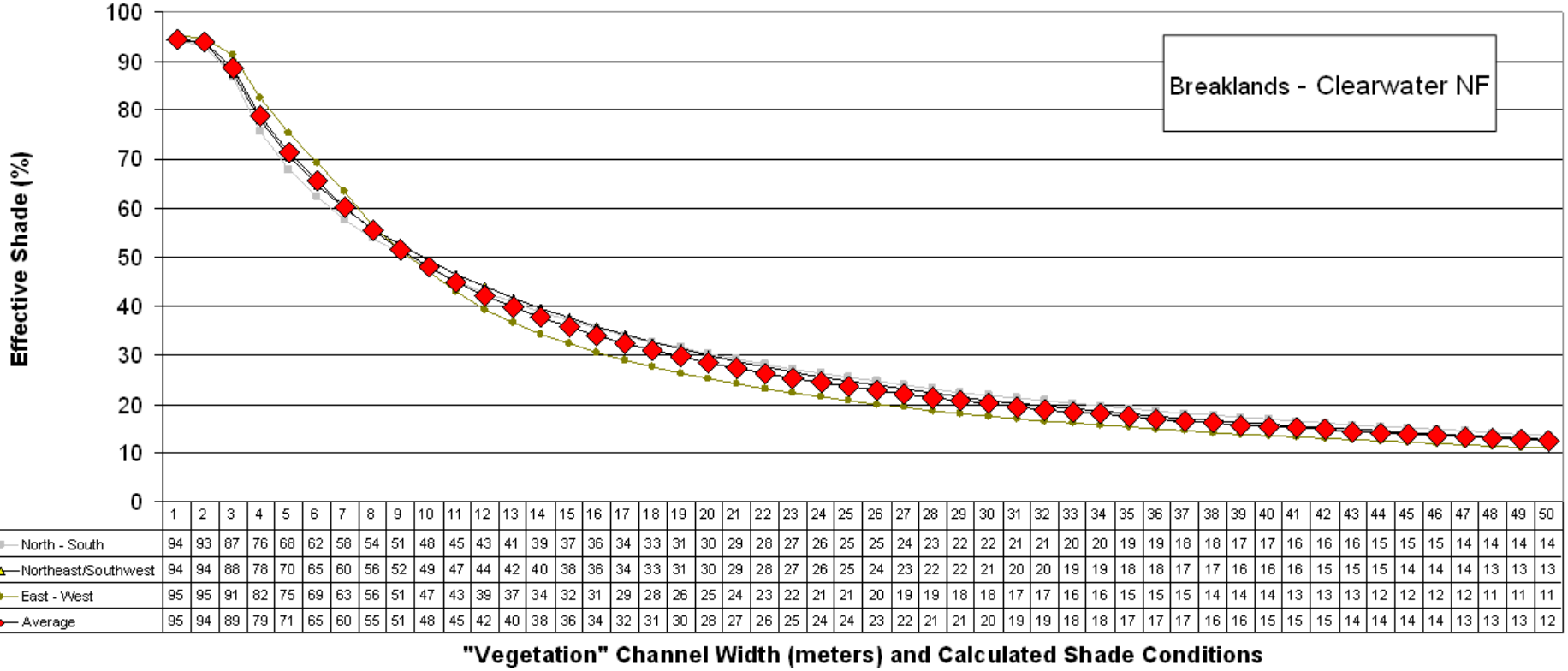
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	12	14	21	31	51	70	86	100	111	122	131	139	147	153	160	166	171	176	181	185	189	193	196	200	203	206	209	211	214	216	218	221	223	225	226	228	230	232	233	235	236	237	239	240	241	242	243	244	245	246
Northeast/Southwest	11	13	20	30	49	66	82	95	108	118	128	137	146	153	160	166	172	178	183	188	192	196	200	204	207	210	213	216	219	221	223	225	227	229	231	233	234	236	237	239	240	242	243	244	245	246	247	248	249	250
East - West	10	11	14	19	32	52	73	97	114	130	144	156	166	174	181	188	193	198	203	207	211	214	218	220	223	226	228	230	232	234	236	238	239	241	242	244	245	246	248	249	250	251	252	253	254	255	255	256	257	258
Average	11	12	18	26	44	63	80	97	111	123	134	144	153	160	167	173	179	184	189	193	197	201	205	208	211	214	217	219	222	224	226	228	230	232	233	235	236	238	239	241	242	243	244	246	247	248	249	250	251	251

Effective Shade Curves and Associated Solar Loading Curves for the Clearwater National Forest and the Nez Perce National Forests

“Warm/Dry” Breaklands

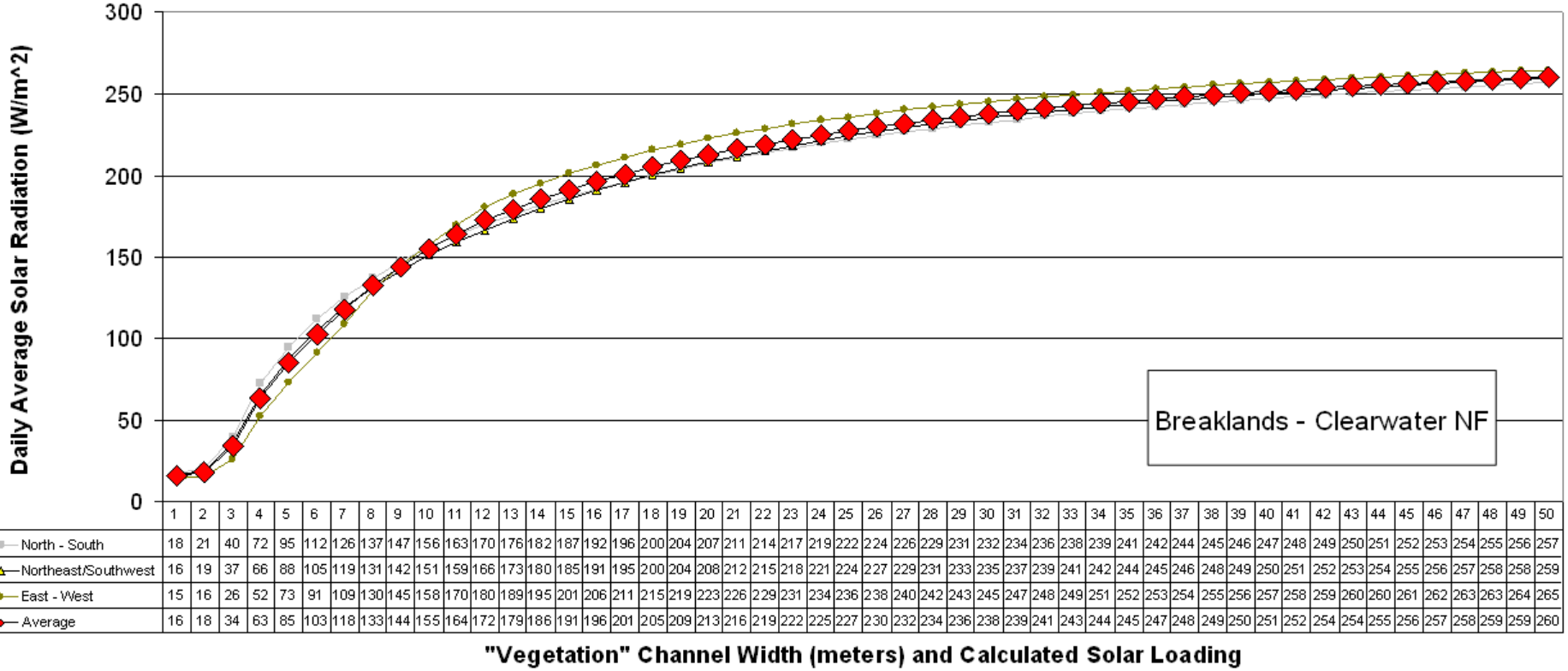
Clearwater National Forest

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
"Warm/Dry" (Breaklands) – Clearwater National Forest



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	94	93	87	76	68	62	58	54	51	48	45	43	41	39	37	36	34	33	31	30	29	28	27	26	25	25	24	23	22	22	21	21	20	20	19	19	18	18	17	17	16	16	16	15	15	15	14	14	14	14
Northeast/Southwest	94	94	88	78	70	65	60	56	52	49	47	44	42	40	38	36	34	33	31	30	29	28	27	26	25	24	23	22	22	21	20	20	19	19	18	18	17	17	16	16	16	15	15	15	14	14	14	13	13	13
East - West	95	95	91	82	75	69	63	56	51	47	43	39	37	34	32	31	29	28	26	25	24	23	22	21	21	20	19	19	18	18	17	17	16	16	15	15	15	14	14	14	13	13	13	12	12	12	12	11	11	11
Average	95	94	89	79	71	65	60	55	51	48	45	42	40	38	36	34	32	31	30	28	27	26	25	24	24	23	22	21	21	20	19	19	18	18	17	17	17	16	16	15	15	15	14	14	14	14	13	13	13	12

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
"Warm/Dry" (Breaklands) – Clearwater National Forest

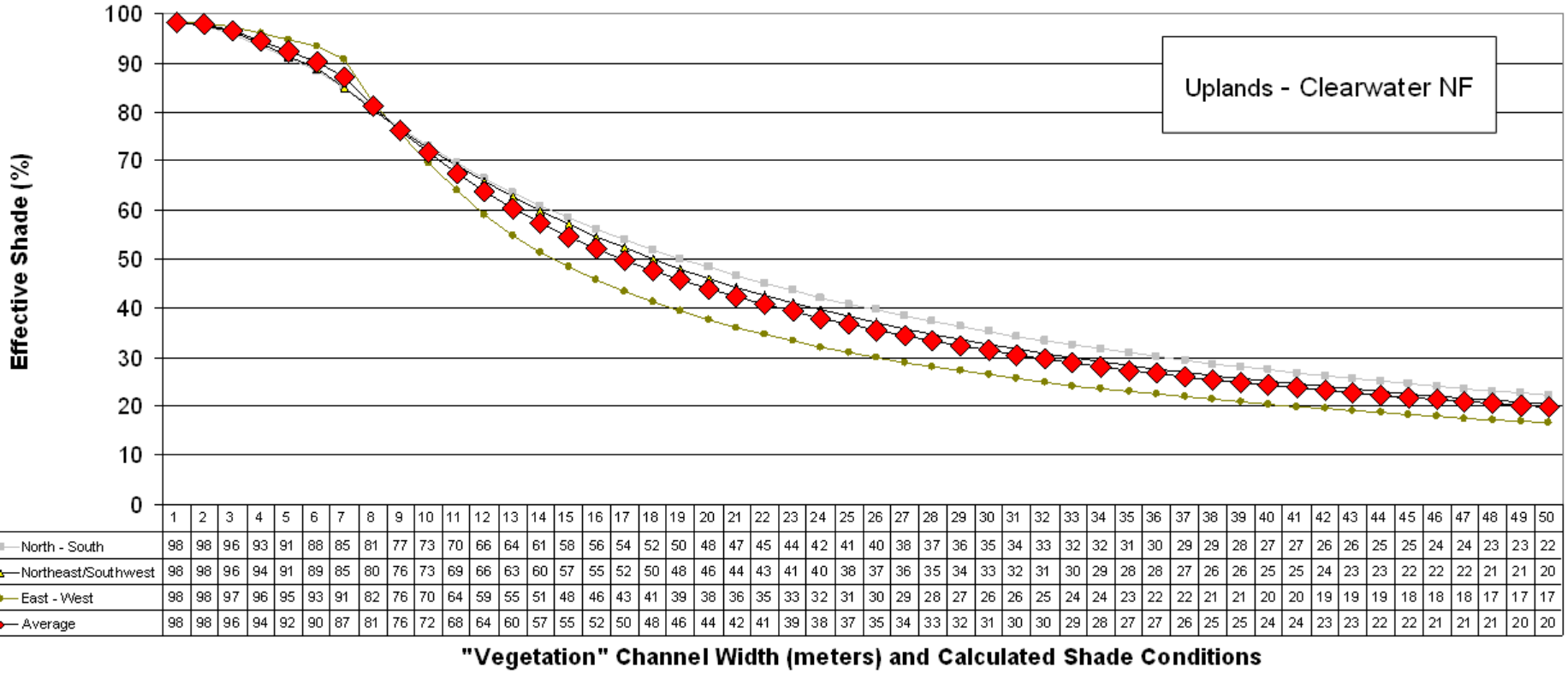


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	18	21	40	72	95	112	126	137	147	156	163	170	176	182	187	192	196	200	204	207	211	214	217	219	222	224	226	229	231	232	234	236	238	239	241	242	244	245	246	247	248	249	250	251	252	253	254	255	256	257
Northeast/Southwest	16	19	37	66	88	105	119	131	142	151	159	166	173	180	185	191	195	200	204	208	212	215	218	221	224	227	229	231	233	235	237	239	241	242	244	245	246	248	249	250	251	252	253	254	255	256	257	258	258	259
East - West	15	16	26	52	73	91	109	130	145	158	170	180	189	195	201	206	211	215	219	223	226	229	231	234	236	238	240	242	243	245	247	248	249	251	252	253	254	255	256	257	258	259	260	260	261	262	263	263	264	265
Average	16	18	34	63	85	103	118	133	144	155	164	172	179	186	191	196	201	205	209	213	216	219	222	225	227	230	232	234	236	238	239	241	243	244	245	247	248	249	250	251	252	254	254	255	256	257	258	259	259	260

“Mesic” Uplands

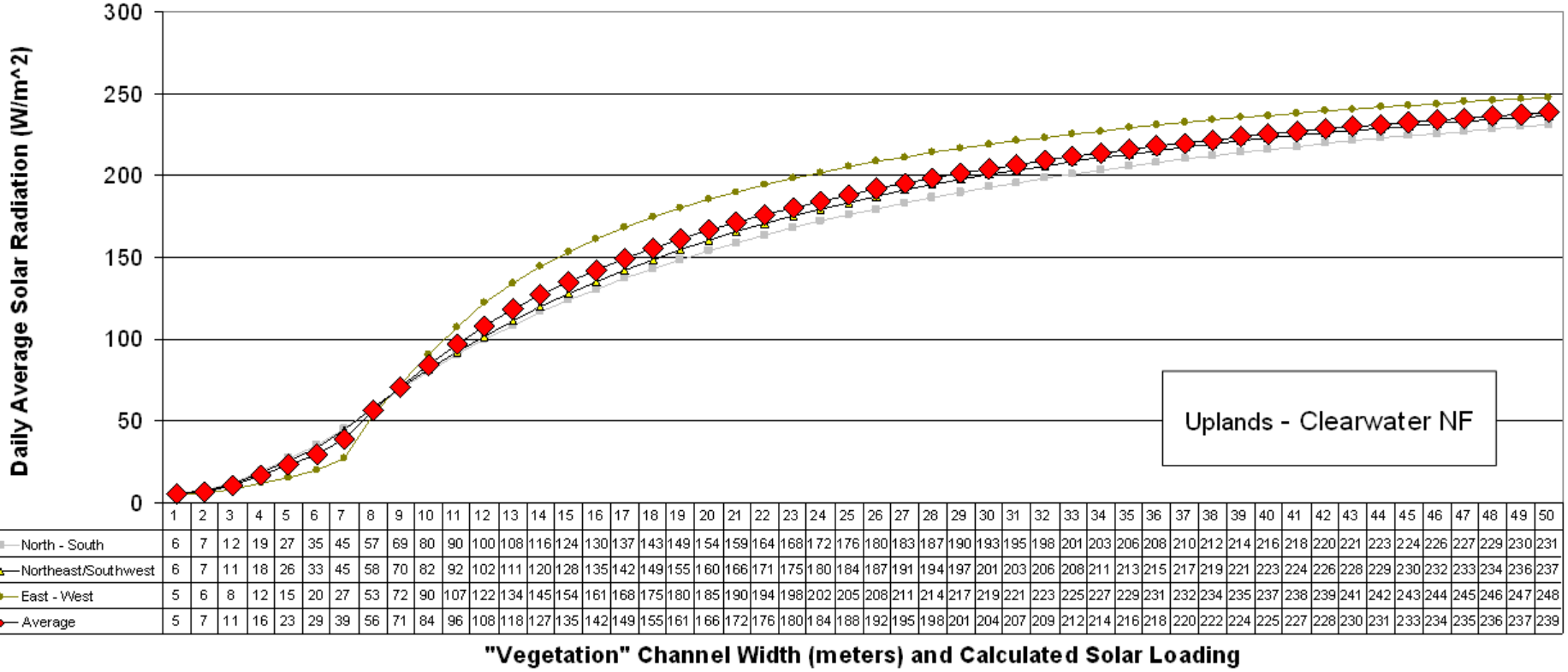
Clearwater National Forest

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
"Mesic" (Uplands) – Clearwater National Forest



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	98	98	96	93	91	88	85	81	77	73	70	66	64	61	58	56	54	52	50	48	47	45	44	42	41	40	38	37	36	35	34	33	32	32	31	30	29	29	28	27	27	26	26	25	25	24	24	23	23	22
Northeast/Southwest	98	98	96	94	91	89	85	80	76	73	69	66	63	60	57	55	52	50	48	46	44	43	41	40	38	37	36	35	34	33	32	31	30	29	28	28	27	26	26	25	25	24	23	23	22	22	22	21	21	20
East - West	98	98	97	96	95	93	91	82	76	70	64	59	55	51	48	46	43	41	39	38	36	35	33	32	31	30	29	28	27	26	26	25	24	24	23	22	22	21	21	20	20	19	19	19	18	18	18	17	17	17
Average	98	98	96	94	92	90	87	81	76	72	68	64	60	57	55	52	50	48	46	44	42	41	39	38	37	35	34	33	32	31	30	30	29	28	27	27	26	25	25	24	24	23	23	22	22	21	21	21	20	20

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
"Mesic" (Uplands) – Clearwater National Forest

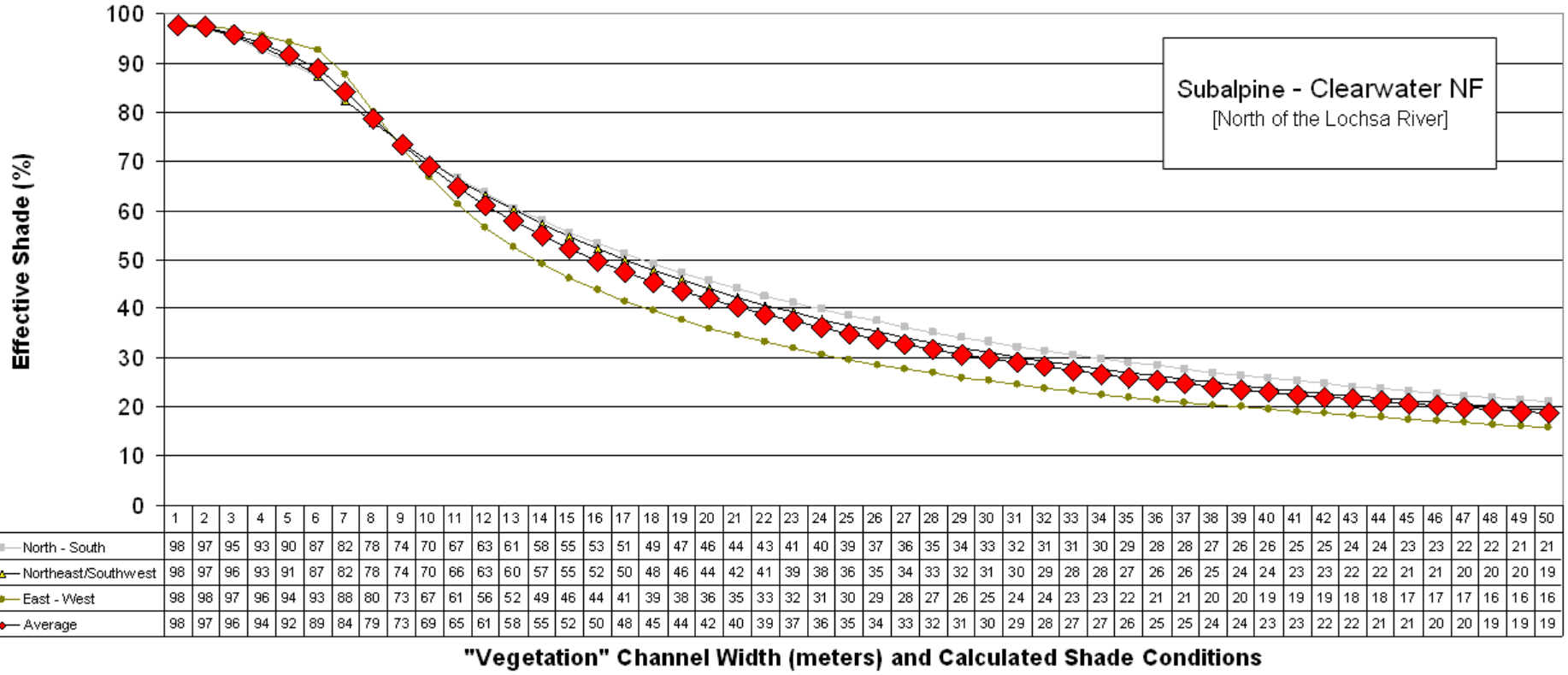


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	6	7	12	19	27	35	45	57	69	80	90	100	108	116	124	130	137	143	149	154	159	164	168	172	176	180	183	187	190	193	195	198	201	203	206	208	210	212	214	216	218	220	221	223	224	226	227	229	230	231
Northeast/Southwest	6	7	11	18	26	33	45	58	70	82	92	102	111	120	128	135	142	149	155	160	166	171	175	180	184	187	191	194	197	201	203	206	208	211	213	215	217	219	221	223	224	226	228	229	230	232	233	234	236	237
East - West	5	6	8	12	15	20	27	53	72	90	107	122	134	145	154	161	168	175	180	185	190	194	198	202	205	208	211	214	217	219	221	223	225	227	229	231	232	234	235	237	238	239	241	242	243	244	245	246	247	248
Average	5	7	11	16	23	29	39	56	71	84	96	108	118	127	135	142	149	155	161	166	172	176	180	184	188	192	195	198	201	204	207	209	212	214	216	218	220	222	224	225	227	228	230	231	233	234	235	236	237	239

“Cold” Subalpine – North of Lochsa River

Clearwater National Forest

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
"Cold" (Subalpine) – North of Lochsa River – Clearwater National Forest



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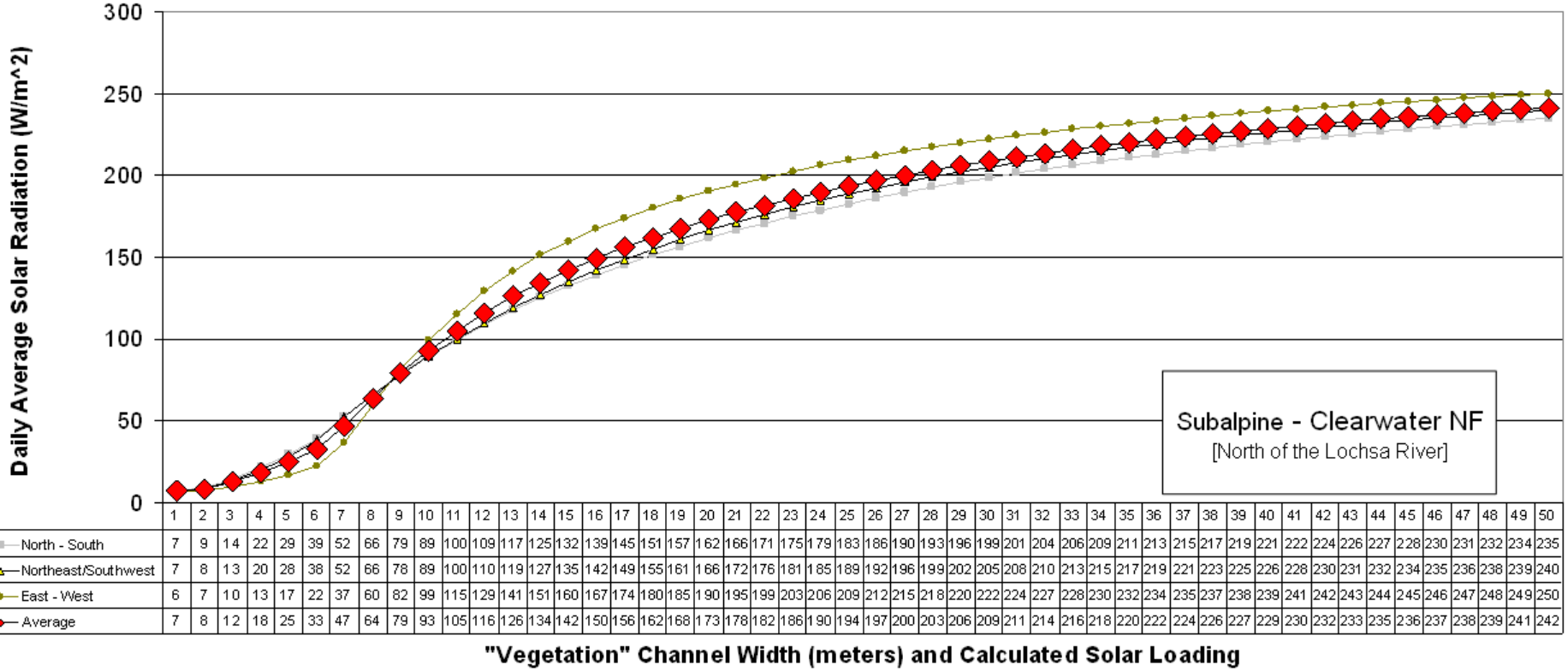
North - South	98	97	95	93	90	87	82	78	74	70	67	63	61	58	55	53	51	49	47	46	44	43	41	40	39	37	36	35	34	33	32	31	31	30	29	28	28	27	26	26	25	25	24	24	23	23	22	22	21	21
Northeast/Southwest	98	97	96	93	91	87	82	78	74	70	66	63	60	57	55	52	50	48	46	44	42	41	39	38	36	35	34	33	32	31	30	29	28	28	27	26	26	25	24	24	23	23	22	22	21	21	20	20	20	19
East - West	98	98	97	96	94	93	88	80	73	67	61	56	52	49	46	44	41	39	38	36	35	33	32	31	30	29	28	27	26	25	24	24	23	23	22	21	21	20	20	19	19	19	18	18	17	17	17	16	16	16
Average	98	97	96	94	92	89	84	79	73	69	65	61	58	55	52	50	48	45	44	42	40	39	37	36	35	34	33	32	31	30	29	28	27	27	26	25	25	24	24	23	23	22	22	21	21	20	20	19	19	19

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
"Cold" (Subalpine) – North of Lochsa River – Clearwater National Forest



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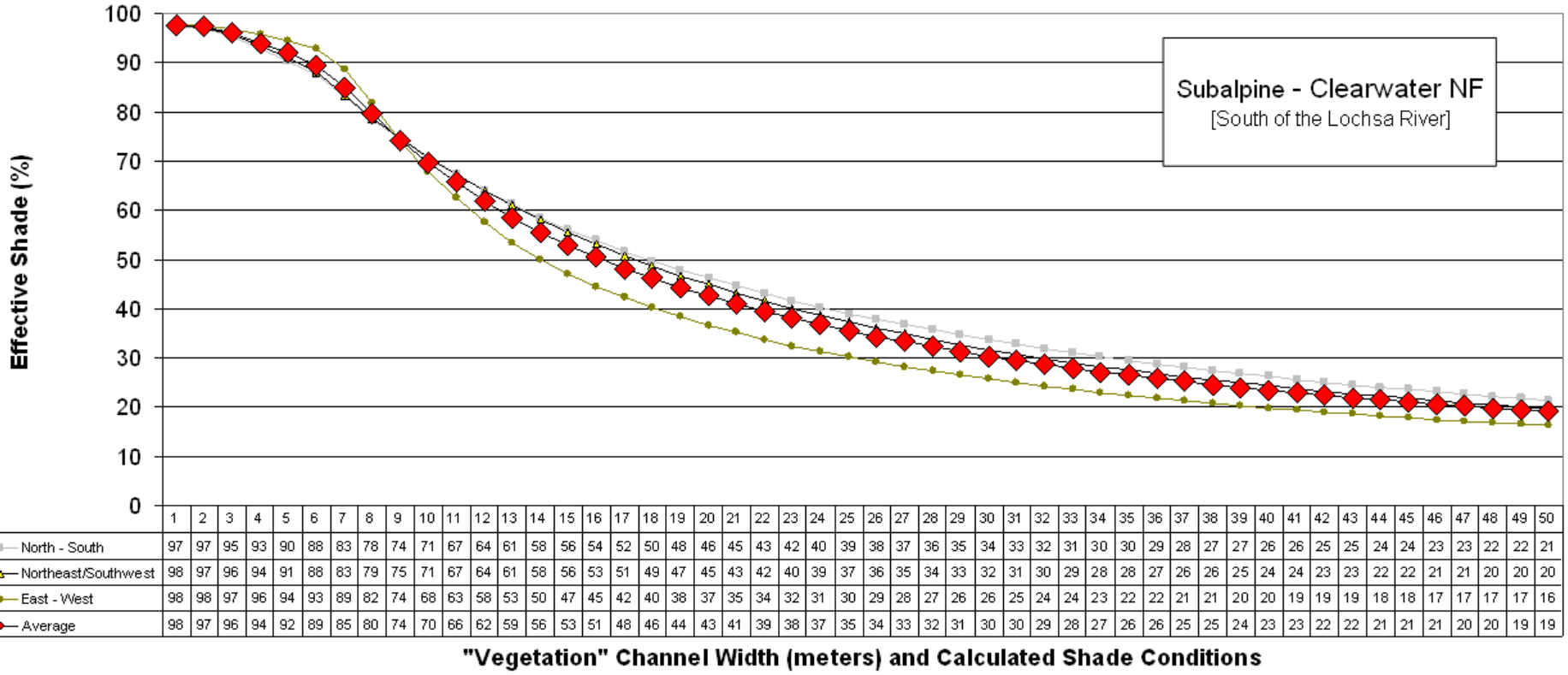
North - South	7	9	14	22	29	39	52	66	79	89	100	109	117	125	132	139	145	151	157	162	166	171	175	179	183	186	190	193	196	199	201	204	206	209	211	213	215	217	219	221	222	224	226	227	228	230	231	232	234	235
Northeast/Southwest	7	8	13	20	28	38	52	66	78	89	100	110	119	127	135	142	149	155	161	166	172	176	181	185	189	192	196	199	202	205	208	210	213	215	217	219	221	223	225	226	228	230	231	232	234	235	236	238	239	240
East - West	6	7	10	13	17	22	37	60	82	99	115	129	141	151	160	167	174	180	185	190	195	199	203	206	209	212	215	218	220	222	224	227	228	230	232	234	235	237	238	239	241	242	243	244	245	246	247	248	249	250
Average	7	8	12	18	25	33	47	64	79	93	105	116	126	134	142	150	156	162	168	173	178	182	186	190	194	197	200	203	206	209	211	214	216	218	220	222	224	226	227	229	230	232	233	235	236	237	238	239	241	242

“Cold” Subalpine – South of Lochsa River

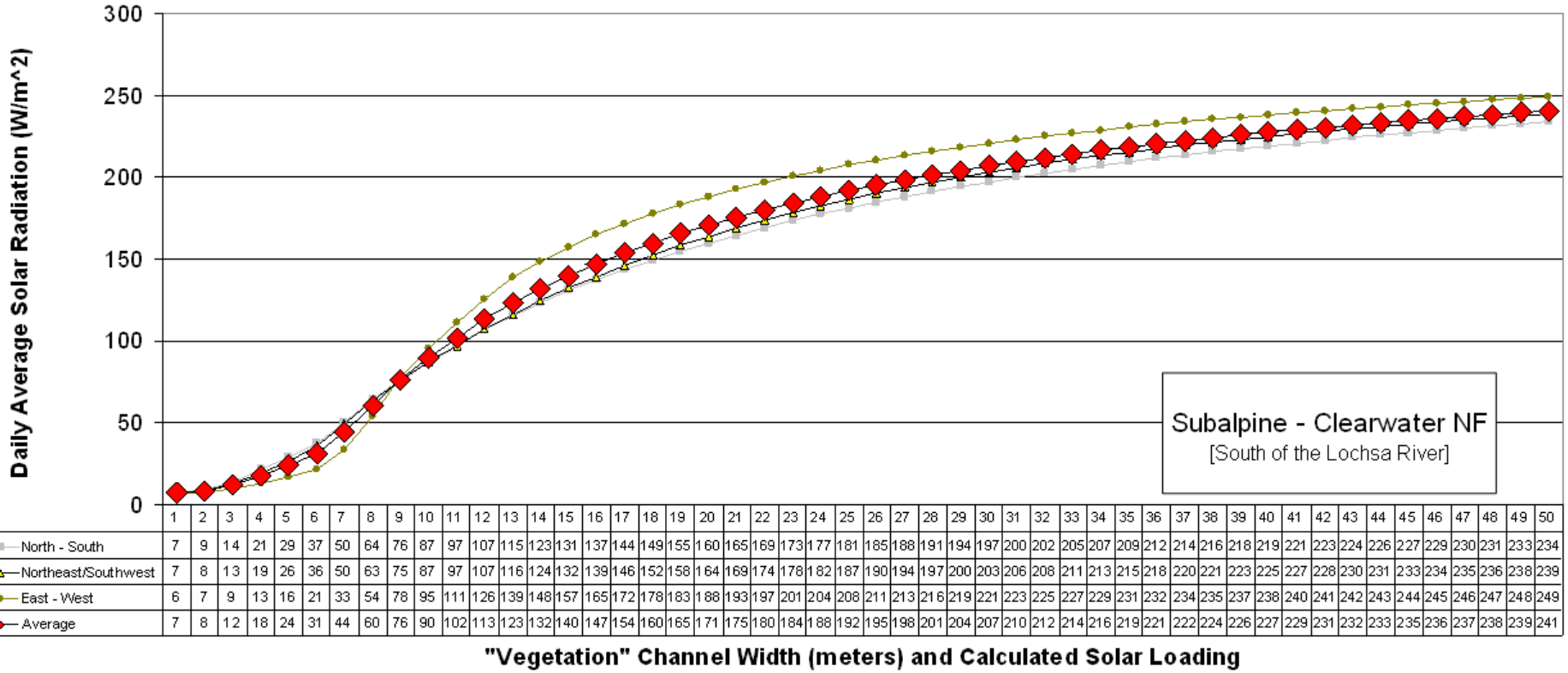
Clearwater National Forest

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
"Cold" (Subalpine) – South of Lochsa River – Clearwater National Forest



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	97	97	95	93	90	88	83	78	74	71	67	64	61	58	56	54	52	50	48	46	45	43	42	40	39	38	37	36	35	34	33	32	31	30	30	29	28	27	27	26	26	25	25	24	24	23	23	22	22	21
Northeast/Southwest	98	97	96	94	91	88	83	79	75	71	67	64	61	58	56	53	51	49	47	45	43	42	40	39	37	36	35	34	33	32	31	30	29	28	28	27	26	26	25	24	24	23	23	22	22	21	21	20	20	20
East - West	98	98	97	96	94	93	89	82	74	68	63	58	53	50	47	45	42	40	38	37	35	34	32	31	30	29	28	27	26	26	25	24	24	23	22	22	21	21	20	20	19	19	19	18	18	17	17	17	17	16
Average	98	97	96	94	92	89	85	80	74	70	66	62	59	56	53	51	48	46	44	43	41	39	38	37	35	34	33	32	31	30	30	29	28	27	26	26	25	25	24	23	23	22	22	21	21	21	20	20	19	19

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
"Cold" (Subalpine) – South of Lochsa River – Clearwater National Forest



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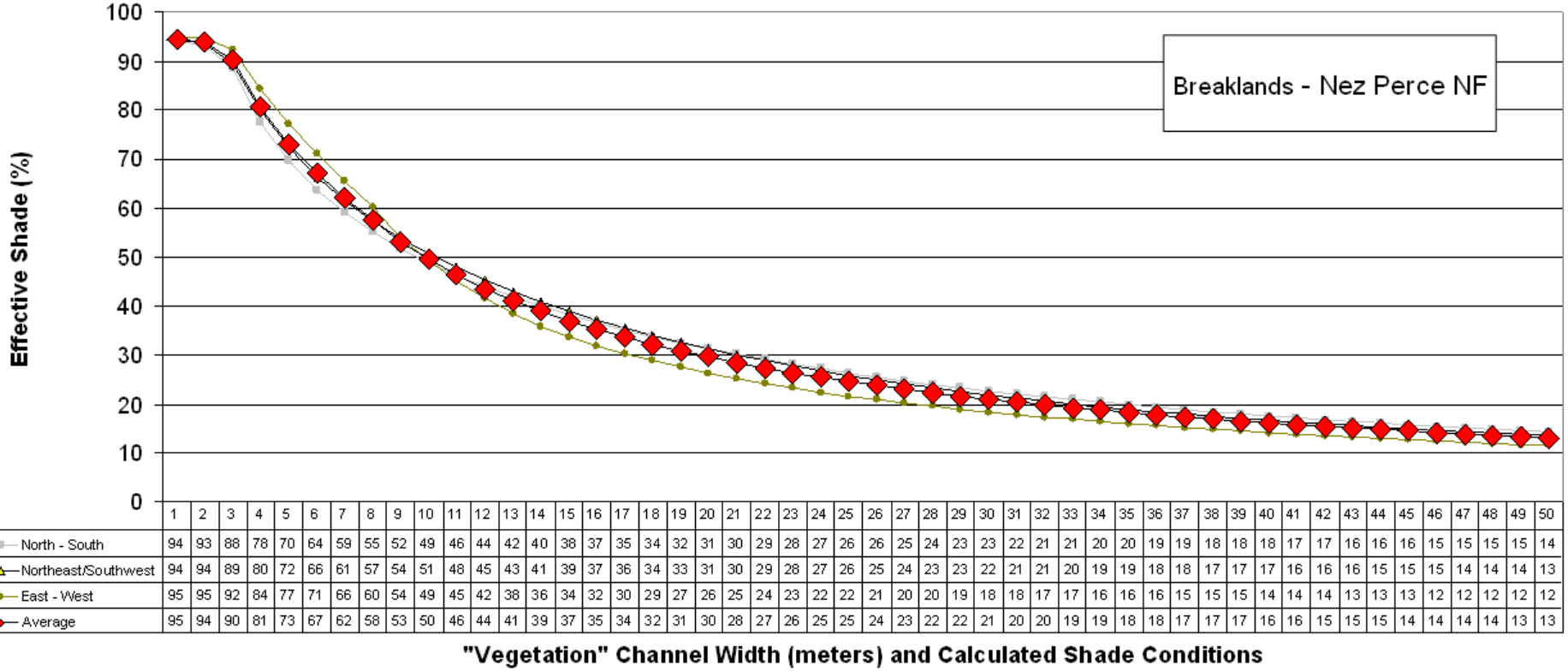
North - South	7	9	14	21	29	37	50	64	76	87	97	107	115	123	131	137	144	149	155	160	165	169	173	177	181	185	188	191	194	197	200	202	205	207	209	212	214	216	218	219	221	223	224	226	227	229	230	231	233	234
Northeast/Southwest	7	8	13	19	26	36	50	63	75	87	97	107	116	124	132	139	146	152	158	164	169	174	178	182	187	190	194	197	200	203	206	208	211	213	215	218	220	221	223	225	227	228	230	231	233	234	235	236	238	239
East - West	6	7	9	13	16	21	33	54	78	95	111	126	139	148	157	165	172	178	183	188	193	197	201	204	208	211	213	216	219	221	223	225	227	229	231	232	234	235	237	238	240	241	242	243	244	245	246	247	248	249
Average	7	8	12	18	24	31	44	60	76	90	102	113	123	132	140	147	154	160	165	171	175	180	184	188	192	195	198	201	204	207	210	212	214	216	219	221	222	224	226	227	229	231	232	233	235	236	237	238	239	241

“Warm/Dry” Breaklands

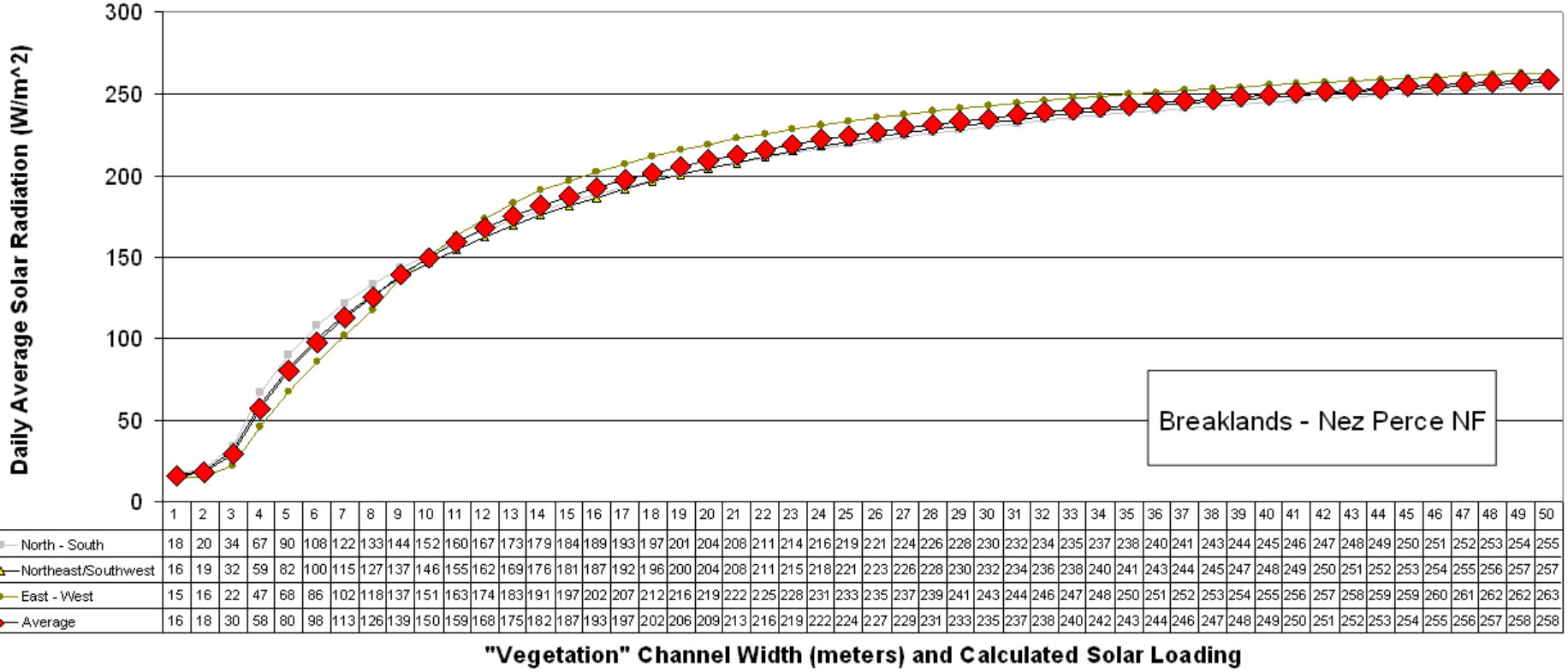
Nez Perce National Forest

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
"Warm/Dry" (Breaklands) – Nez Perce National Forest



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	94	93	88	78	70	64	59	55	52	49	46	44	42	40	38	37	35	34	32	31	30	29	28	27	26	26	25	24	23	23	22	21	21	20	20	19	19	18	18	18	17	17	16	16	16	15	15	15	15	14
Northeast/Southwest	94	94	89	80	72	66	61	57	54	51	48	45	43	41	39	37	36	34	33	31	30	29	28	27	26	25	24	23	23	22	21	21	20	19	19	18	18	17	17	17	16	16	16	15	15	15	14	14	14	13
East - West	95	95	92	84	77	71	66	60	54	49	45	42	38	36	34	32	30	29	27	26	25	24	23	22	22	21	20	20	19	18	18	17	17	16	16	16	15	15	15	14	14	14	13	13	13	12	12	12	12	12
Average	95	94	90	81	73	67	62	58	53	50	46	44	41	39	37	35	34	32	31	30	28	27	26	25	25	24	23	22	22	21	20	20	19	19	18	18	17	17	17	16	16	15	15	15	14	14	14	14	13	13

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
"Warm/Dry" (Breaklands) – Nez Perce National Forest



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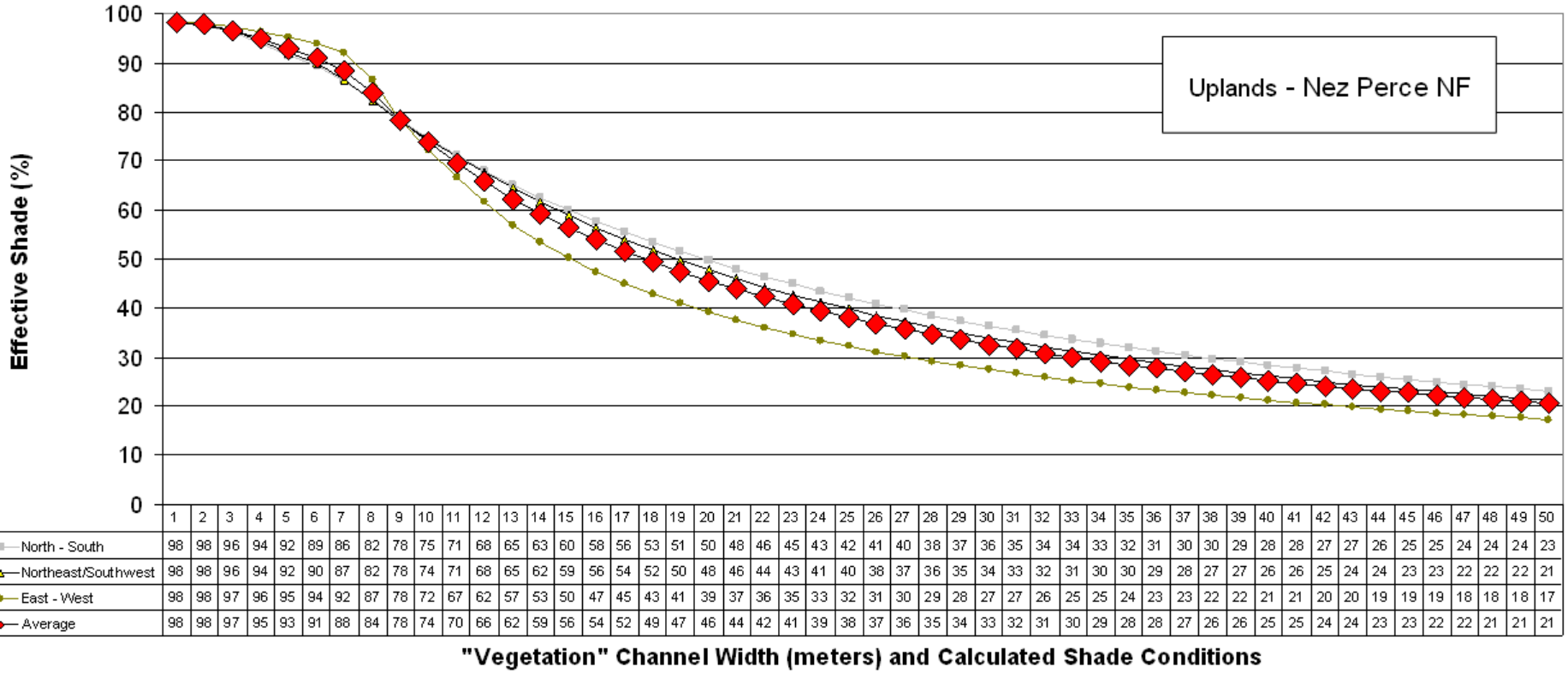
North - South	18	20	34	67	90	108	122	133	144	152	160	167	173	179	184	189	193	197	201	204	208	211	214	216	219	221	224	226	228	230	232	234	235	237	238	240	241	243	244	245	246	247	248	249	250	251	252	253	254	255
Northeast/Southwest	16	19	32	59	82	100	115	127	137	146	155	162	169	176	181	187	192	196	200	204	208	211	215	218	221	223	226	228	230	232	234	236	238	240	241	243	244	245	247	248	249	250	251	252	253	254	255	256	257	257
East - West	15	16	22	47	68	86	102	118	137	151	163	174	183	191	197	202	207	212	216	219	222	225	228	231	233	235	237	239	241	243	244	246	247	248	250	251	252	253	254	255	256	257	258	259	259	260	261	262	262	263
Average	16	18	30	58	80	98	113	126	139	150	159	168	175	182	187	193	197	202	206	209	213	216	219	222	224	227	229	231	233	235	237	238	240	242	243	244	246	247	248	249	250	251	252	253	254	255	256	257	258	258

“Mesic” Uplands

Nez Perce National Forest

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
"Mesic" (Uplands) – Nez Perce National Forest



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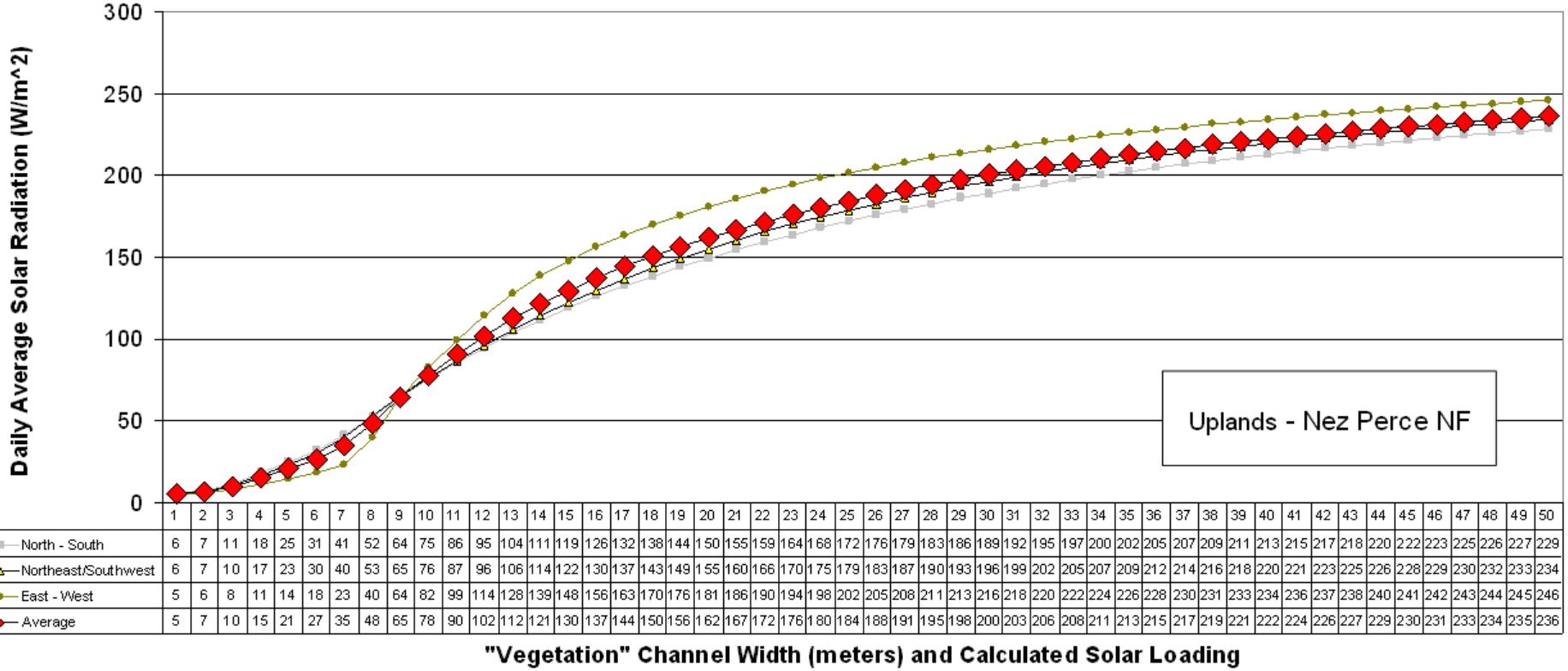
North - South	98	98	96	94	92	89	86	82	78	75	71	68	65	63	60	58	56	53	51	50	48	46	45	43	42	41	40	38	37	36	35	34	34	33	32	31	30	30	29	28	28	27	27	26	25	25	24	24	24	23
Northeast/Southwest	98	98	96	94	92	90	87	82	78	74	71	68	65	62	59	56	54	52	50	48	46	44	43	41	40	38	37	36	35	34	33	32	31	30	30	29	28	27	27	26	26	25	24	24	23	23	22	22	22	21
East - West	98	98	97	96	95	94	92	87	78	72	67	62	57	53	50	47	45	43	41	39	37	36	35	33	32	31	30	29	28	27	27	26	25	25	24	23	23	22	22	21	21	20	20	19	19	19	18	18	18	17
Average	98	98	97	95	93	91	88	84	78	74	70	66	62	59	56	54	52	49	47	46	44	42	41	39	38	37	36	35	34	33	32	31	30	29	28	28	27	26	26	25	25	24	24	23	23	22	22	21	21	21

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
"Mesic" (Uplands) – Nez Perce National Forest



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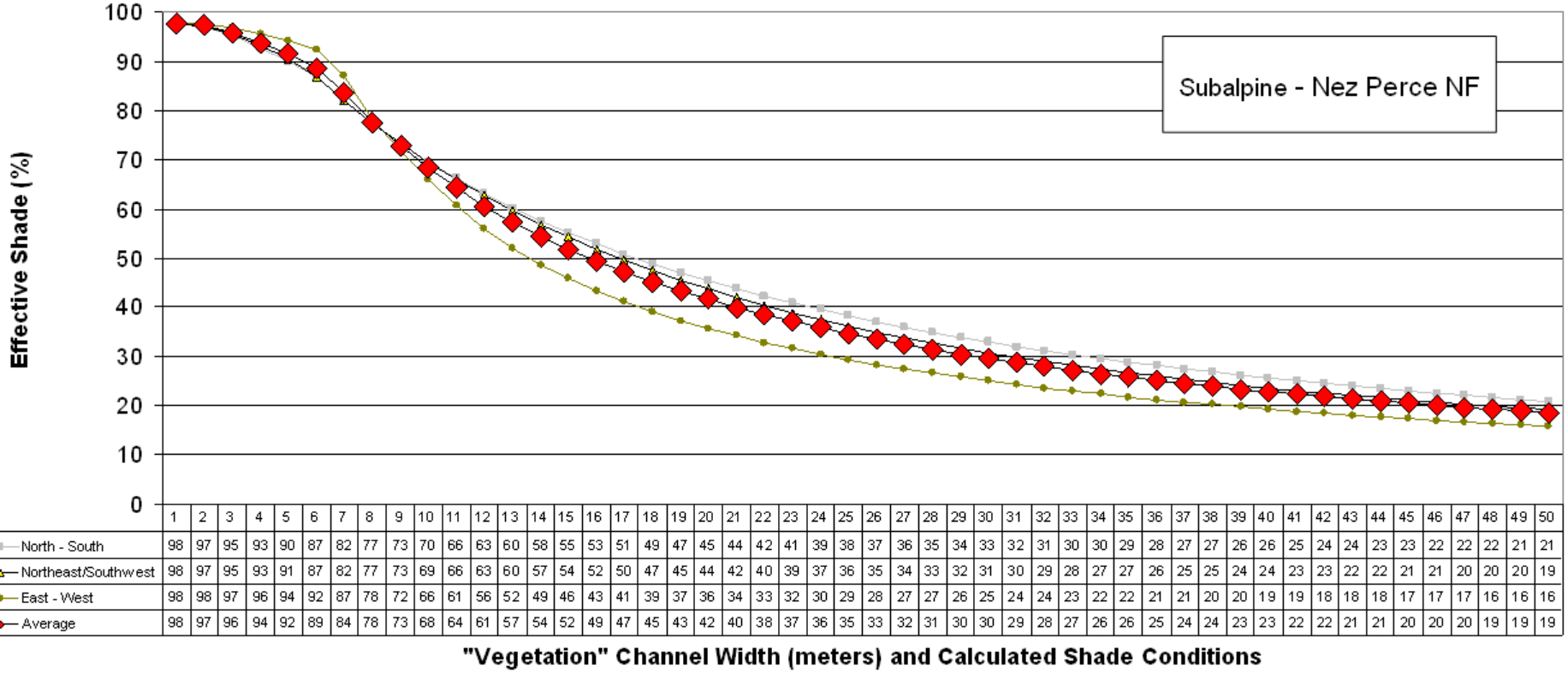
North - South	6	7	11	18	25	31	41	52	64	75	86	95	104	111	119	126	132	138	144	150	155	159	164	168	172	176	179	183	186	189	192	195	197	200	202	205	207	209	211	213	215	217	218	220	222	223	225	226	227	229
Northeast/Southwest	6	7	10	17	23	30	40	53	65	76	87	96	106	114	122	130	137	143	149	155	160	166	170	175	179	183	187	190	193	196	199	202	205	207	209	212	214	216	218	220	221	223	225	226	228	229	230	232	233	234
East - West	5	6	8	11	14	18	23	40	64	82	99	114	128	139	148	156	163	170	176	181	186	190	194	198	202	205	208	211	213	216	218	220	222	224	226	228	230	231	233	234	236	237	238	240	241	242	243	244	245	246
Average	5	7	10	15	21	27	35	48	65	78	90	102	112	121	130	137	144	150	156	162	167	172	176	180	184	188	191	195	198	200	203	206	208	211	213	215	217	219	221	222	224	226	227	229	230	231	233	234	235	236

“Cold” Subalpine

Nez Perce National Forest

Figure A.1-1 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
"Cold" (Subalpine) – Nez Perce National Forest



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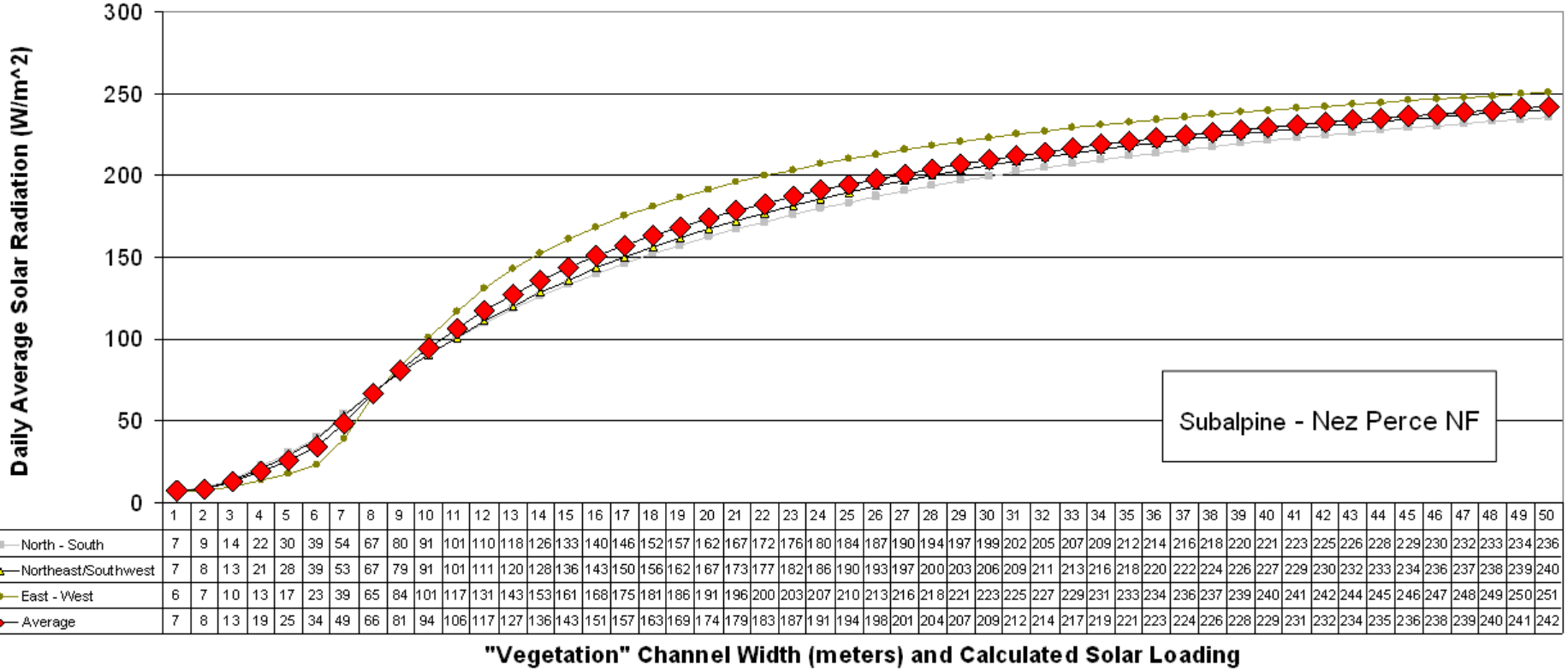
North - South	98	97	95	93	90	87	82	77	73	70	66	63	60	58	55	53	51	49	47	45	44	42	41	39	38	37	36	35	34	33	32	31	30	30	29	28	27	27	26	26	25	24	24	23	23	22	22	22	21	21
Northeast/Southwest	98	97	95	93	91	87	82	77	73	69	66	63	60	57	54	52	50	47	45	44	42	40	39	37	36	35	34	33	32	31	30	29	28	27	27	26	25	25	24	24	23	23	22	22	21	21	20	20	20	19
East - West	98	98	97	96	94	92	87	78	72	66	61	56	52	49	46	43	41	39	37	36	34	33	32	30	29	28	27	27	26	25	24	24	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16	16	16
Average	98	97	96	94	92	89	84	78	73	68	64	61	57	54	52	49	47	45	43	42	40	38	37	36	35	33	32	31	30	30	29	28	27	26	26	25	24	24	23	23	22	22	21	21	20	20	20	19	19	19

Figure A.1-2 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
"Cold" (Subalpine) – Nez Perce National Forest



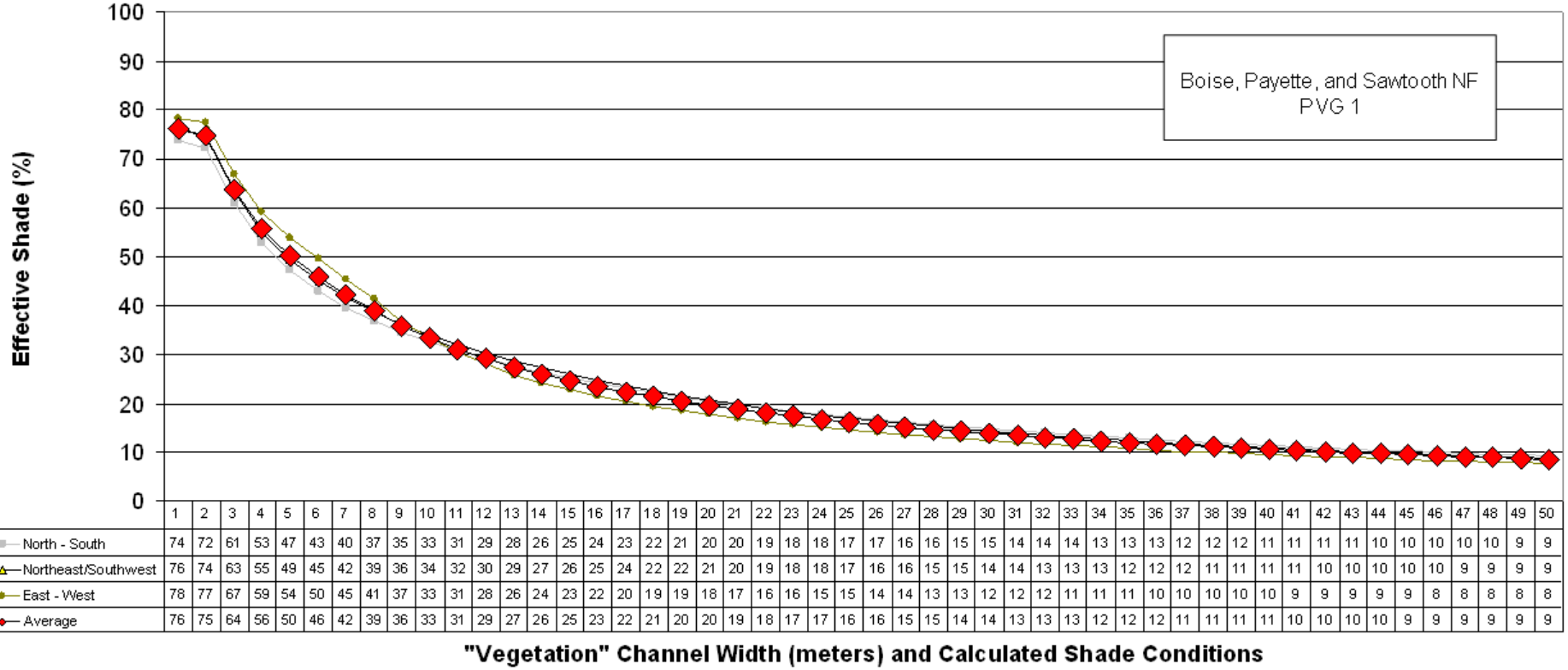
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	7	9	14	22	30	39	54	67	80	91	101	110	118	126	133	140	146	152	157	162	167	172	176	180	184	187	190	194	197	199	202	205	207	209	212	214	216	218	220	221	223	225	226	228	229	230	232	233	234	236
Northeast/Southwest	7	8	13	21	28	39	53	67	79	91	101	111	120	128	136	143	150	156	162	167	173	177	182	186	190	193	197	200	203	206	209	211	213	216	218	220	222	224	226	227	229	230	232	233	234	236	237	238	239	240
East - West	6	7	10	13	17	23	39	65	84	101	117	131	143	153	161	168	175	181	186	191	196	200	203	207	210	213	216	218	221	223	225	227	229	231	233	234	236	237	239	240	241	242	244	245	246	247	248	249	250	251
Average	7	8	13	19	25	34	49	66	81	94	106	117	127	136	143	151	157	163	169	174	179	183	187	191	194	198	201	204	207	209	212	214	217	219	221	223	224	226	228	229	231	232	234	235	236	238	239	240	241	242

Effective Shade Curves and Associated Solar Loading Curves for the Boise, Payette, and Sawtooth National Forests

PVG 1 – Dry Ponderosa Pine/Xeric Douglas-fir

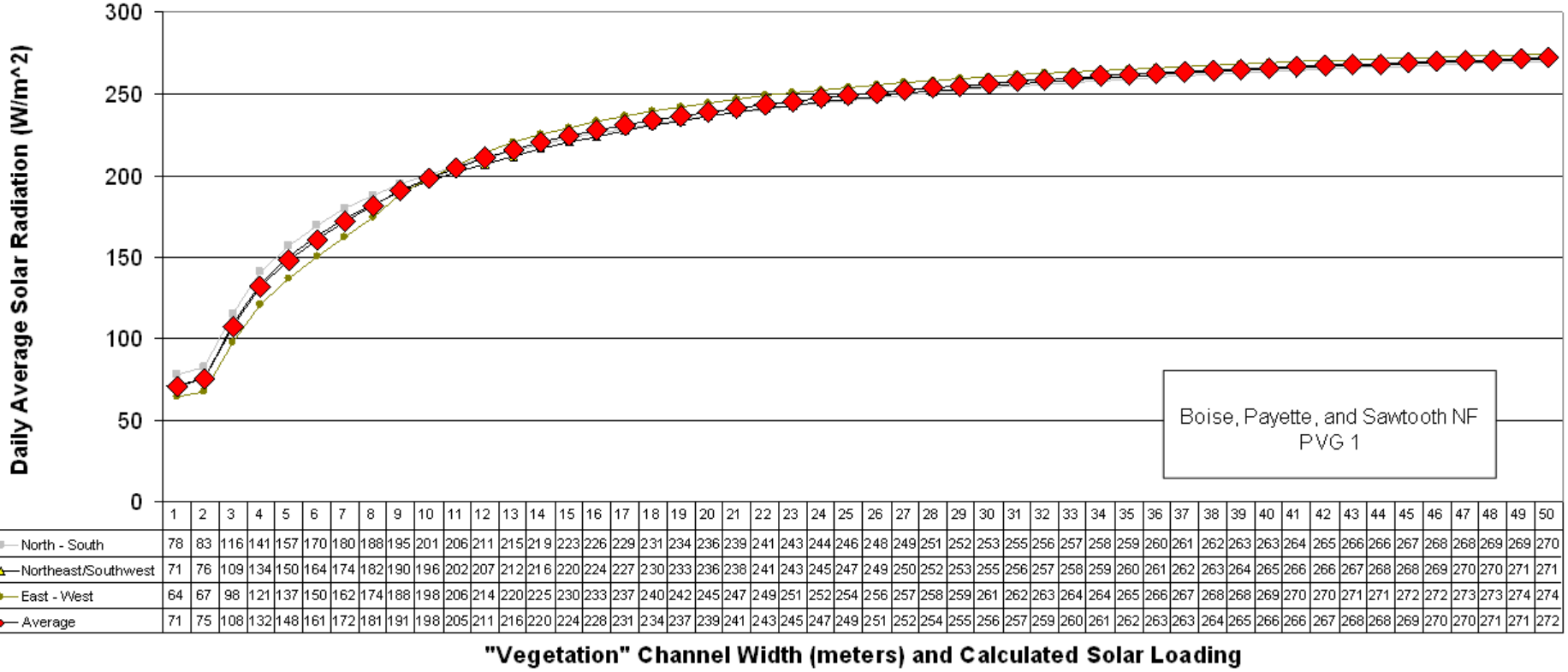
Boise, Payette and Sawtooth National Forests

Figure A.1-3. System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
PVG 1 *– Dry Ponderosa Pine/Xeric Douglas-fir – Boise, Payette and Sawtooth National Forests*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	74	72	61	53	47	43	40	37	35	33	31	29	28	26	25	24	23	22	21	20	20	19	18	18	17	17	16	16	15	15	14	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10	10	10	9	9
Northeast/Southwest	76	74	63	55	49	45	42	39	36	34	32	30	29	27	26	25	24	22	22	21	20	19	18	18	17	16	16	15	15	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10	10	10	9	9	9	9
East - West	78	77	67	59	54	50	45	41	37	33	31	28	26	24	23	22	20	19	19	18	17	16	16	15	15	14	14	13	13	12	12	12	11	11	11	10	10	10	10	10	9	9	9	9	9	8	8	8	8	8
Average	76	75	64	56	50	46	42	39	36	33	31	29	27	26	25	23	22	21	20	20	19	18	17	17	16	16	15	15	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10	10	9	9	9	9	9	9

Figure A.1-4. Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
PVG 1 *– Dry Ponderosa Pine/Xeric Douglas-fir – Boise, Payette and Sawtooth National Forests*

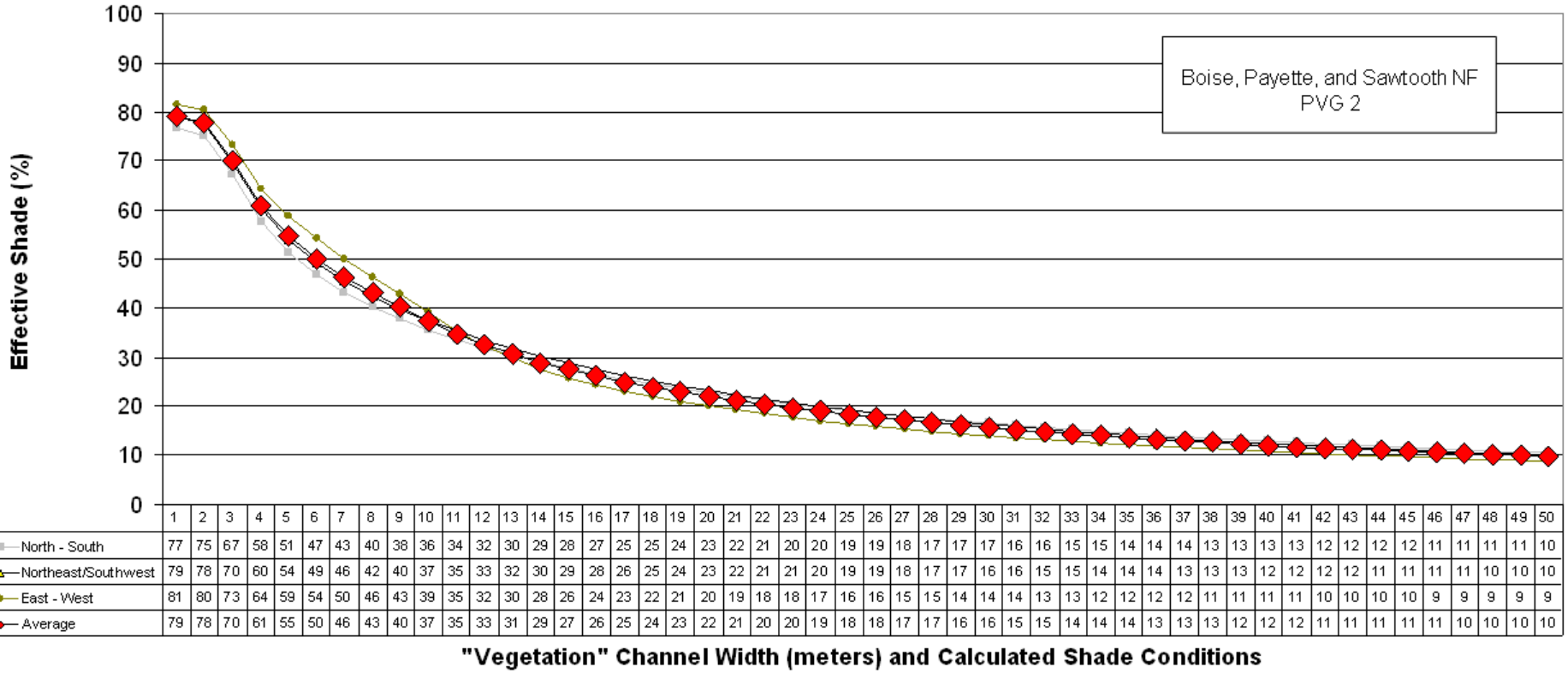


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	78	83	116	141	157	170	180	188	195	201	206	211	215	219	223	226	229	231	234	236	239	241	243	244	246	248	249	251	252	253	255	256	257	258	259	260	261	262	263	263	264	265	266	266	267	268	268	269	269	270
Northeast/Southwest	71	76	109	134	150	164	174	182	190	196	202	207	212	216	220	224	227	230	233	236	238	241	243	245	247	249	250	252	253	255	256	257	258	259	260	261	262	263	264	265	266	266	267	268	268	269	270	270	271	271
East - West	64	67	98	121	137	150	162	174	188	198	206	214	220	225	230	233	237	240	242	245	247	249	251	252	254	256	257	258	259	261	262	263	264	264	265	266	267	268	268	269	270	270	271	271	272	272	273	273	274	274
Average	71	75	108	132	148	161	172	181	191	198	205	211	216	220	224	228	231	234	237	239	241	243	245	247	249	251	252	254	255	256	257	259	260	261	262	263	263	264	265	266	266	267	268	268	269	270	270	271	271	272

PVG 2 – Warm, Dry Douglas-fir/Moist Ponderosa Pine

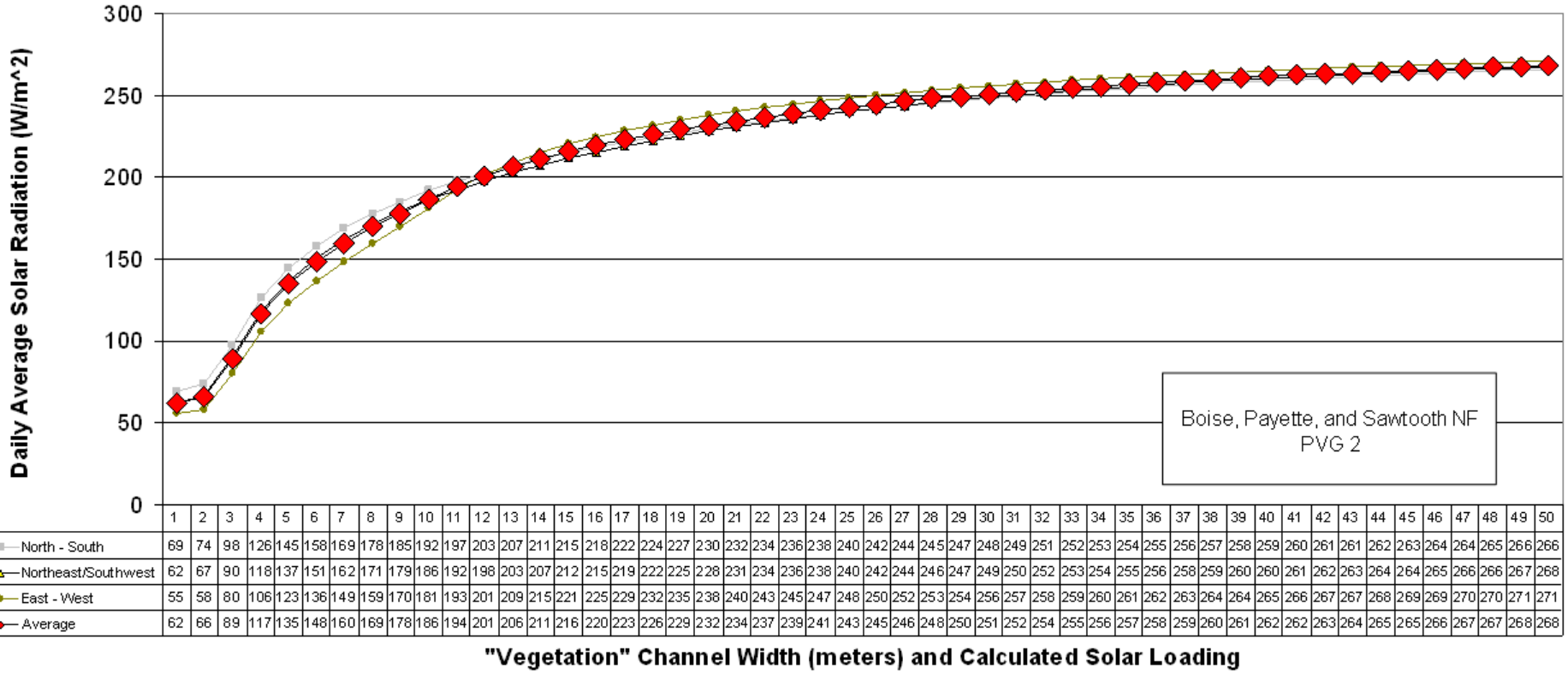
Boise, Payette and Sawtooth National Forests

Figure A.1-3 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
PVG 2 *– Warm, Dry Douglas-fir/Moist Ponderosa Pine – Boise, Payette and Sawtooth National Forests*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	77	75	67	58	51	47	43	40	38	36	34	32	30	29	28	27	25	25	24	23	22	21	20	20	19	19	18	17	17	17	16	16	15	15	14	14	14	13	13	13	13	12	12	12	12	11	11	11	11	10
Northeast/Southwest	79	78	70	60	54	49	46	42	40	37	35	33	32	30	29	28	26	25	24	23	22	21	21	20	19	19	18	17	17	16	16	15	15	14	14	14	13	13	13	12	12	12	12	11	11	11	11	10	10	10
East - West	81	80	73	64	59	54	50	46	43	39	35	32	30	28	26	24	23	22	21	20	19	18	18	17	16	16	15	15	14	14	14	13	13	12	12	12	12	11	11	11	11	10	10	10	10	9	9	9	9	9
Average	79	78	70	61	55	50	46	43	40	37	35	33	31	29	27	26	25	24	23	22	21	20	20	19	18	18	17	17	16	16	15	15	14	14	14	13	13	13	12	12	12	11	11	11	11	11	10	10	10	10

Figure A.1-4 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
PVG 2 *– Warm, Dry Douglas-fir/Moist Ponderosa Pine – Boise, Payette and Sawtooth National Forests*

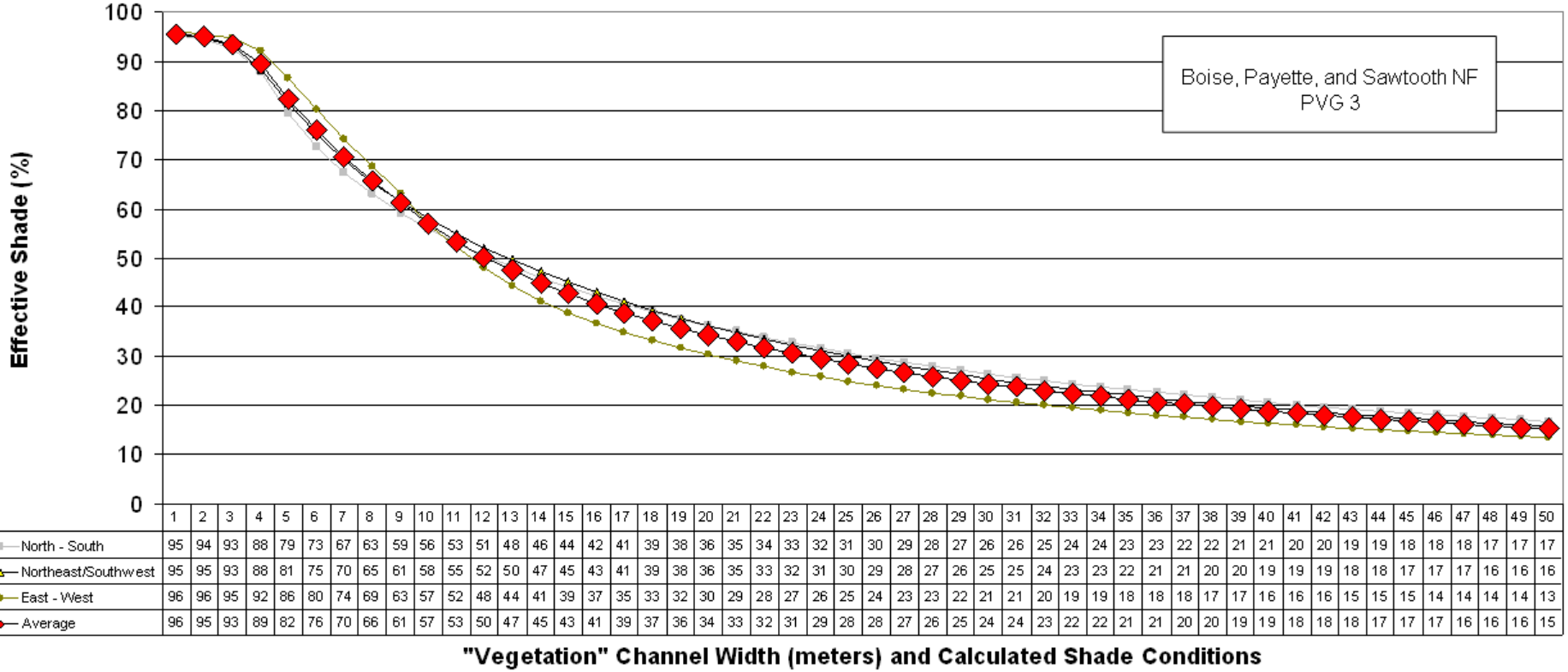


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	69	74	98	126	145	158	169	178	185	192	197	203	207	211	215	218	222	224	227	230	232	234	236	238	240	242	244	245	247	248	249	251	252	253	254	255	256	257	258	259	260	261	261	262	263	264	264	265	266	266
Northeast/Southwest	62	67	90	118	137	151	162	171	179	186	192	198	203	207	212	215	219	222	225	228	231	234	236	238	240	242	244	246	247	249	250	252	253	254	255	256	258	259	260	260	261	262	263	264	264	265	266	266	267	268
East - West	55	58	80	106	123	136	149	159	170	181	193	201	209	215	221	225	229	232	235	238	240	243	245	247	248	250	252	253	254	256	257	258	259	260	261	262	263	264	264	265	266	267	267	268	269	269	270	270	271	271
Average	62	66	89	117	135	148	160	169	178	186	194	201	206	211	216	220	223	226	229	232	234	237	239	241	243	245	246	248	250	251	252	254	255	256	257	258	259	260	261	262	262	263	264	265	265	266	267	267	268	268

PVG 3 – Cool, Moist Douglas-fir

Boise, Payette and Sawtooth National Forests

Figure A.1-3 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
PVG 3 *– Cool, Moist Douglas-fir – Boise, Payette and Sawtooth National Forests*



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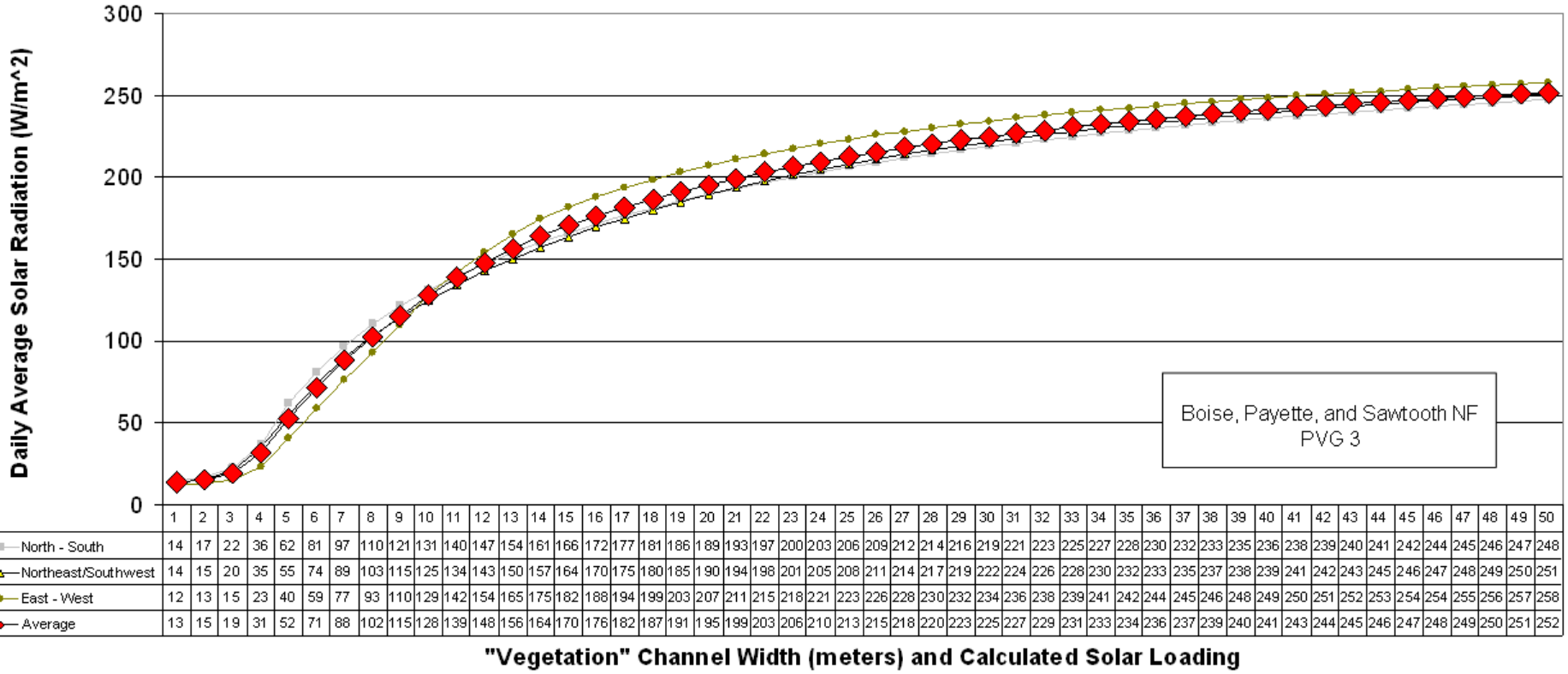
North - South	95	94	93	88	79	73	67	63	59	56	53	51	48	46	44	42	41	39	38	36	35	34	33	32	31	30	29	28	27	26	26	25	24	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17
Northeast/Southwest	95	95	93	88	81	75	70	65	61	58	55	52	50	47	45	43	41	39	38	36	35	33	32	31	30	29	28	27	26	25	25	24	23	23	22	21	21	20	20	19	19	19	18	18	17	17	17	16	16	16
East - West	96	96	95	92	86	80	74	69	63	57	52	48	44	41	39	37	35	33	32	30	29	28	27	26	25	24	23	23	22	21	21	20	19	19	18	18	18	17	17	16	16	16	15	15	15	14	14	14	14	13
Average	96	95	93	89	82	76	70	66	61	57	53	50	47	45	43	41	39	37	36	34	33	32	31	29	28	28	27	26	25	24	24	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16	16	16	15

Figure A.1-4 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
PVG 3 *– Cool, Moist Douglas-fir – Boise, Payette and Sawtooth National Forests*

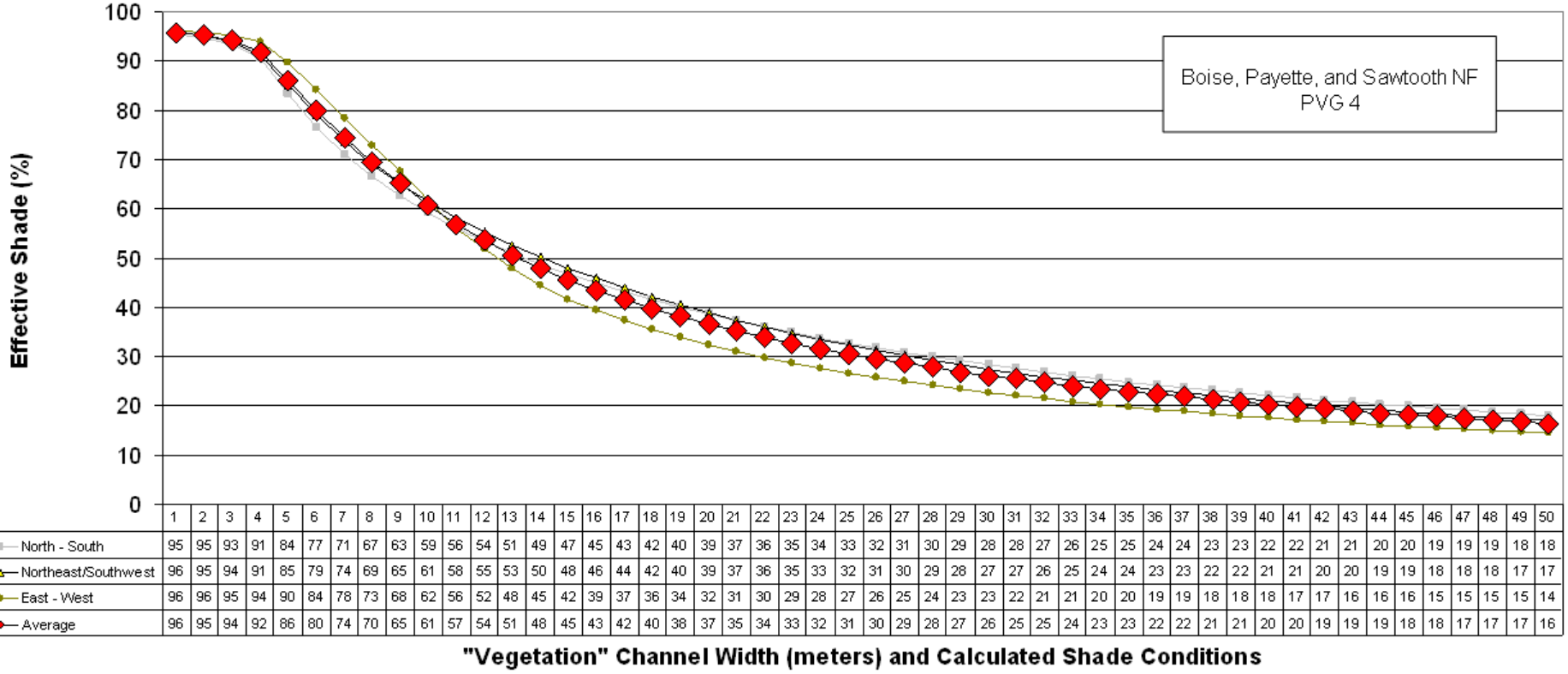


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	14	17	22	36	62	81	97	110	121	131	140	147	154	161	166	172	177	181	186	189	193	197	200	203	206	209	212	214	216	219	221	223	225	227	228	230	232	233	235	236	238	239	240	241	242	244	245	246	247	248
Northeast/Southwest	14	15	20	35	55	74	89	103	115	125	134	143	150	157	164	170	175	180	185	190	194	198	201	205	208	211	214	217	219	222	224	226	228	230	232	233	235	237	238	239	241	242	243	245	246	247	248	249	250	251
East - West	12	13	15	23	40	59	77	93	110	129	142	154	165	175	182	188	194	199	203	207	211	215	218	221	223	226	228	230	232	234	236	238	239	241	242	244	245	246	248	249	250	251	252	253	254	254	255	256	257	258
Average	13	15	19	31	52	71	88	102	115	128	139	148	156	164	170	176	182	187	191	195	199	203	206	210	213	215	218	220	223	225	227	229	231	233	234	236	237	239	240	241	243	244	245	246	247	248	249	250	251	252

PVG 4 – Cool, Dry Douglas-fir

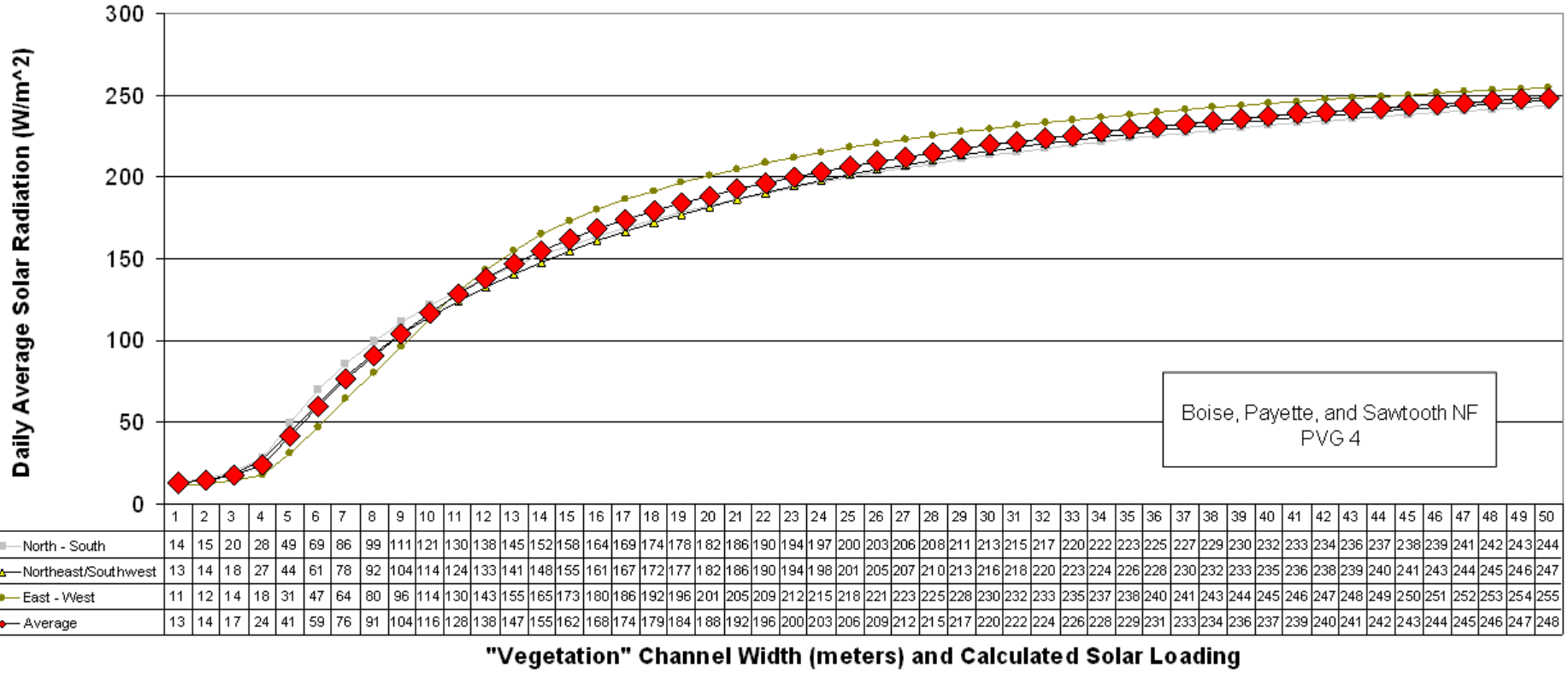
Boise, Payette and Sawtooth National Forests

Figure A.1-3 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
PVG 4 *– Cool, Dry Douglas-fir – Boise, Payette and Sawtooth National Forests*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	95	95	93	91	84	77	71	67	63	59	56	54	51	49	47	45	43	42	40	39	37	36	35	34	33	32	31	30	29	28	28	27	26	25	25	24	24	23	23	22	22	21	21	20	20	19	19	19	18	18
Northeast/Southwest	96	95	94	91	85	79	74	69	65	61	58	55	53	50	48	46	44	42	40	39	37	36	35	33	32	31	30	29	28	27	27	26	25	24	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17
East - West	96	96	95	94	90	84	78	73	68	62	56	52	48	45	42	39	37	36	34	32	31	30	29	28	27	26	25	24	23	23	22	21	21	20	20	19	19	18	18	18	17	17	16	16	16	15	15	15	15	14
Average	96	95	94	92	86	80	74	70	65	61	57	54	51	48	45	43	42	40	38	37	35	34	33	32	31	30	29	28	27	26	25	25	24	23	23	22	22	21	21	20	20	19	19	19	18	18	17	17	17	16

Figure A.1-4 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
PVG 4 *– Cool, Dry Douglas-fir – Boise, Payette and Sawtooth National Forests*

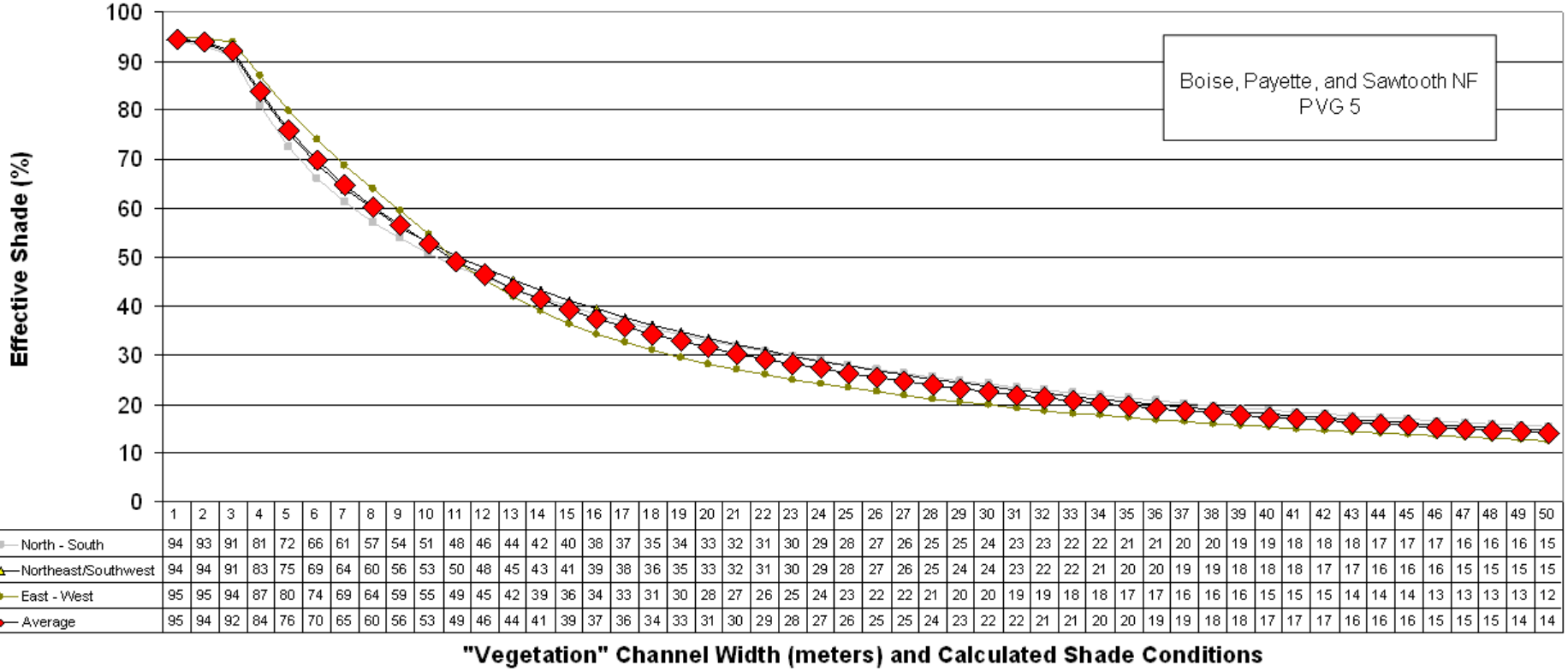


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	14	15	20	28	49	69	86	99	111	121	130	138	145	152	158	164	169	174	178	182	186	190	194	197	200	203	206	208	211	213	215	217	220	222	223	225	227	229	230	232	233	234	236	237	238	239	241	242	243	244
Northeast/Southwest	13	14	18	27	44	61	78	92	104	114	124	133	141	148	155	161	167	172	177	182	186	190	194	198	201	205	207	210	213	216	218	220	223	224	226	228	230	232	233	235	236	238	239	240	241	243	244	245	246	247
East - West	11	12	14	18	31	47	64	80	96	114	130	143	155	165	173	180	186	192	196	201	205	209	212	215	218	221	223	225	228	230	232	233	235	237	238	240	241	243	244	245	246	247	248	249	250	251	252	253	254	255
Average	13	14	17	24	41	59	76	91	104	116	128	138	147	155	162	168	174	179	184	188	192	196	200	203	206	209	212	215	217	220	222	224	226	228	229	231	233	234	236	237	239	240	241	242	243	244	245	246	247	248

PVG 5 – Dry Grand Fir

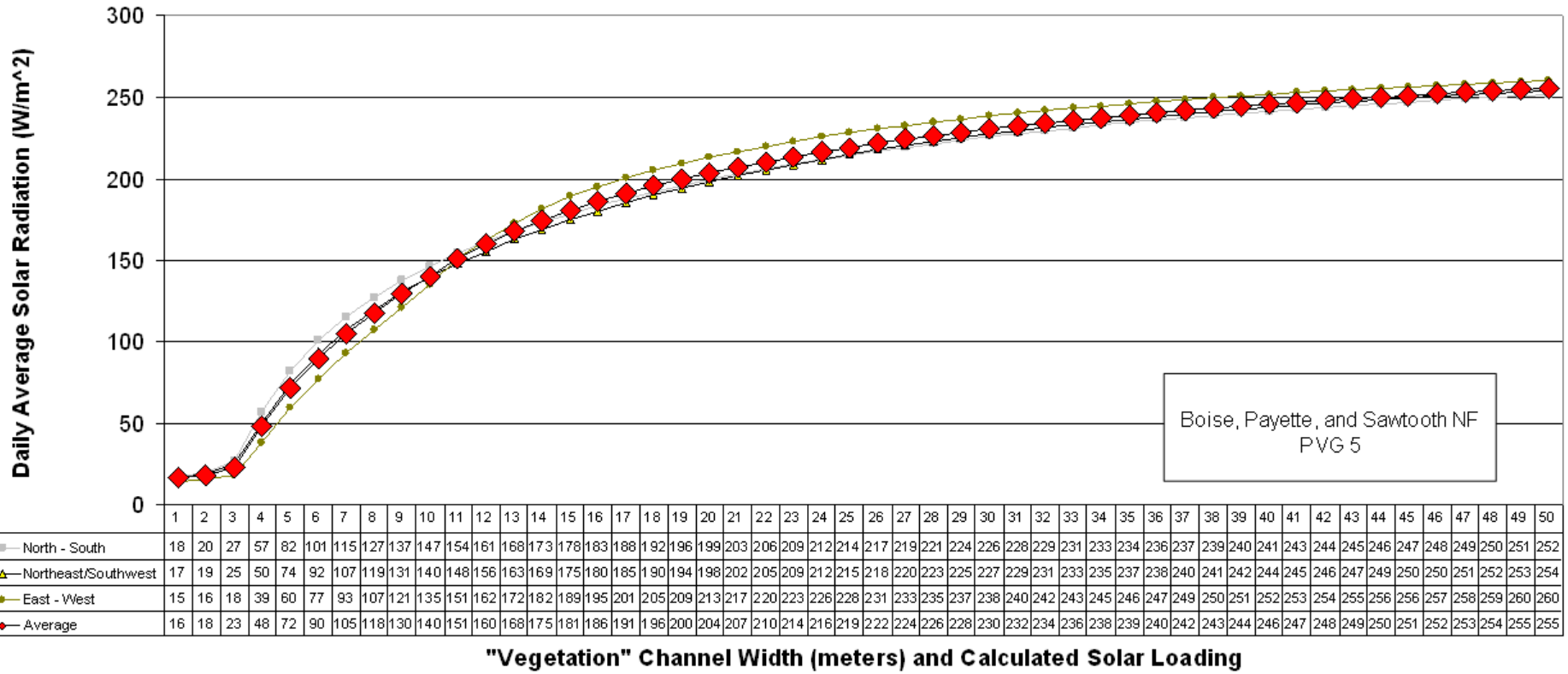
Boise, Payette and Sawtooth National Forests

Figure A.1-3 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
***PVG 5** – Dry Grand Fir – Boise, Payette and Sawtooth National Forests*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	94	93	91	81	72	66	61	57	54	51	48	46	44	42	40	38	37	35	34	33	32	31	30	29	28	27	26	25	25	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16	16	16	15
Northeast/Southwest	94	94	91	83	75	69	64	60	56	53	50	48	45	43	41	39	38	36	35	33	32	31	30	29	28	27	26	25	24	24	23	22	22	21	20	20	19	19	18	18	18	17	17	16	16	16	15	15	15	15
East - West	95	95	94	87	80	74	69	64	59	55	49	45	42	39	36	34	33	31	30	28	27	26	25	24	23	22	22	21	20	20	19	19	18	18	17	17	16	16	16	15	15	15	14	14	14	13	13	13	13	12
Average	95	94	92	84	76	70	65	60	56	53	49	46	44	41	39	37	36	34	33	31	30	29	28	27	26	25	25	24	23	22	22	21	21	20	20	19	19	18	18	17	17	17	16	16	16	15	15	15	14	14

Figure A.1-4 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
PVG 5 *– Dry Grand Fir – Boise, Payette and Sawtooth National Forests*

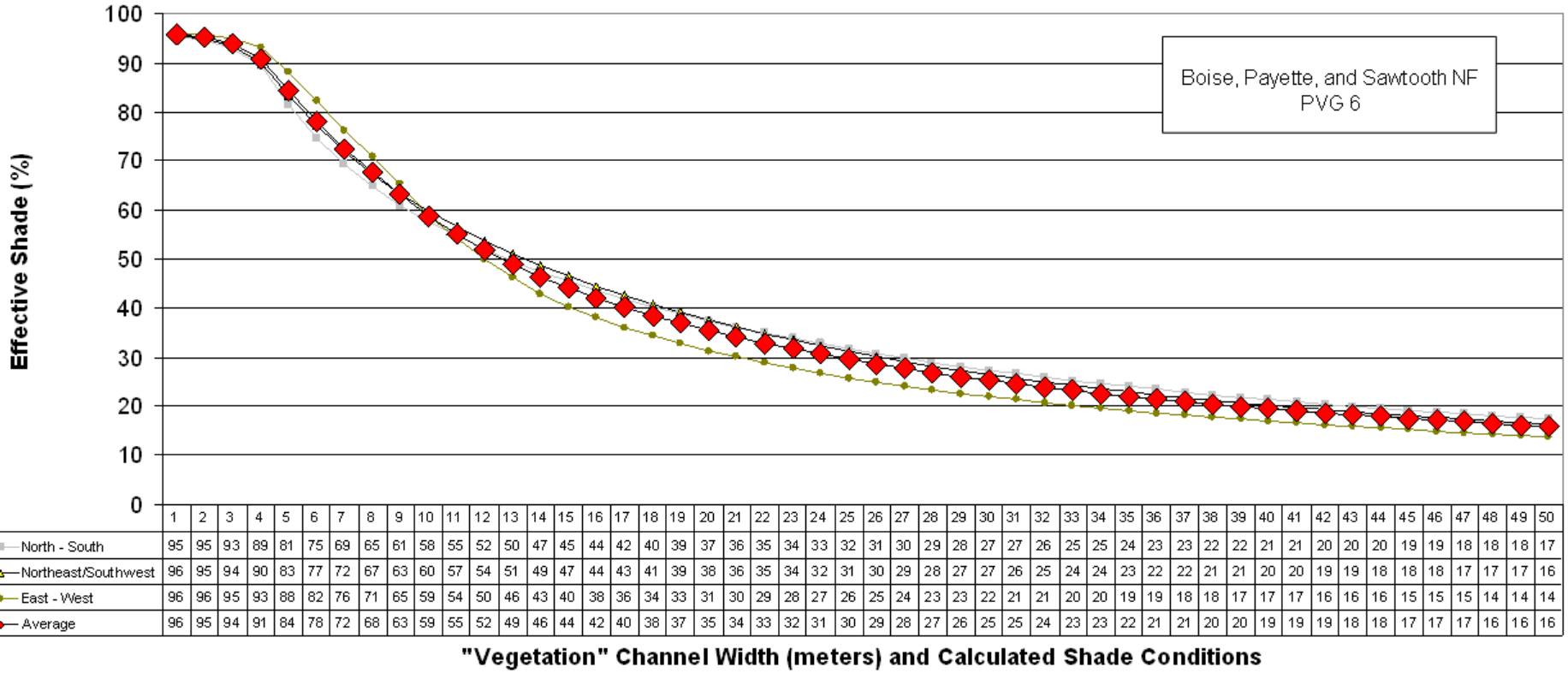


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	18	20	27	57	82	101	115	127	137	147	154	161	168	173	178	183	188	192	196	199	203	206	209	212	214	217	219	221	224	226	228	229	231	233	234	236	237	239	240	241	243	244	245	246	247	248	249	250	251	252
Northeast/Southwest	17	19	25	50	74	92	107	119	131	140	148	156	163	169	175	180	185	190	194	198	202	205	209	212	215	218	220	223	225	227	229	231	233	235	237	238	240	241	242	244	245	246	247	249	250	250	251	252	253	254
East - West	15	16	18	39	60	77	93	107	121	135	151	162	172	182	189	195	201	205	209	213	217	220	223	226	228	231	233	235	237	238	240	242	243	245	246	247	249	250	251	252	253	254	255	256	256	257	258	259	260	260
Average	16	18	23	48	72	90	105	118	130	140	151	160	168	175	181	186	191	196	200	204	207	210	214	216	219	222	224	226	228	230	232	234	236	238	239	240	242	243	244	246	247	248	249	250	251	252	253	254	255	255

PVG 6 – Moist Grand Fir

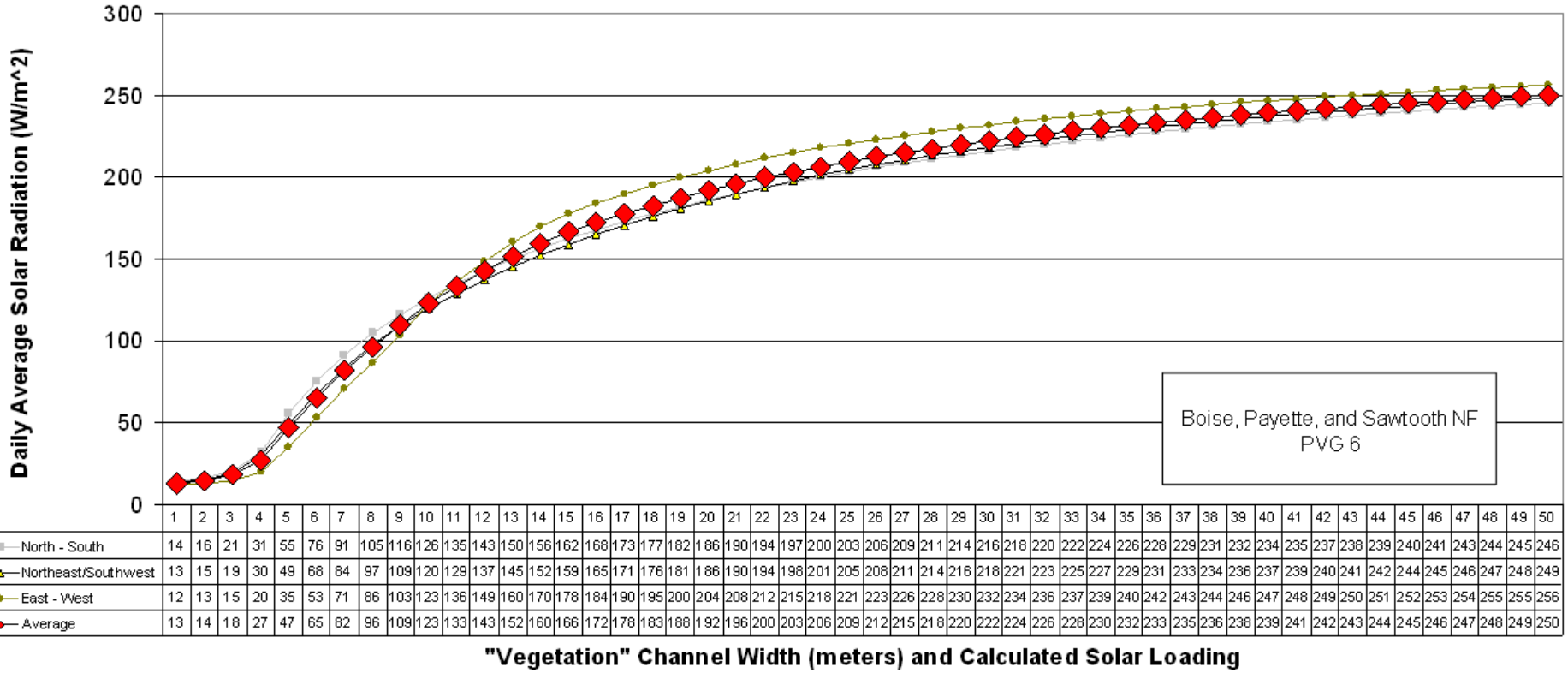
Boise, Payette and Sawtooth National Forests

Figure A.1-3 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
***PVG 6** – Moist Grand Fir – Boise, Payette and Sawtooth National Forests*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	95	95	93	89	81	75	69	65	61	58	55	52	50	47	45	44	42	40	39	37	36	35	34	33	32	31	30	29	28	27	27	26	25	25	24	23	23	22	22	21	21	20	20	20	19	19	18	18	18	17
Northeast/Southwest	96	95	94	90	83	77	72	67	63	60	57	54	51	49	47	44	43	41	39	38	36	35	34	32	31	30	29	28	27	27	26	25	24	24	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16
East - West	96	96	95	93	88	82	76	71	65	59	54	50	46	43	40	38	36	34	33	31	30	29	28	27	26	25	24	23	23	22	21	21	20	20	19	19	18	18	17	17	17	16	16	16	15	15	15	14	14	14
Average	96	95	94	91	84	78	72	68	63	59	55	52	49	46	44	42	40	38	37	35	34	33	32	31	30	29	28	27	26	25	25	24	23	23	22	21	21	20	20	19	19	19	18	18	17	17	17	16	16	16

Figure A.1-4 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
PVG 6 *– Moist Grand Fir – Boise, Payette and Sawtooth National Forests*

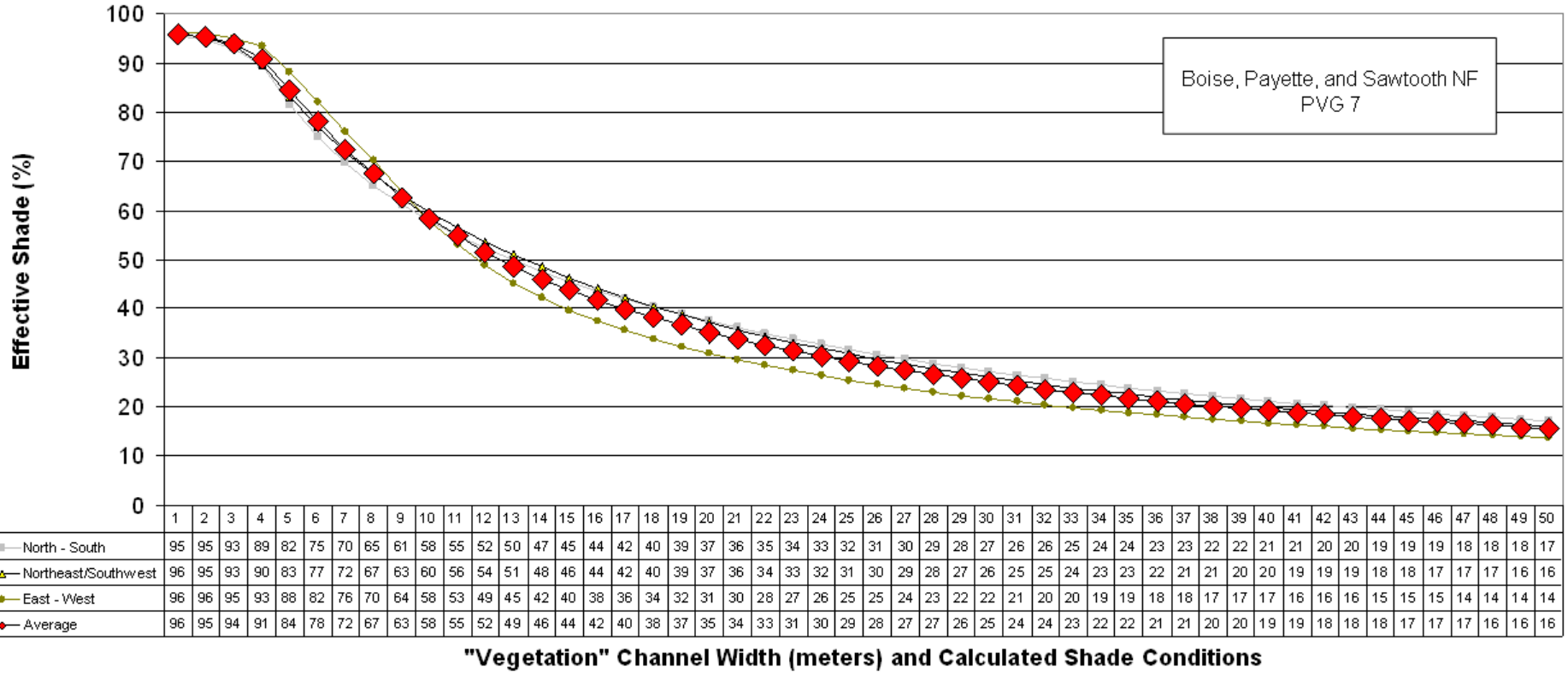


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	14	16	21	31	55	76	91	105	116	126	135	143	150	156	162	168	173	177	182	186	190	194	197	200	203	206	209	211	214	216	218	220	222	224	226	228	229	231	232	234	235	237	238	239	240	241	243	244	245	246
Northeast/Southwest	13	15	19	30	49	68	84	97	109	120	129	137	145	152	159	165	171	176	181	186	190	194	198	201	205	208	211	214	216	218	221	223	225	227	229	231	233	234	236	237	239	240	241	242	244	245	246	247	248	249
East - West	12	13	15	20	35	53	71	86	103	123	136	149	160	170	178	184	190	195	200	204	208	212	215	218	221	223	226	228	230	232	234	236	237	239	240	242	243	244	246	247	248	249	250	251	252	253	254	255	255	256
Average	13	14	18	27	47	65	82	96	109	123	133	143	152	160	166	172	178	183	188	192	196	200	203	206	209	212	215	218	220	222	224	226	228	230	232	233	235	236	238	239	241	242	243	244	245	246	247	248	249	250

PVG 7 – Warm, Dry Subalpine Fir

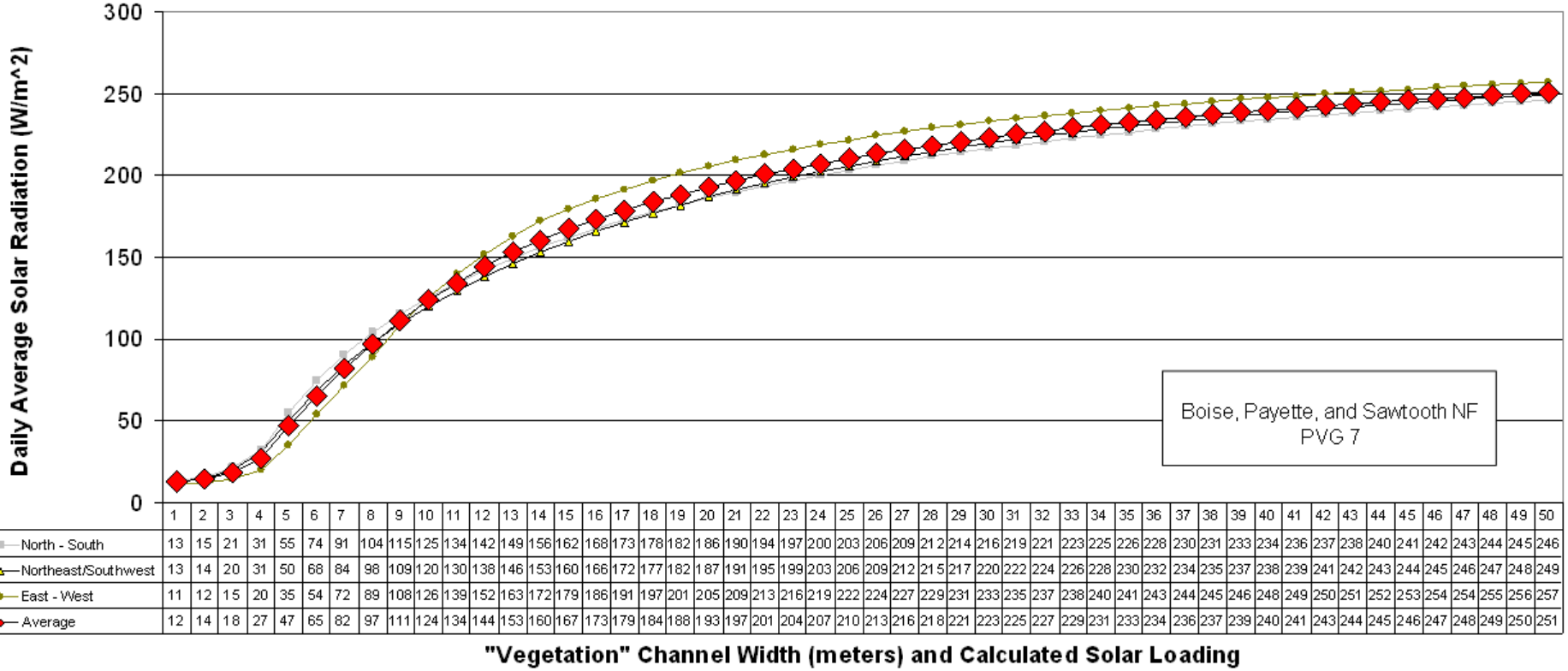
Boise, Payette and Sawtooth National Forests

Figure A.1-3 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
***PVG 7** – Warm, Dry Subalpine Fir – Boise, Payette and Sawtooth National Forests*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	95	95	93	89	82	75	70	65	61	58	55	52	50	47	45	44	42	40	39	37	36	35	34	33	32	31	30	29	28	27	26	26	25	24	24	23	23	22	22	21	21	20	20	19	19	19	18	18	18	17
Northeast/Southwest	96	95	93	90	83	77	72	67	63	60	56	54	51	48	46	44	42	40	39	37	36	34	33	32	31	30	29	28	27	26	25	25	24	23	23	22	21	21	20	20	19	19	19	18	18	17	17	17	16	16
East - West	96	96	95	93	88	82	76	70	64	58	53	49	45	42	40	38	36	34	32	31	30	28	27	26	25	25	24	23	22	22	21	20	20	19	19	18	18	17	17	17	16	16	16	15	15	15	14	14	14	14
Average	96	95	94	91	84	78	72	67	63	58	55	52	49	46	44	42	40	38	37	35	34	33	31	30	29	28	27	27	26	25	24	24	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16	16	16

Figure A.1-4 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
***PVG 7** – Warm, Dry Subalpine Fir – Boise, Payette and Sawtooth National Forests*

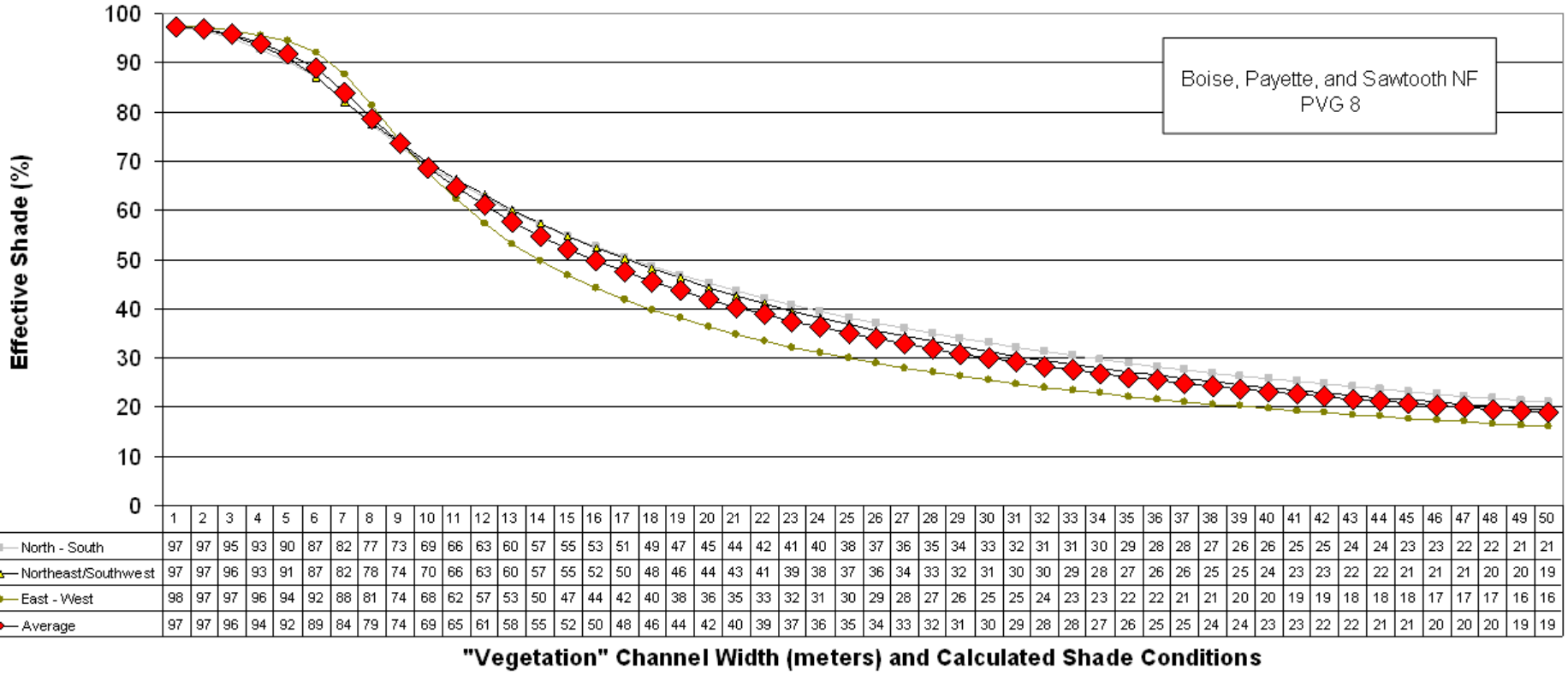


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	13	15	21	31	55	74	91	104	115	125	134	142	149	156	162	168	173	178	182	186	190	194	197	200	203	206	209	212	214	216	219	221	223	225	226	228	230	231	233	234	236	237	238	240	241	242	243	244	245	246
Northeast/Southwest	13	14	20	31	50	68	84	98	109	120	130	138	146	153	160	166	172	177	182	187	191	195	199	203	206	209	212	215	217	220	222	224	226	228	230	232	234	235	237	238	239	241	242	243	244	245	246	247	248	249
East - West	11	12	15	20	35	54	72	89	108	126	139	152	163	172	179	186	191	197	201	205	209	213	216	219	222	224	227	229	231	233	235	237	238	240	241	243	244	245	246	248	249	250	251	252	253	254	254	255	256	257
Average	12	14	18	27	47	65	82	97	111	124	134	144	153	160	167	173	179	184	188	193	197	201	204	207	210	213	216	218	221	223	225	227	229	231	233	234	236	237	239	240	241	243	244	245	246	247	248	249	250	251

PVG 8 – Warm, Moist Subalpine Fir

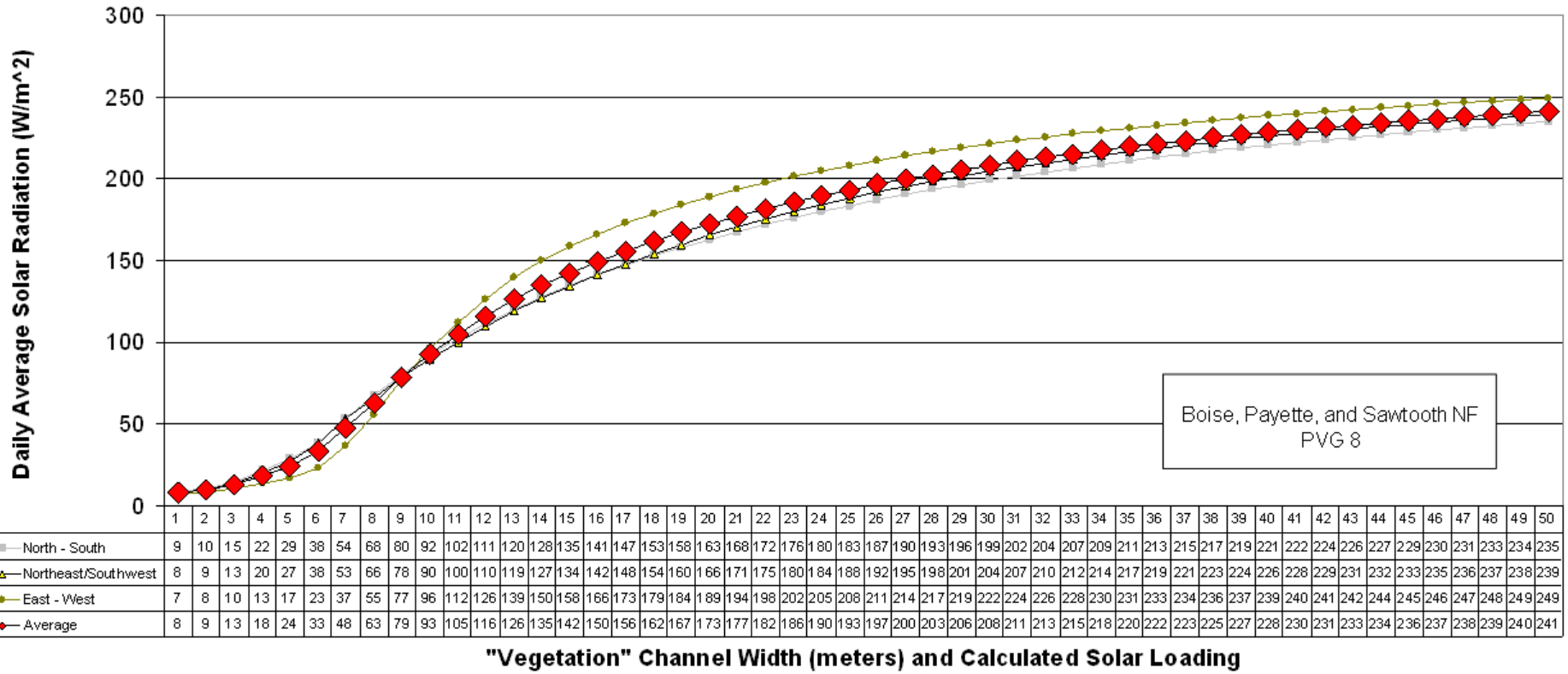
Boise, Payette and Sawtooth National Forests

Figure A.1-3 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
PVG 8 *– Warm, Moist Subalpine Fir – Boise, Payette and Sawtooth National Forests*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	97	97	95	93	90	87	82	77	73	69	66	63	60	57	55	53	51	49	47	45	44	42	41	40	38	37	36	35	34	33	32	31	31	30	29	28	28	27	26	26	25	25	24	24	23	23	22	22	21	21
Northeast/Southwest	97	97	96	93	91	87	82	78	74	70	66	63	60	57	55	52	50	48	46	44	43	41	39	38	37	36	34	33	32	31	30	30	29	28	27	26	26	25	25	24	23	23	22	22	21	21	21	20	20	19
East - West	98	97	97	96	94	92	88	81	74	68	62	57	53	50	47	44	42	40	38	36	35	33	32	31	30	29	28	27	26	25	25	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16	16
Average	97	97	96	94	92	89	84	79	74	69	65	61	58	55	52	50	48	46	44	42	40	39	37	36	35	34	33	32	31	30	29	28	28	27	26	25	25	24	24	23	23	22	22	21	21	20	20	20	19	19

Figure A.1-4 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
PVG 8 *– Warm, Moist Subalpine Fir – Boise, Payette and Sawtooth National Forests*

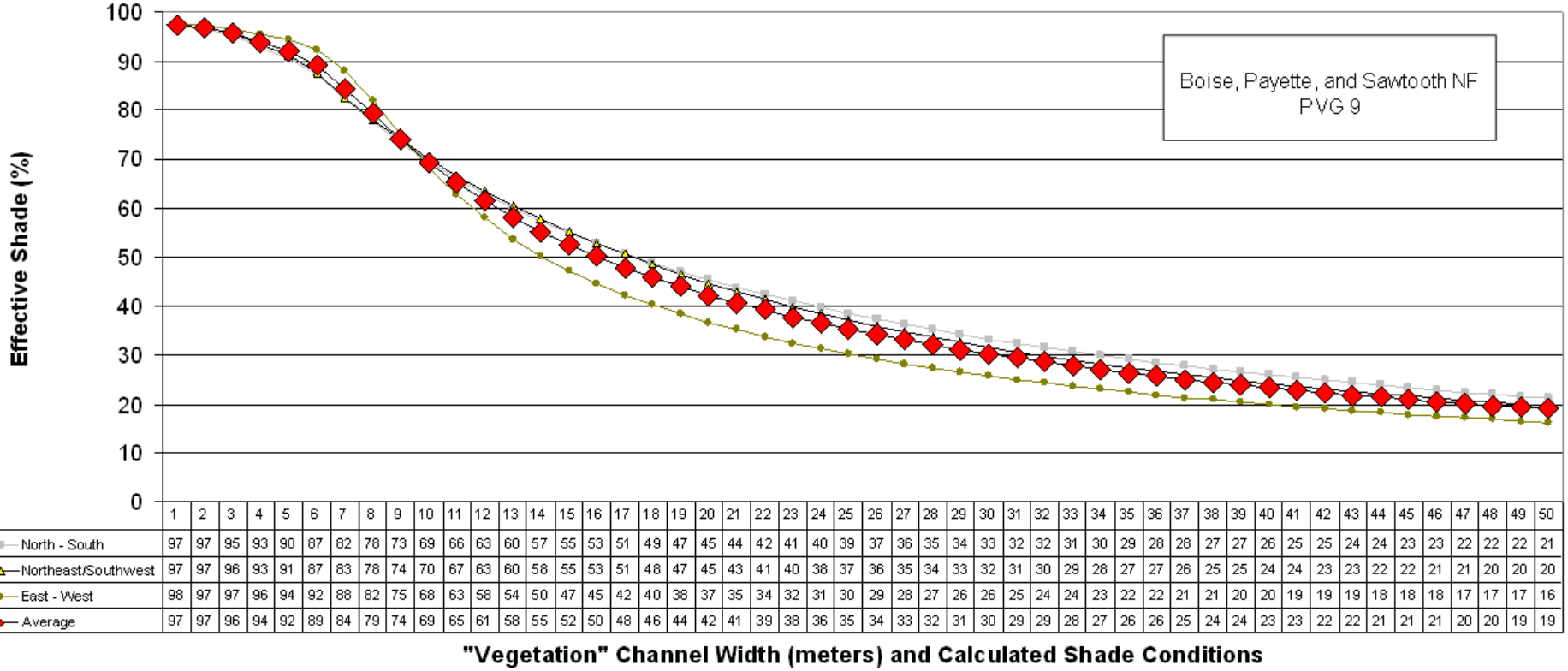


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	9	10	15	22	29	38	54	68	80	92	102	111	120	128	135	141	147	153	158	163	168	172	176	180	183	187	190	193	196	199	202	204	207	209	211	213	215	217	219	221	222	224	226	227	229	230	231	233	234	235
Northeast/Southwest	8	9	13	20	27	38	53	66	78	90	100	110	119	127	134	142	148	154	160	166	171	175	180	184	188	192	195	198	201	204	207	210	212	214	217	219	221	223	224	226	228	229	231	232	233	235	236	237	238	239
East - West	7	8	10	13	17	23	37	55	77	96	112	126	139	150	158	166	173	179	184	189	194	198	202	205	208	211	214	217	219	222	224	226	228	230	231	233	234	236	237	239	240	241	242	244	245	246	247	248	249	249
Average	8	9	13	18	24	33	48	63	79	93	105	116	126	135	142	150	156	162	167	173	177	182	186	190	193	197	200	203	206	208	211	213	215	218	220	222	223	225	227	228	230	231	233	234	236	237	238	239	240	241

PVG 9 – Hydric Subalpine Fir

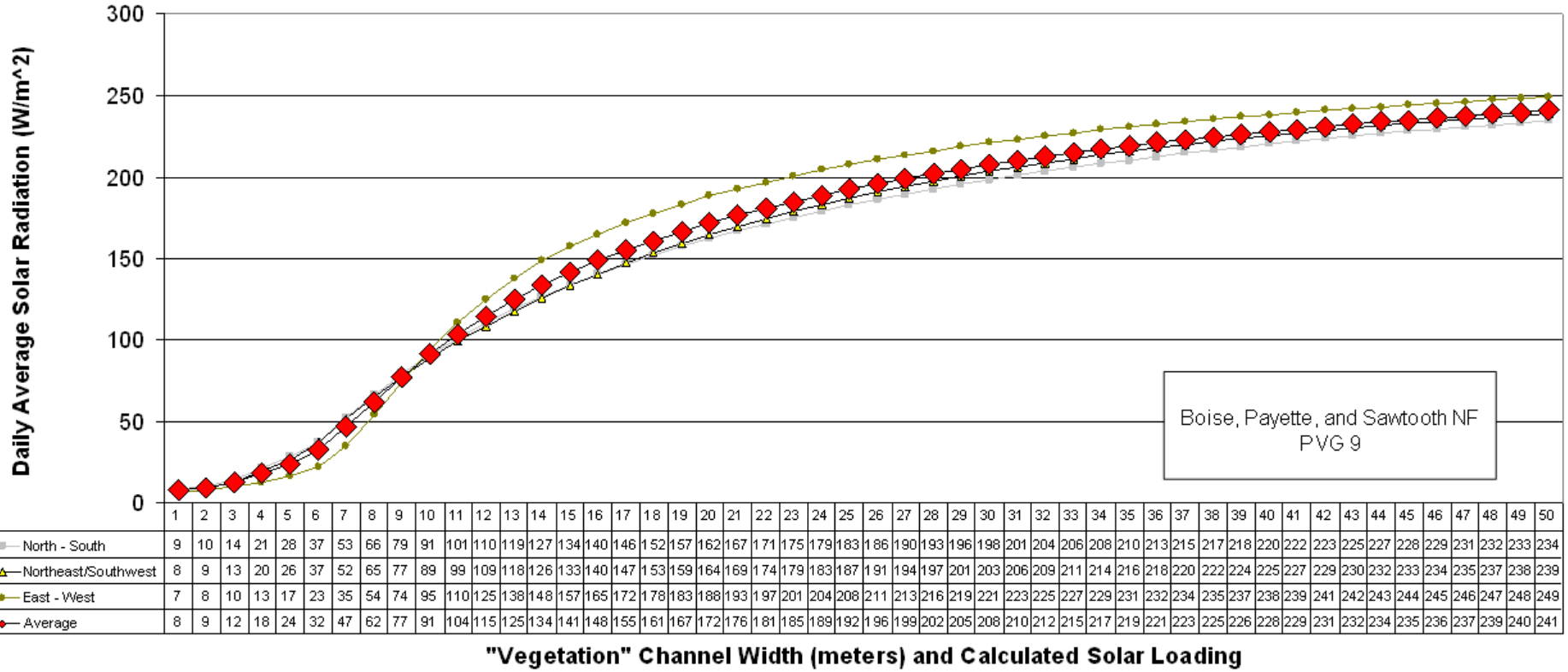
Boise, Payette and Sawtooth National Forests

Figure A.1-3 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
PVG 9 *– Hydric Subalpine Fir – Boise, Payette and Sawtooth National Forests*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	97	97	95	93	90	87	82	78	73	69	66	63	60	57	55	53	51	49	47	45	44	42	41	40	39	37	36	35	34	33	32	32	31	30	29	28	28	27	27	26	25	25	24	24	23	23	22	22	22	21
Northeast/Southwest	97	97	96	93	91	87	83	78	74	70	67	63	60	58	55	53	51	48	47	45	43	41	40	38	37	36	35	34	33	32	31	30	29	28	27	27	26	25	25	24	24	23	23	22	22	21	21	20	20	20
East - West	98	97	97	96	94	92	88	82	75	68	63	58	54	50	47	45	42	40	38	37	35	34	32	31	30	29	28	27	26	26	25	24	24	23	22	22	21	21	20	20	19	19	19	18	18	18	17	17	17	16
Average	97	97	96	94	92	89	84	79	74	69	65	61	58	55	52	50	48	46	44	42	41	39	38	36	35	34	33	32	31	30	29	29	28	27	26	26	25	24	24	23	23	22	22	21	21	21	20	20	19	19

Figure A.1-4 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
PVG 9 *– Hydric Subalpine Fir – Boise, Payette and Sawtooth National Forests*

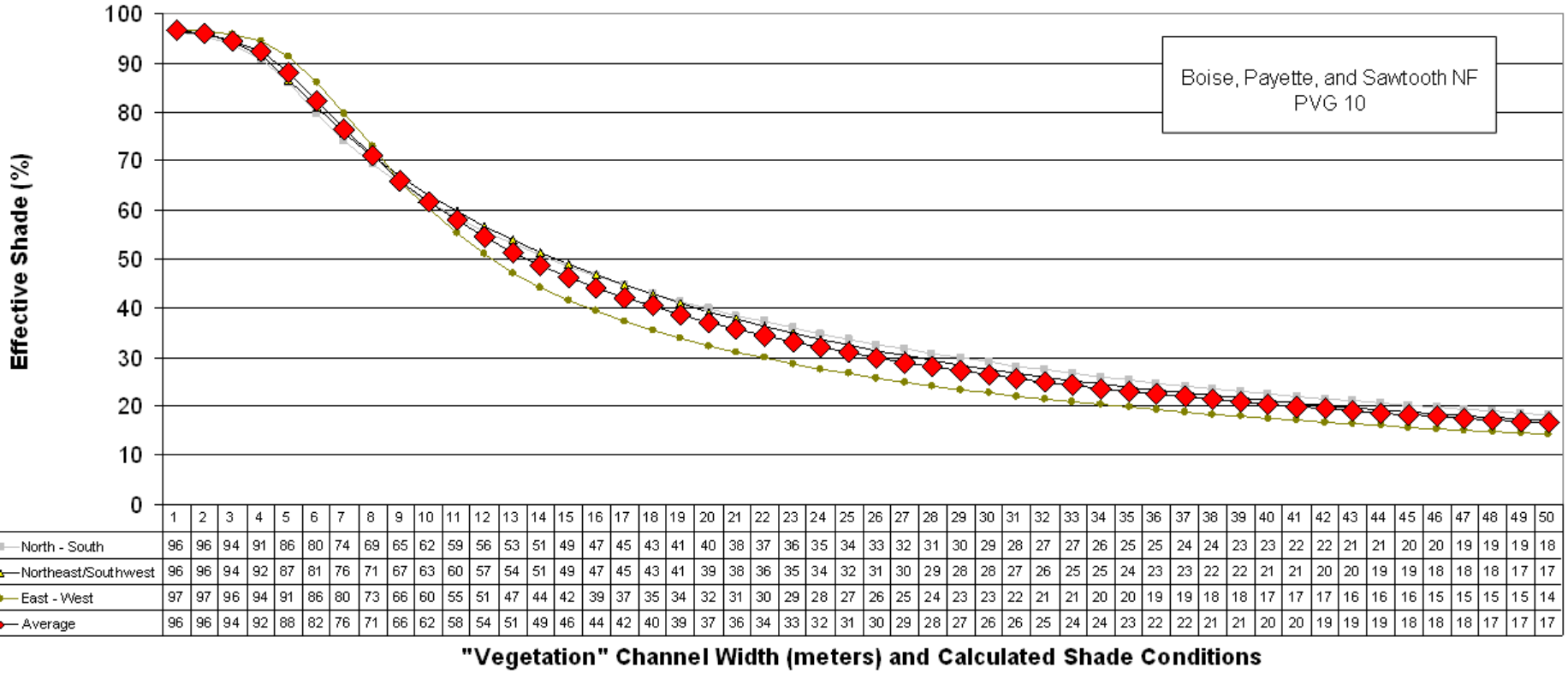


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	9	10	14	21	28	37	53	66	79	91	101	110	119	127	134	140	146	152	157	162	167	171	175	179	183	186	190	193	196	198	201	204	206	208	210	213	215	217	218	220	222	223	225	227	228	229	231	232	233	234
Northeast/Southwest	8	9	13	20	26	37	52	65	77	89	99	109	118	126	133	140	147	153	159	164	169	174	179	183	187	191	194	197	201	203	206	209	211	214	216	218	220	222	224	225	227	229	230	232	233	234	235	237	238	239
East - West	7	8	10	13	17	23	35	54	74	95	110	125	138	148	157	165	172	178	183	188	193	197	201	204	208	211	213	216	219	221	223	225	227	229	231	232	234	235	237	238	239	241	242	243	244	245	246	247	248	249
Average	8	9	12	18	24	32	47	62	77	91	104	115	125	134	141	148	155	161	167	172	176	181	185	189	192	196	199	202	205	208	210	212	215	217	219	221	223	225	226	228	229	231	232	234	235	236	237	239	240	241

PVG 10 – Persistent Lodgepole Pine

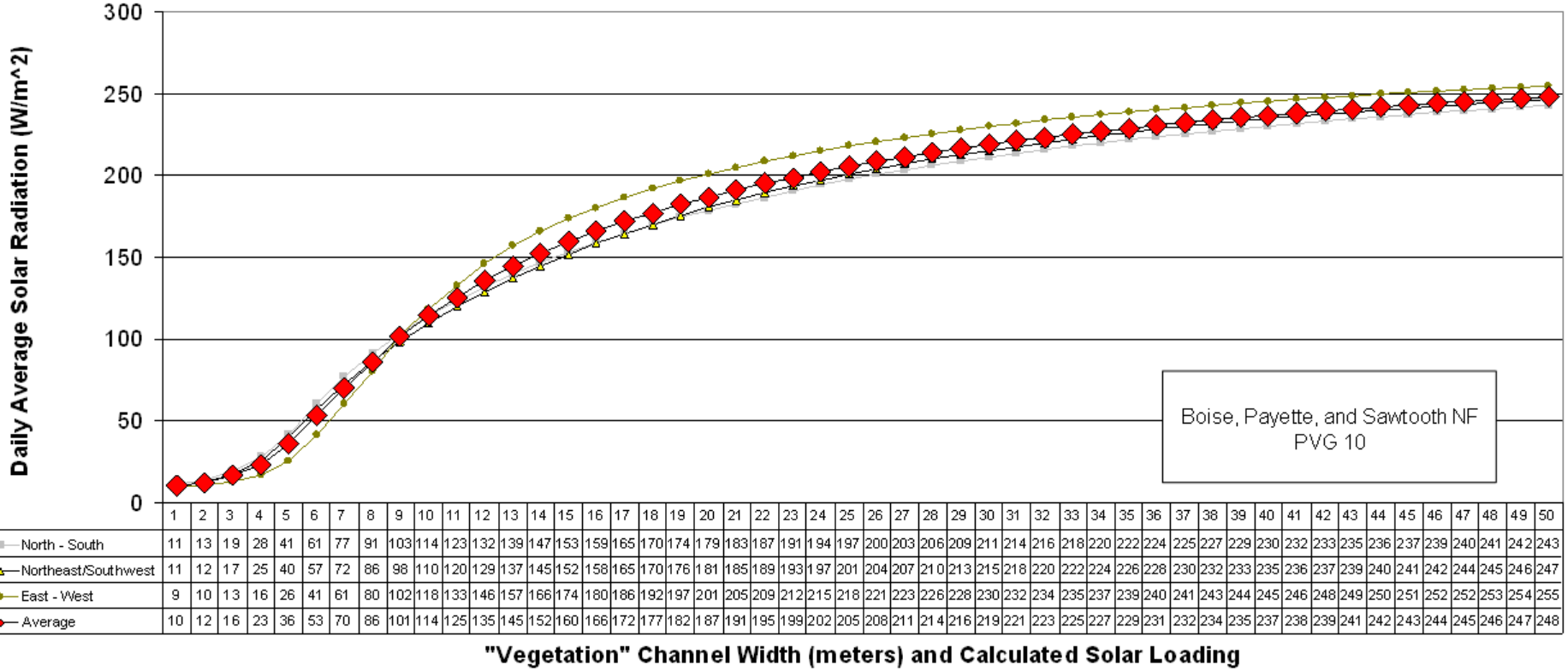
Boise, Payette and Sawtooth National Forests

Figure A.1-3 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
PVG 10 *– Persistent Lodgepole Pine – Boise, Payette and Sawtooth National Forests*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	96	96	94	91	86	80	74	69	65	62	59	56	53	51	49	47	45	43	41	40	38	37	36	35	34	33	32	31	30	29	28	27	27	26	25	25	24	24	23	23	22	22	21	21	20	20	19	19	19	18
Northeast/Southwest	96	96	94	92	87	81	76	71	67	63	60	57	54	51	49	47	45	43	41	39	38	36	35	34	32	31	30	29	28	28	27	26	25	25	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17
East - West	97	97	96	94	91	86	80	73	66	60	55	51	47	44	42	39	37	35	34	32	31	30	29	28	27	26	25	24	23	23	22	21	21	20	20	19	19	18	18	17	17	17	16	16	16	15	15	15	15	14
Average	96	96	94	92	88	82	76	71	66	62	58	54	51	49	46	44	42	40	39	37	36	34	33	32	31	30	29	28	27	26	26	25	24	24	23	22	22	21	21	20	20	19	19	19	18	18	18	17	17	17

Figure A.1-4 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
PVG 10 *– Persistent Lodgepole Pine – Boise, Payette and Sawtooth National Forests*

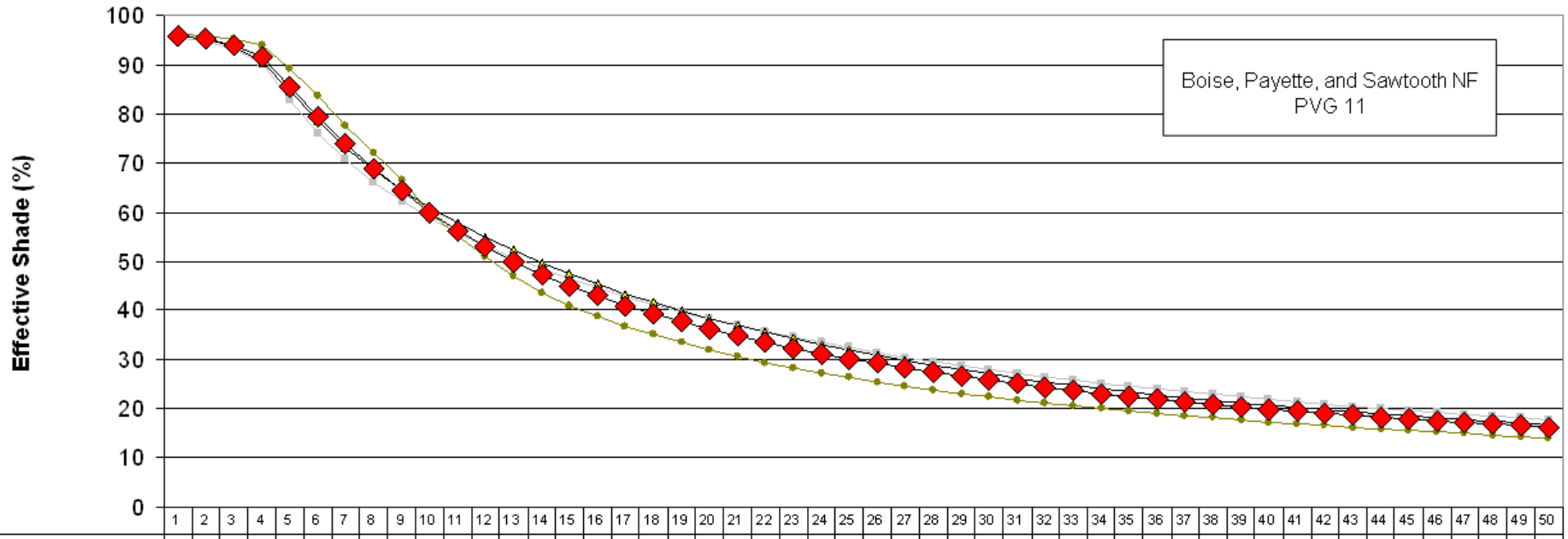


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	11	13	19	28	41	61	77	91	103	114	123	132	139	147	153	159	165	170	174	179	183	187	191	194	197	200	203	206	209	211	214	216	218	220	222	224	225	227	229	230	232	233	235	236	237	239	240	241	242	243
Northeast/Southwest	11	12	17	25	40	57	72	86	98	110	120	129	137	145	152	158	165	170	176	181	185	189	193	197	201	204	207	210	213	215	218	220	222	224	226	228	230	232	233	235	236	237	239	240	241	242	244	245	246	247
East - West	9	10	13	16	26	41	61	80	102	118	133	146	157	166	174	180	186	192	197	201	205	209	212	215	218	221	223	226	228	230	232	234	235	237	239	240	241	243	244	245	246	248	249	250	251	252	252	253	254	255
Average	10	12	16	23	36	53	70	86	101	114	125	135	145	152	160	166	172	177	182	187	191	195	199	202	205	208	211	214	216	219	221	223	225	227	229	231	232	234	235	237	238	239	241	242	243	244	245	246	247	248

PVG 11 – High Elevation Subalpine Fir

Boise, Payette and Sawtooth National Forests

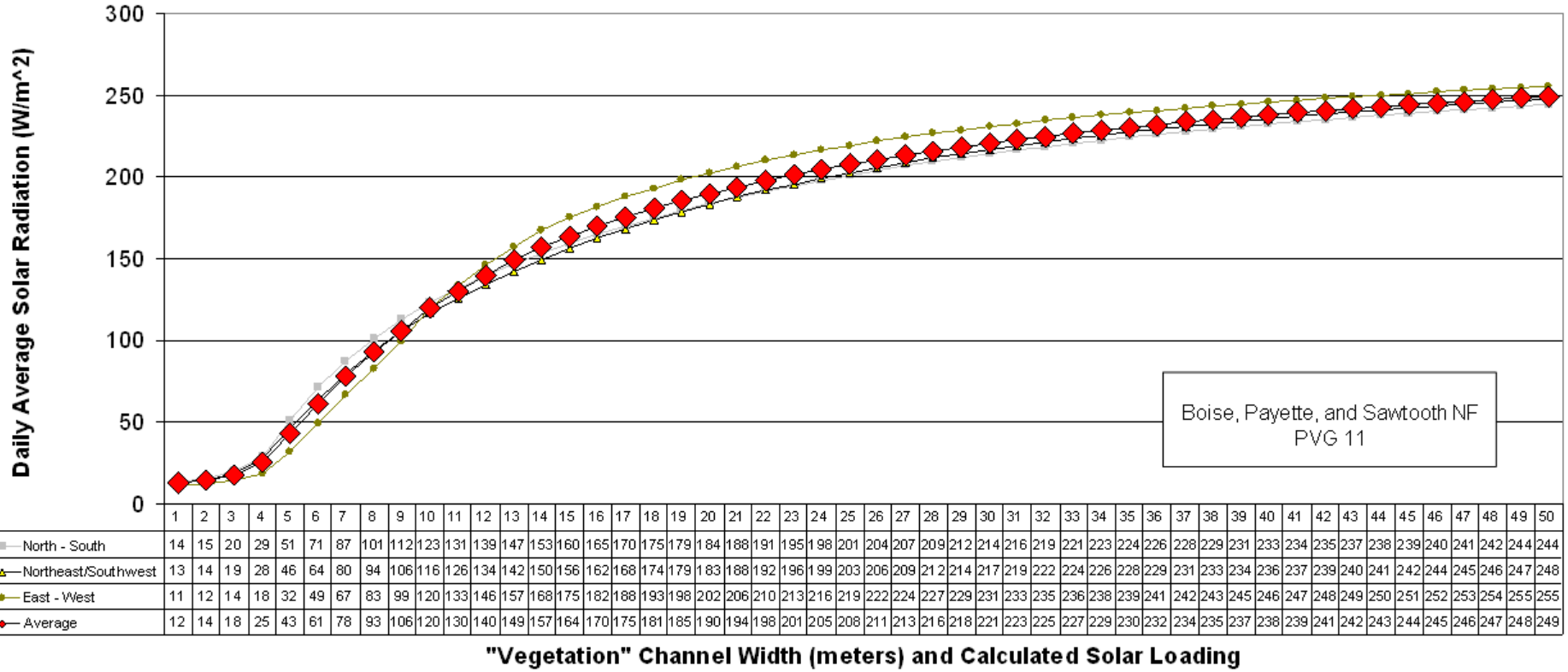
Figure A.1-3 (Continued). System Potential Effective Shade at Various Stream Aspect and Stream Width Conditions.
PVG 11 *– High Elevation Subalpine Fir – Boise, Payette and Sawtooth National Forests*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	95	95	93	90	83	76	71	66	62	59	56	53	51	48	46	44	43	41	40	38	37	36	34	33	32	31	30	30	29	28	27	26	26	25	25	24	23	23	22	22	21	21	20	20	20	19	19	18	18	18
Northeast/Southwest	96	95	94	91	85	79	73	69	64	61	58	55	52	50	47	45	43	42	40	38	37	35	34	33	32	31	30	29	28	27	26	25	25	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17
East - West	96	96	95	94	89	84	78	72	67	60	55	51	47	44	41	39	37	35	33	32	31	29	28	27	26	25	25	24	23	22	22	21	21	20	19	19	19	18	18	17	17	17	16	16	16	15	15	15	14	14
Average	96	95	94	92	86	79	74	69	64	60	56	53	50	47	45	43	41	39	38	36	35	34	32	31	30	29	28	27	27	26	25	24	24	23	22	22	21	21	20	20	19	19	19	18	18	18	17	17	16	16

"Vegetation" Channel Width (meters) and Calculated Shade Conditions

Figure A.1-4 (Continued). Solar Radiation Loading at System Potential Effective Shade at Various Stream Aspect and Widths.
PVG 11 *– High Elevation Subalpine Fir – Boise, Payette and Sawtooth National Forests*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North - South	14	15	20	29	51	71	87	101	112	123	131	139	147	153	160	165	170	175	179	184	188	191	195	198	201	204	207	209	212	214	216	219	221	223	224	226	228	229	231	233	234	235	237	238	239	240	241	242	244	244
Northeast/Southwest	13	14	19	28	46	64	80	94	106	116	126	134	142	150	156	162	168	174	179	183	188	192	196	199	203	206	209	212	214	217	219	222	224	226	228	229	231	233	234	236	237	239	240	241	242	244	245	246	247	248
East - West	11	12	14	18	32	49	67	83	99	120	133	146	157	168	175	182	188	193	198	202	206	210	213	216	219	222	224	227	229	231	233	235	236	238	239	241	242	243	245	246	247	248	249	250	251	252	253	254	255	255
Average	12	14	18	25	43	61	78	93	106	120	130	140	149	157	164	170	175	181	185	190	194	198	201	205	208	211	213	216	218	221	223	225	227	229	230	232	234	235	237	238	239	241	242	243	244	245	246	247	248	249

A.2 Shade Curve Development for Hardwood "Non-forest" Riparian Communities in North Idaho (Prepared by EPA)

The Northern Idaho National Forests shade curve development process is based largely on coniferous forest types in the Idaho Panhandle National Forests system (see Section A.1 of this Appendix). However, non-coniferous species play an important role in riparian plant communities along streams and rivers in northern Idaho. These hardwood species come into play most often along water courses that have wider valleys and are typically in low-gradient sections of the stream system. A process was developed by Peter Leinenbach of the U.S. Environmental Protection Agency (EPA), Region 10 (Seattle) for the Pend Oreille Lake tributaries temperature TMDL, in which stream order and stream gradient are used to assign one of two hardwood shade curves especially designed for northern Idaho non-coniferous forest riparian areas. That process is outlined below in text and figures borrowed from the Pend Oreille Lake Tributaries Temperature TMDL (IDEQ, 2007). All references below to "non-forest" are referring to these non-coniferous hardwood-based riparian communities.

A.2-1. "Forest/Non-forest" Delineation Method

Background - System Potential Effective Shade Defined

Primary factors that affect shade are near-stream vegetation height and channel width (i.e., bankfull width). The maximum level of shade practical at a particular site is termed the "system potential" effective shade level. System Potential Effective Shade occurs when:

1. Near-stream vegetation is at a mature life stage
   - Vegetation community is mature and undisturbed by anthropogenic sources;
   - Vegetation height and density is at or near the potential expected for the given plant community;
   - Vegetation is sufficiently wide to maximize solar attenuation; and
   - Vegetation width should accommodate channel migrations.

2. Channel width reflects a suitable range for hydrologic process given that near-stream vegetation is at a mature life stage
   - Stream banks reflect appropriate ranges of stability via vegetation rooting strength and floodplain roughness;
   - Sedimentation reflects appropriate levels of sediment input and transport;
   - Substrate is appropriate to channel type; and
   - Local high flow shear velocities are within appropriate ranges based on watershed hydrology and climate.

It is important to distinguish between *site* potential shade and *system* potential shade. System potential shade is a broad scale view of shade conditions along a stream. It could

be expected that site potential shade would be greater than system potential shade because over a large area, such as a river reach, it is unlikely that all sites will be at their potential due to localized natural disturbances (e.g., fire, flood, landslide, disease), causing some fraction of the area to be in a less than "mature" condition. Accordingly, a disturbance component is included in the development of "system potential landcover," which is subsequently used to calculate "system potential effective shade" conditions.

Background -Landcover and Riparian Conditions

Currently, approximately 72% of landcover within the Pend Oreille Basin is categorized as "forest" by the National Landcover Dataset (**Figure A.2-1**). These "forest" areas are located throughout the basin. The remaining "non-forest" areas are primarily located in low elevation, and low surface gradient, areas of the basin.

The following discussion on historic riparian vegetation conditions for both upland (i.e., "forest") and lowland (i.e., "non-forest") areas within the Pend Oreille Basin was obtained from the Fish and Wildlife subbasin plan.[19]

> *"Historic vegetation patterns in the Upper Pend Oreille Subbasin were largely influenced by wildfire. Early accounts and photographs of the Subbasin indicate that old-growth stands of western red cedar, Thuja plicates, and other species were common in riparian zones and floodplains. Large cedar stumps can still be found in many riparian areas along Subbasin streams. Uplands were more typically dominated by seral species in various stages of succession, with age and composition dependent largely on fire cycles, elevation, slope, and aspect.*
>
> *Low elevation riparian zones near tributary mouths include areas with and without tree canopy cover. Along stream corridors where tree overstory does not exist or is thin, vegetation includes shrubs and small trees such as thin-leaf alder, Alnus sinuate; willows, Salix spp.; snowberry, Symphoricarpos albus; mountain maple, Acer glabrum; red-osier dogwood, Cornus stolonifera; blue elderberry, Sambucus cerulea; and black hawthorn, Crataegus douglasii. Where tree canopy is present, tree species include black cottonwood, Populus trichocarpa; water birch, Betula occidentalis; quaking aspen, Populus tremuloides; and a mix of conifer species including western red cedar, Thuja plicates; western hemlock, Tsuga heterophylla; Douglas fir, Psuedotsuga menziesi; grand fir, Abies grandis; and western white pine, Pinus monticola."*

As can been seen in the description above, a higher proportion of upland vegetation is present within the riparian zone for streams within the "forested" areas. Accordingly, there is a need to account for this variability in the landscape when developing ***system potential effective shade*** conditions for the Pend Oreille Basin.

Aquatic Response Units (ARU) were used to differentiate between "forest" and "non-forest" areas and methods used to estimate system potential riparian landcover for "non-forest" areas are presented in the following pages.

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[19] Obtained from - http://www.nwcouncil.org/fw/subbasinplanning/admin/level2/intermtn/plan/

Figure A.2-1. Landcover Designations in the Pend Oreille Basin.
(Forested areas illustrated by green) [Source – National Landcover Dataset 2000]

Aquatic Response Unit (ARU)

The Aquatic Response Unit (ARU) is a method which the USFS uses to understand the composition, structure, and function of riparian vegetation. ARUs are determined by temporal and spatial patterns of hydrologic and geomorphic processes within defined valley bottoms of predetermined widths. Departure from a range of variability and/or a proper functioning condition can be determined by either comparison to reference stream reaches within a given valley bottom type (or ARU) undisturbed by human influence or from an understanding of aquatic processes developed through ARUs.

The Kootenai National Forest (KNF) has developed an ARU classification and inventory. The ARUs were grouped based on overall similar descriptive characteristics. Summary descriptions for allocated ARUs classes are presented in **Table A.2-1**. As can be seen in Table A.2-1, there are four groups associated with ARU classifications -

- Group 1: Steep Headwater Streams
- Group 2: Moderate Gradient , Small- to Mid-sized Streams
- Group 3: Low Gradient, Small- to Mid-sized Streams, and
- Group 4: Low Gradient, Large Streams.

These groups are subsequently subdivided into the individual ARUs. Each ARU is coded so the first number reflects the dominant stream order. The second and third letters reflect the overall gradient (stream gradient) where "A" is the highest gradient and "C" is the lowest gradient. Additional detailed information can be found in the draft ARU document on file at the Forest Supervisor's Office in Libby, Montana. The Idaho Panhandle National Forests (IPNF) has developed input parameters associated with ARU development (sinuosity, gradient, Rosgen stream order, valley bottom width), but has not yet completed the final classification work.

This input data was obtained from IPNF staff and was used to develop an "ARU filter" for the Pend Oreille Basin. The "ARU filter" was used to delineate between "forest" and "non-forest" riparian classes within the Pend Oreille Basin. Specifically, general conditions presented in the KNF ARU document for the four ARU Groups (**Table A.2-2**) were used to establish the benchmarks (**Table A.2-3**) used in the development of the "ARU filter" groups for the Pend Oreille.

As can be seen in Table A.2-3, stream order (**Figure A.2-2**) and stream gradient are the parameters used to develop the "ARU filter" groupings (**Figure A.2-3**). These parameters were found to efficiently delineate areas of "forest" riparian areas vs. "non-forest" riparian areas. Specifically, "ARU filter Group A" are small- to medium-sized streams with a moderate to high stream gradient. These areas are more likely to have a higher proportion of forest type upland vegetation within the riparian zone. "ARU filter Group B" are low gradient reaches of small and medium sized streams. Similarly "ARU filter Group C" are also low-gradient streams, but are large in size.

Table A.2-1. Summary of Aquatic Response Units (ARUs) on the Kootenai National Forest.

Group	ARU	Proportion of the KNF	Description	Vegetation
1	1A	33%	First and some second order, very steep streams. Commonly found at elevations between 3000-5500'. Major landtype groups are 300 and 400 series. Valley bottoms are narrow.	Grand fir, Black Cottonwood, Western Redcedar, Western Hemlock, Common Snowberry,
1	1AB	19%	First and 2nd order, steep streams. Commonly found at elevations between 2500-5500'. Major landtype group is 300 series. Valley bottoms are fairly narrow.	Western Redcedar, Mountain Alder, Sitka Alder, Fools's Huckleberry, Drummond Willow, Arnica
1	3AB	1%	Third order, steep streams. Commonly found at elevations below 4500'. Major landtype groups are 300 and 400 series, followed by 100 series. Valley bottoms are fairly narrow.	Grand fir, Western Redcedar, Rocky Mountain Maple, Common Prince's-pine, Twinflower, Thimbleberry
2	1B	17%	First and second order, moderate gradient streams. Mainly found at elevations between 2500-5000'. Most common landtype group is 300 series, followed by the 100 then the 400 series. Valley bottoms are moderately wide.	Engelmann Spruce, Western Redcedar, Sitka Alder, Sphagnum sp., Ticklegrass, Oak-fern
2	1B	17%	First and second order, moderate gradient streams. Mainly found at elevations between 2500-5000'. Most common landtype group is 300 series, followed by the 100 then the 400 series. Valley bottoms are moderately wide.	Engelmann Spruce, Western Redcedar, Sitka Alder, Sphagnum sp., Ticklegrass, Oak-fern
2	3B	4%	Third order, moderate gradient streams. Mainly found at elevations between 2500-4500'. Most common landtype group is the 300 series, followed by the 100 and 400 series. Valley bottoms are moderately wide.	Grand fir, Paper Birch, Western Redcedar, Western Hemlock, Sitka Alder, Fools's Huckleberry, Devil's Club,
2	4B		Characteristics of this group include 1st, 2nd, and 3rd order streams with low gradient, higher sinuosity, and wide valley bottoms.	
3	1C	7%	First and second order, low gradient streams. Commonly found at elevations between 2000-4000'. Major landtype groups are 100 and 300 series. Valley bottoms are wide.	Spruce, Sitka Alder, Thimbleberry, Reedgrass, Ladyfern,
3	3C	5%	Third order, low gradient streams. Commonly found at elevations between 2000-4500'. Major landtype groups are 100 and 300 series. Valley bottoms are wide.	Grand fir, Engelmann Spruce, Black Cottonwood, Red-osier Dogwood, Douglas Spiraea, Ticklegrass,
4	4C	6%	Fourth order, low gradient streams. Mainly found at elevations below 4000'. Major landtype groups are 100 and 300 series. Valley bottoms are wide.	Paper Birch, Paper Birch, Balsam Poplar, Scouler Willow, Bentgrass, Beaked Sedge, Reed Canarygrass, Fowl Bluegrass
4	5C	2%	Fifth order, low gradient streams. Commonly found at elevations below 3500'. Major landtype group is the 100 series. Valley bottoms are wide.	Black Cottonwood, Western Redcedar, Shrubby Cinquefoil, Reed Canarygrass, Ladyfern
4	6C	1%	Average gradient is 1%. Gradient and sinuosity were computer generated and may differ from actual measurements. Sixth order streams are large and typically occur in the lowest reaches of the watershed at elevations under 3000'. The average width of the valley bottom in ARU 6C is 355 meters.	Paper Birch, Western Larch, Engelmann Spruce, Western Redcedar, Western Hemlock, Common Snowberry
5	LT32	1%	These streams are within landtype group 325. Streams are generally low to moderate gradient and occur in fairly wide valley bottoms. Stream order is generally 3rd order or smaller.	Engelmann Spruce, White Spruce, Rocky Mountain Maple, Alder, Alder Buckthorn, Redtop, Field Horsetail

Table A.2-2. Summary Stream Characteristics for Aquatic Response Units(ARU)Groups
Group 1 - Steep Headwater Streams
The Kootenai National Forest describes this group as small (1st and 2nd order), fairly low sinuosity, and high gradient streams within narrow valley bottoms.
Riparian vegetation is characterized by upland coniferous forest.
Group 2: Moderate gradient, small- to mid-sized streams
The Kootenai National Forest describes this group as small- (1st and 2nd order) to mid-sized (3rd to 4th order) streams with moderate gradient and fairly low sinuosity.
Riparian vegetation is characterized by upland coniferous forest.
Group 3: Low gradient, small- to mid-sized streams
The Kootenai National Forest describes this group as small- (1st and 2nd order) to mid-sized (3rd order) streams with low gradient and slight sinuosity.
Riparian Vegetation – 1st and 2nd Order Streams - Along lower gradient streams, valley bottom vegetation is shrub wetland, mountain alder community type on low alluvial terraces and upland coniferous forest on glacial outwash terraces. Along slightly higher gradient streams, vegetation is commonly upland coniferous forest and coniferous wetland. 3rd Order Streams - Along lower gradient streams, valley bottom vegetation is herbaceous and shrub wetlands on low alluvial terraces and wetland coniferous forest such as spruce/red osier dogwood, spruce/field horsetail, or western redcedar/bracken fern on alluvial terraces. Along moderate gradient streams, valley bottom vegetation is dominated by upland coniferous forest and coniferous wetland.
Group 4: Large, low gradient streams
The Kootenai National Forest describes this group as mid-sized (4th order) to large (5th and 6th order) streams with low gradient and fairly sinuous.
Low alluvial terraces support a complex pattern of herbaceous and shrub vegetation and upland coniferous forest on glacial outwash terraces.

Table A.2-3. Summary Aquatic Response Unit (ARU) filter Group Characteristics
ARU filter Group A - Forest Riparian Group • Stream Order – 1st, 2nd, 3rd and 4th • Stream gradient ≥ 3 percent
ARU filter Group B - Non-Forest Riparian Group 1 • Stream Order – 1st, 2nd, 3rd and 4th • Stream gradient < 3 percent
ARU filter Group C - Non-Forest Riparian Group 2 • Stream Order – 5th and 6th

Only 13% of stream miles for 1st order streams had a gradient less than 3%. These areas were primarily located in the lower elevation valley locations with the basin (see Figure A.2-2). "ARU filter Group B" would be applied to these areas. The remaining 87% of stream miles for first order streams would be within the "ARU filter Group A" (e.g., Forest Riparian Groups). Similarly, the proportions of stream miles having a gradient less than 3% for 2nd, 3rd and 4th order streams is 33%, 54%, and 87%, respectively. (Once again, "ARU filter Group B" would be applied to these areas.)

Methods used to estimate system potential riparian landcover for "non-forested" areas of the basin are presented here.

Figure A.2-2. Stream Order in the Pend Oreille Basin.

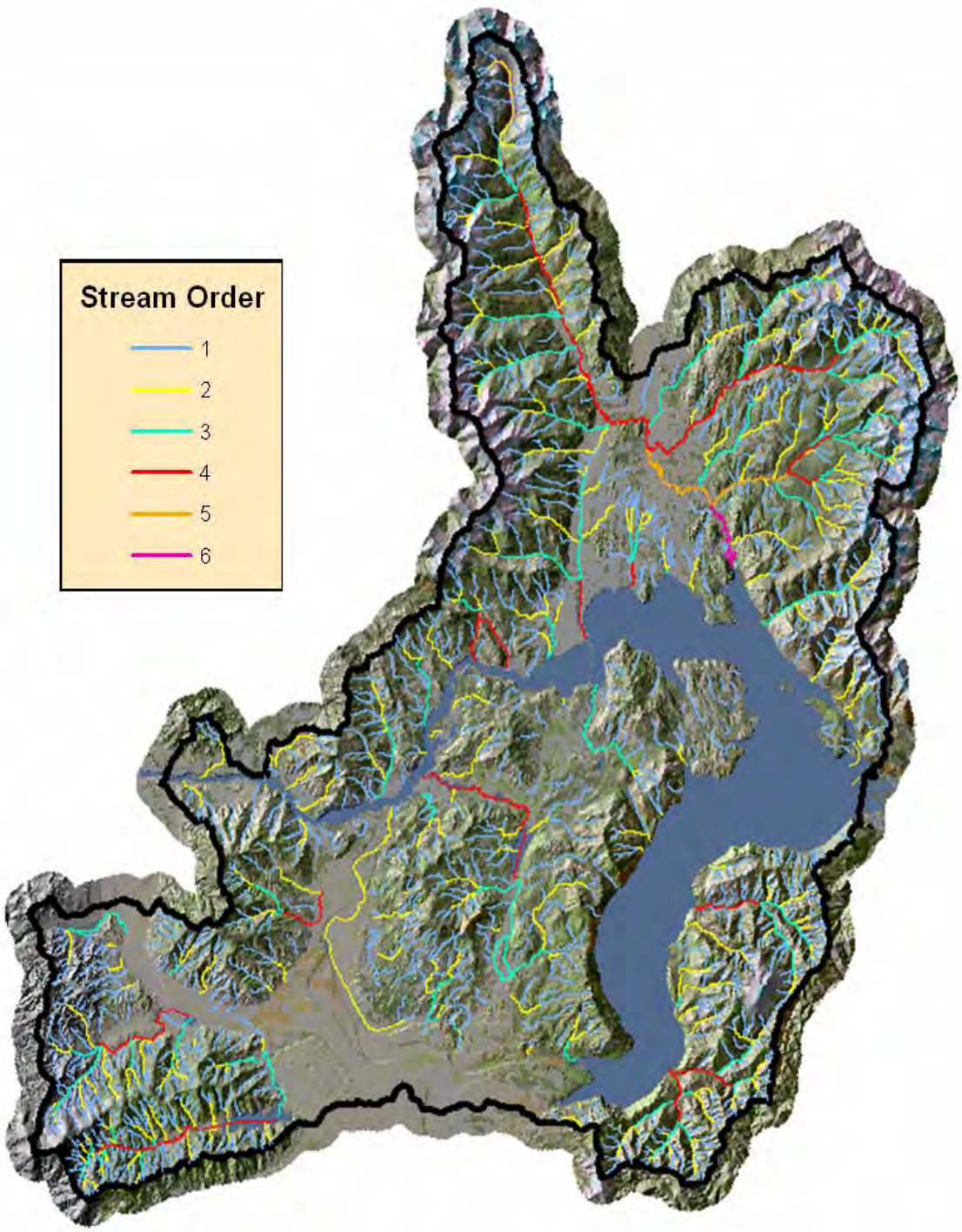
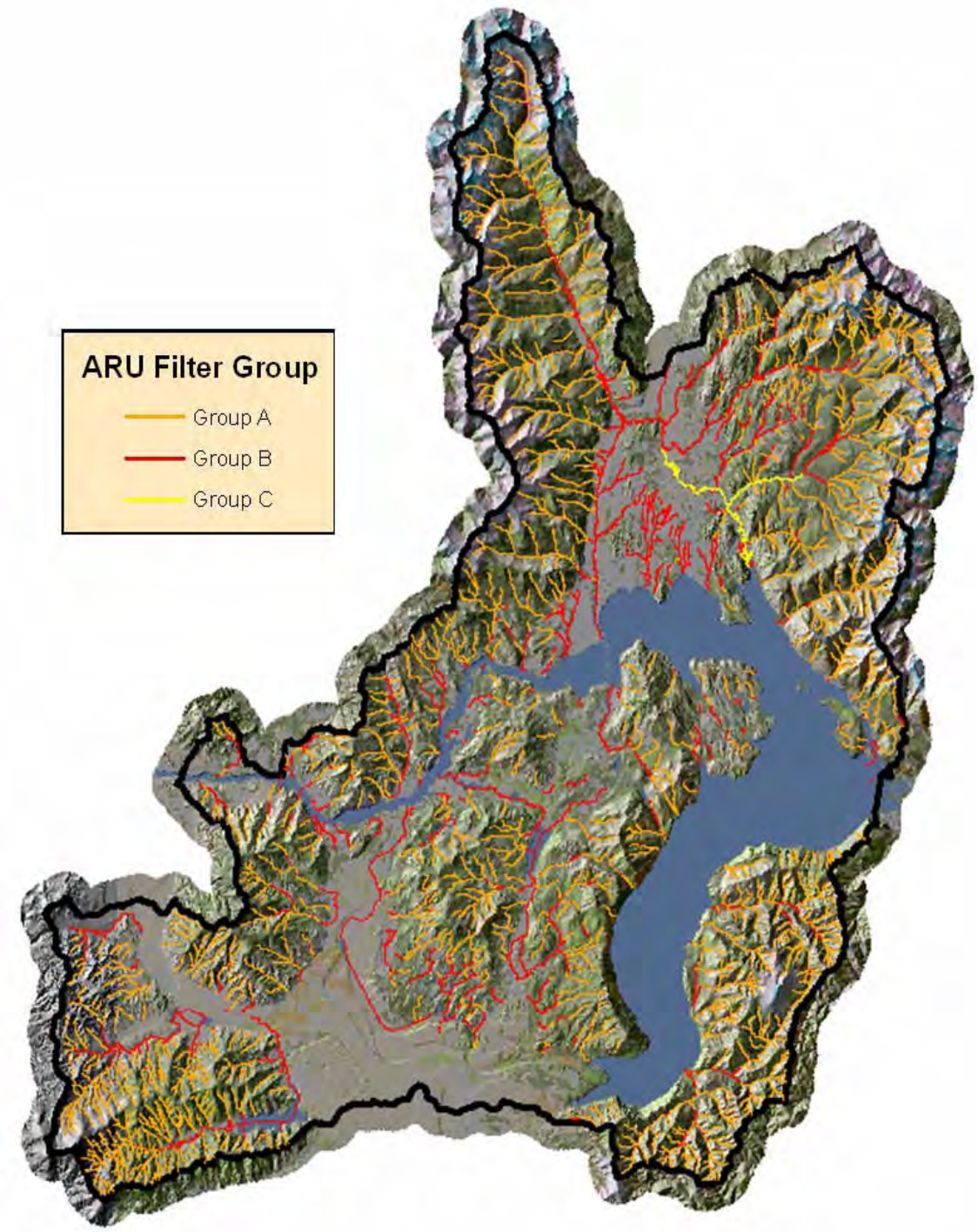


Figure A.2-3. "ARU filter" Groups in the Pend Oreille Basin.



A2-2. System Potential "Non-Forest" Vegetation Landcover Estimates

This section will discuss methods used to develop system potential landcover estimates for riparian areas of the Pend Oreille Basin located within "non-forest" areas. These areas are primarily located within low elevation and low surface gradient areas. It is important to point out that these "non-forest" riparian areas still have an upland forest component, but at lower levels than "forest" riparian areas described elsewhere.

These "non-forest" areas are often located in areas that have been exposed to anthropogenic changes over the past several decades. Accordingly, these areas often deviate dramatically from "potential" landcover conditions. It is important to point out once again that "system potential landcover" is necessary to achieve "system potential effective shade" and is defined for purposes of the TMDL as "the potential near-stream land cover condition which can grow and reproduce on a site, given: climate, elevation, soil properties, plant biology, and hydrologic processes." In addition, "system potential does not consider management or land use as limiting factors."

Recently, there have been efforts to assess riparian areas for "non-forest" areas in the Pend Oreille Basin. For example, a detailed survey of stream channel conditions was recently developed for the Pack River system. As part of this effort, riparian vegetation conditions were assessed, including estimates of "vegetation reference conditions". In addition, the Bonner Soil and Water Conservation District conducted riparian vegetation surveys along several stream reaches located within the Pend Oreille Basin lowlands. This effort included estimates for "Potential Natural Vegetation" for these assessed reaches. Information provided from these efforts will provide insight into riparian vegetation conditions for areas located within "Non-Forest Riparian Group 1" and "Non-Forest Riparian Group 2" (see Table A.2-3).

Pack River Stream Channel Assessment

Discussions included in the Pack River Stream Channel Assessment (Golder, 2003) described reference riparian vegetation along the Pack River as the following

> *"The reference sub-reaches for riparian vegetation on the Pack River can be found in Reaches A and B. Sub-reaches 5 and 17 both contain a high percentage of late-seral Western redcedar vegetation type (88 and 90 percent, respectively).*
>
> *The locations of these sub-reaches within more confined portions of the valley appear to have limited their exposure to the Sundance fire effects. The riparian habitat is less disturbed in these sub-reaches than in others on the Pack River. Based on these reference sub-reaches, it is likely that more stable, larger substrate B-type streams have alder as a subdominate species (as in subreach 5), while the more dynamic C and F-type stream reaches are likely to contain willow as a subdominate species (as in sub-reach 17).*

Sub-reach 5 likely represents the reference vegetation condition for B channel types within the watershed. Despite elevational differences between the lower and upper watershed, it is likely that sub-reach 17 is indicative of reference conditions for C and F channel types within Reaches C, D, and E of the watershed as indicated by the presence of Western redcedar trees and stumps."

Photographs for subreaches 5 and 17 are presented in **Figure A.2-4** (These images were obtained from the Pack River Report). River reach designations used for the Pack River within this report are illustrated in **Figure A.2-5**.

Subreach 5

Subreach 17

Figure A.2-4. Photographs of available reference riparian areas along the Pack River.

Figure A.2-5. Reach Designations along the Pack River[20]

[20] Reach A contains subreaches 1 through 8, Reach B contains subreaches 9 through 21, Reach C contains subreaches 22 through 30, Reach D contains subreaches 31 through 39, Reach E contains subreaches 40 through 52, and Reach F contains subreaches 53 and 54.

2006 Riparian Vegetation Surveys in Pend Oreille Basin Lowlands

In the summer of 2006, staff at the Bonner Soil and Water Conservation District conducted riparian vegetation surveys along several stream reaches located within the Pend Oreille Basin lowlands. The four areas where these sampling sites were located are highlighted in **Figure A.2-6**. These surveys were for the purpose of identifying priority areas for agricultural TMDL implementation plan development in the Pack River watershed. Given this focus, the areas that were surveyed were chosen based on the presence of agricultural activity. As part of this effort, descriptions of "potential natural vegetation" were estimated by the field crew for many of the sampling reaches.

Recall that these riparian areas associated with these sites are currently modified by land use activities, and thus estimates of **"potential natural vegetation"** conditions could be problematic to accurately establish. However, this information is the best estimate considering available information at the site. In addition, descriptions of **current vegetation** conditions can also be valuable in developing "system potential landcover" estimates for these areas of the basin. This information is summarized in **Figure A.2-7.**

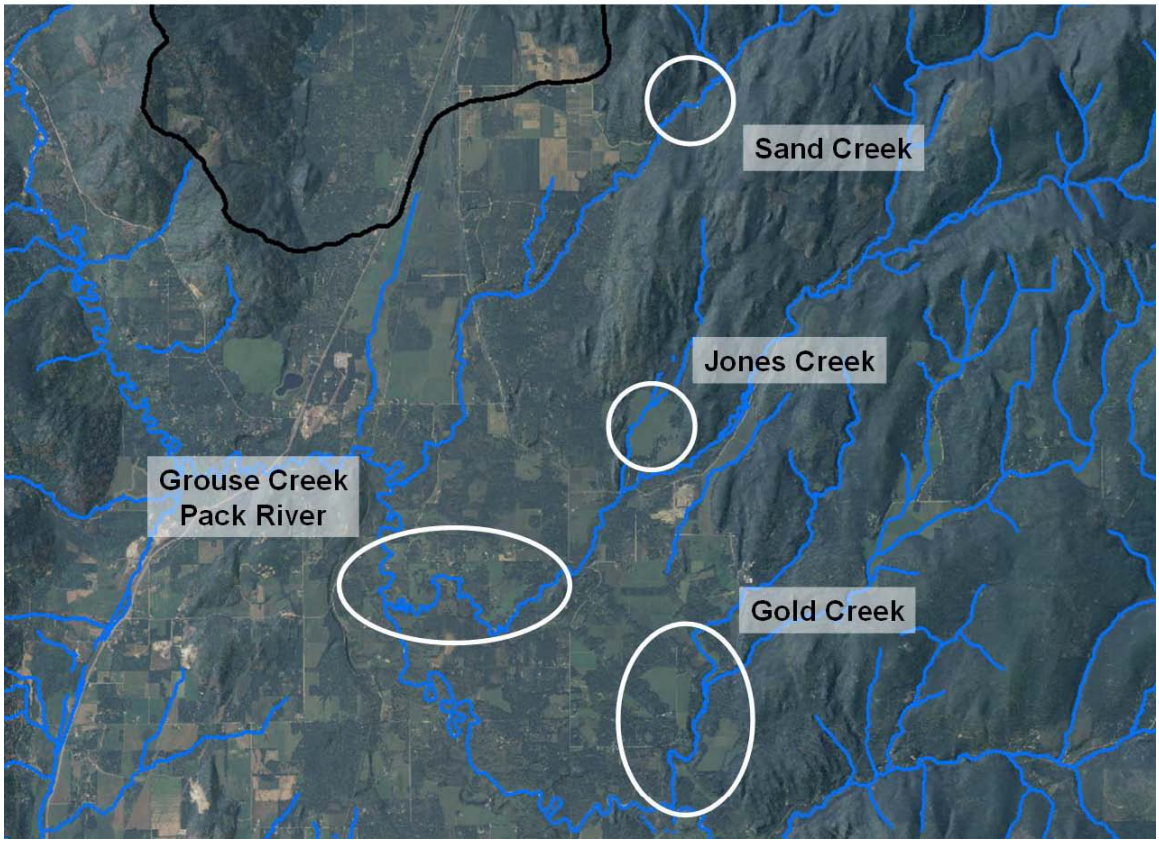
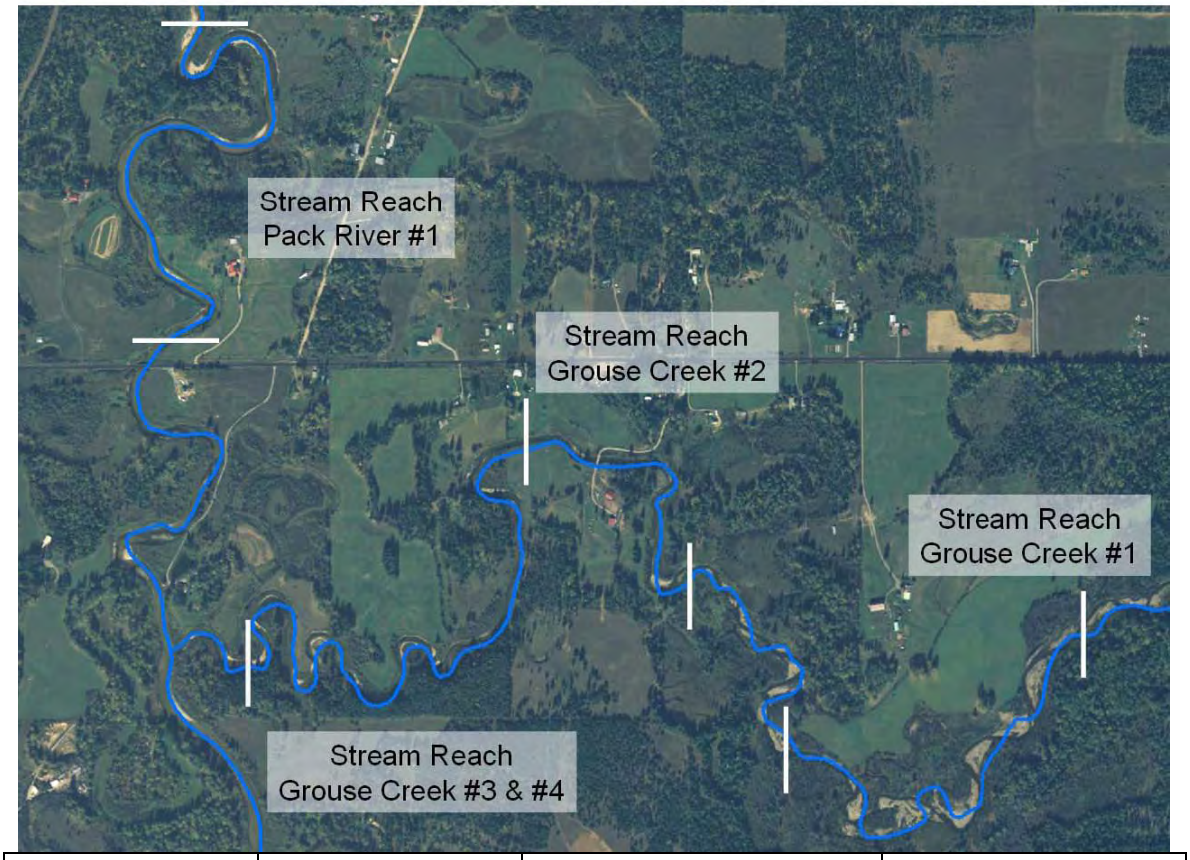
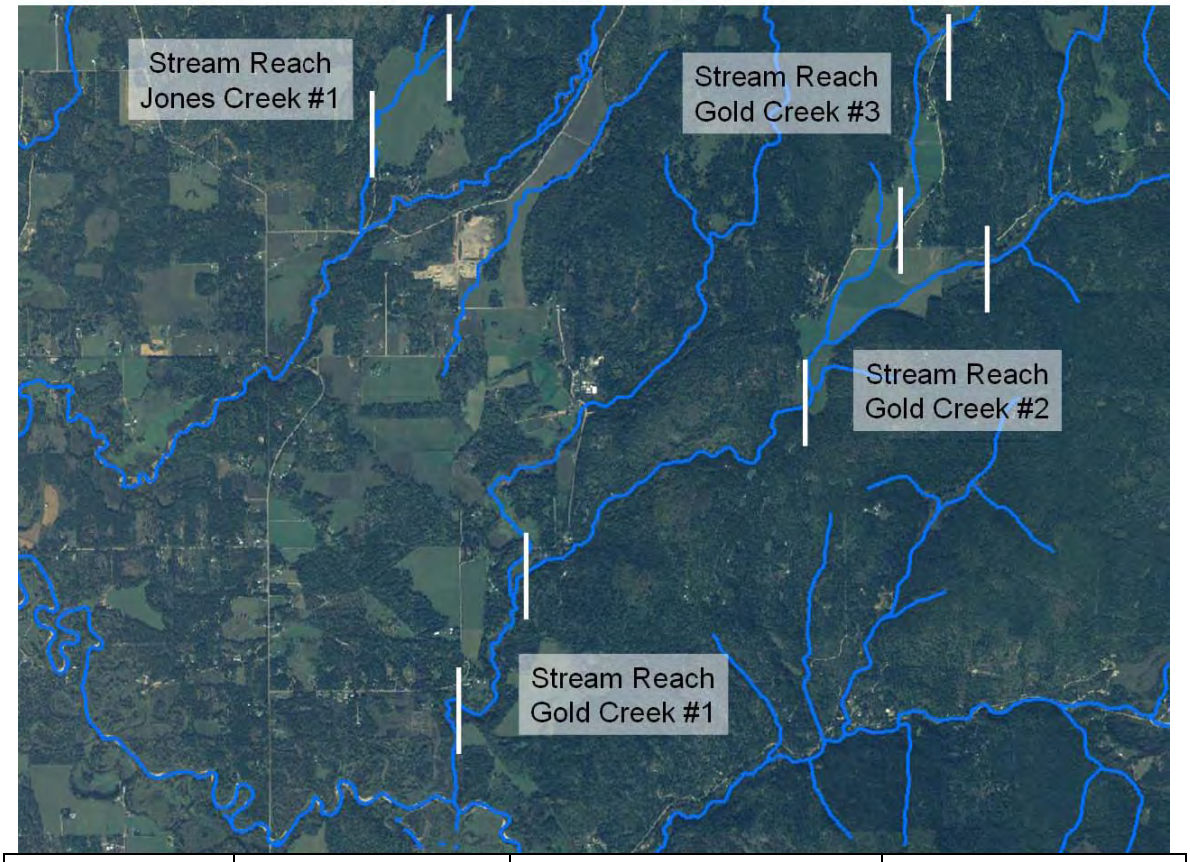


Figure A.2-6. Riparian Vegetation Survey Locations in the Pend Oreille Basin Lowlands.



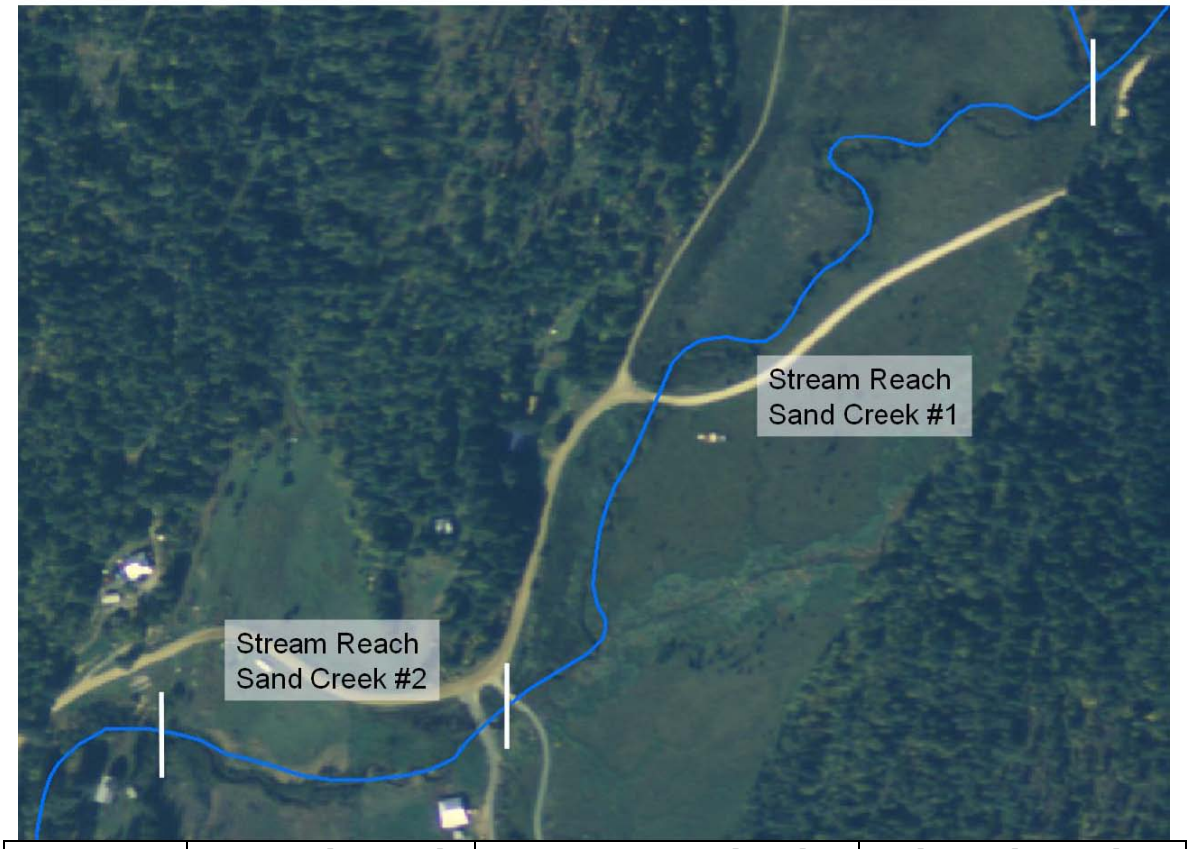
Site ID	Potential Natural Vegetation	Vegetation providing the major source of Shade	Observed "Woody" Vegetation
Pack River #1	Cottonwoods Willow Cedar	Cedar Cottonwoods	Abundant - Cedar Common – Hawthorn, Alder, Willow, Cottonwood, Douglas fir, Grand fir, Larch
Grouse Creek #1	Cottonwoods Willow Alder	Alder	Abundant – Alder Common – Hawthorn Trace -Cottonwood
Grouse Creek #2	Cedar Cottonwood Willow Sedges	Alder (Very little shade currently)	Abundant – Alder Common – Willow Trace – Grand fir, Douglas fir, larch
Grouse Creek #3 & #4	Birch Cedar Conifers Cottonwood Willows	Lodgepole Douglas fir Larch	Hawthorn, Alder, Larch, Lodgepole Pine, Birch, Willow, Cottonwood, Cedar,

Figure A.2-7. Pack River and Grouse Creek Reaches.



Site ID	Potential Natural Vegetation	Vegetation providing the major source of Shade	Observed "Forest" Vegetation
Jones Creek #1	Alder Willow	Grasses Sedge Invasive Weeds	Trace - Alder
Gold Creek #1	Not Completed	Not Completed	Abundant – Alder Common – Willow, Cottonwood, Cedar Trace - Hawthorn
Gold Creek #2	Alder Willows, Cedars Cottonwood	Alder Willows Reeds	Common – Alder, Cottonwood, Cedar Trace – Hawthorn, Douglas fir, Grand fir
Gold Creek #3	Not Completed	Alder	Common – Alder, Cottonwood, Cedar Trace – Hawthorn, Douglas fir, Grand fir

Figure A.2-7 (continued). Jones and Gold Creek Reaches.



Site ID	Potential Natural Vegetation	Vegetation providing the major source of Shade	Observed "Woody" Vegetation
Sand Creek #1	Spirea Alder	Spirea Alder	Common – Alder, Willow
Sand Creek #2	Spirea	Spirea Alder	Common – Alder Trace - Willow

Figure A.2-7 (continued).. Sand Creek Reaches.

As can be seen from riparian survey results, riparian habitat within lowland areas of the Pend Oreille Basin is comprised of a mixture of deciduous and conifer vegetation. Similarly, the Pend Oreille subbasin plan[21] states that historical riparian habitat varied greatly in structure, including multi-canopy forest, woodlands, and shrublands. In addition, it is proposed that black cottonwood, quaking aspen, paper birch, and other deciduous trees were a historic riparian vegetation component of lowland areas.

Methods used to estimate "system potential landcover" for "Non-Forest" Areas

Riparian vegetation descriptions for the Aquatic Response Units (ARU) in the Kootenai basin were used as the framework to develop estimates of height and canopy cover conditions for the "non-forest" riparian groups in the Pend Oreille Basin (see Table A.2-3). This analysis produced a weighted average estimate of "system potential land cover" condition for each Assessment Group. This information is subsequently used to calculate "***system potential effective shade condition.***"

"Non-forest" Riparian Group 1-Ecodata plots collected along streams of this group describe a very diverse group of plant communities. The different communities include late-successional cedar-hemlock, black cottonwood, mixed conifer and riparian shrubs. Measured constancy and canopy cover conditions for significant shade producing riparian vegetation (i.e., Overstory) within the "Non-forest " Riparian Group 1 are presented in **Table A.2–4**. Constancy is defined and discussed in section A.3.

"Non-forest" Riparian Group 2 -Ecodata plots collected along streams of this group describe an area that is subject to flooding disturbance, indicated by the common presence of black cottonwood. Shrubs and grasses are also common and reflect the dynamic nature of these areas. Although conifer tree species are present in many plots, the average canopy cover is low. Measured constancy and canopy cover conditions for significant shade-producing riparian vegetation (i.e., Overstory) within the "Non-forest" Riparian Group 2 are presented in **Table A.2–5**.

Calculated System Potential Effective Shade Values for Forest Areas

Calculated System Potential Effective Shade values for the two "non-forest" riparian groups are presented in **Figures A.2-8** and **A.2-9**. The corresponding energy loading associated with these targeted conditions is presented in **Figure A.2-10**. Although this TMDL allocates a specific "target" condition (e.g., "system potential effective shade"), a range of values can be expected to occur as a results of "natural" variability of riparian land cover. In other words, although the individual measurements may not be at the "dot", average condition over a distance must be at or above the "dot".

[21] Obtained from - http://www.nwcouncil.org/fw/subbasinplanning/admin/level2/intermtn/plan/

Table A.2-4. Canopy Cover and Constancy Conditions for Riparian "Overstory" Vegetation along VRU3C and VRU4C Streams.

Common Name	Canopy Cover (CC)	Constancy	Weighted CC[10]	System Potential (SP) Height[11]	Weighting Factor[12]	Weighted SP Height
VRU 3C (n = 43 Ecodata plots)						
Grand Fir	20	51	10	100	14%	14
Engelmann Spruce	16	33	5	90	9%	8
Black Cottonwood	15	30	5	100	8%	8
Douglas Fir	8	35	3	91	10%	9
Western Redcedar	30	40	12	87	11%	10
Western Hemlock	19	56	11	85	16%	13
Rocky Mountain Maple	8	65	5	30	18%	5
Mountain Alder	21	21	4	30	6%	2
Sitka Alder	11	28	3	30	8%	2
Total			**58**	**Total**		**72**
VRU 4C (n = 34 Ecodata plots)						
Grand Fir	6	35	2	100	10%	10
Subalpine Fir	5	18	1	63	5%	3
Paper Birch	40	9	4	70	3%	2
Engelmann Spruce	13	44	6	90	13%	11
Balsam Poplar	30	3	1	80	1%	1
Black Cottonwood	16	24	4	100	7%	7
Douglas Fir	16	50	8	91	14%	13
Western Red Cedar	32	26	8	87	7%	6
Western Hemlock	5	26	1	85	7%	6
Rocky Mountain Maple	11	56	6	30	16%	5
Mountain Alder	34	35	12	30	10%	3
Sitka Alder	21	24	5	30	7%	2
Total			**58**	**Total**		**70**

[10]Calculated as Canopy Cover times Constancy
[11]Heights were assigned as the median of measured "large" trees. Tree species not included in the FSVeg database (i.e., deciduous) were assigned maximum height values obtained from the following NRCS webpage - http://plants.usda.gov/
[12]Calculated as relative weight that the species was observed (i.e., observed divided by total constancy)

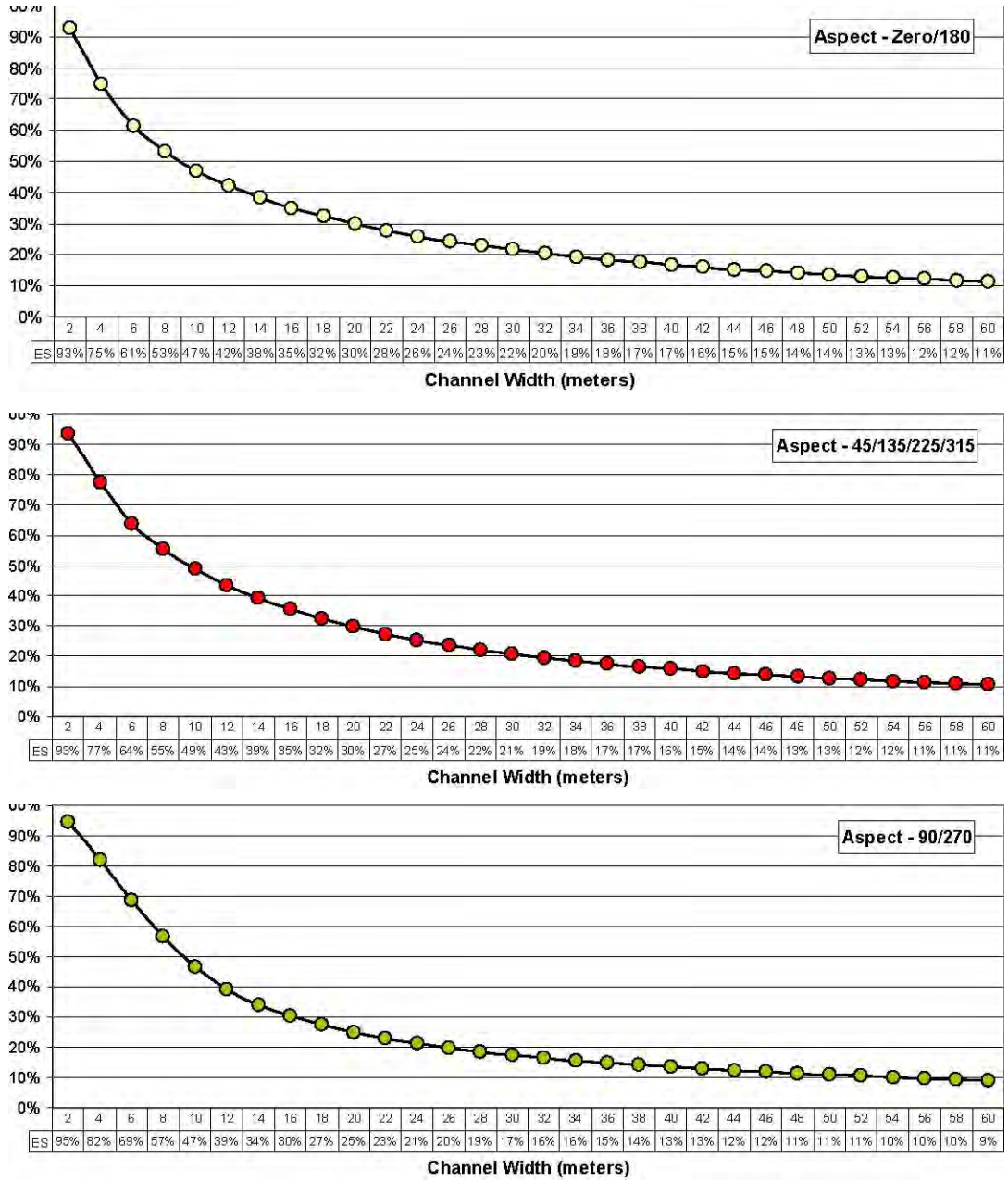


Figure A.2-8. System Potential Effective Shade for "Non-Forest" Assessment Group 1 at Various Stream Aspect and Stream Width Conditions.

Table A.2-5 Canopy Cover and Constancy Conditions for Riparian "Overstory" Vegetation along VRU 5CStreams.

Common Name	Canopy Cover (CC)	Constancy	Weighted CC[13]	System Potential (SP) Height[14]	Weighting Factor[15]	Weighted SP Height
VRU 5C (n = 9 Ecodata plots)						
Grand Fir	16	50	8	100	15%	15
Paper Birch	12	31	4	70	10%	7
Engelmann Spruce	5	31	2	90	10%	9
Black Cottonwood	28	63	18	100	19%	19
Douglas Fir	2	38	1	91	12%	11
Western Red Cedar	18	44	8	87	13%	12
Western Hemlock	6	25	2	85	8%	7
Mountain Alder	20	44	9	25	13%	3
Sitka Alder	11	28	3	30	8%	2
Total			**50**	**Total**		**82**

[13]Calculated as Canopy Cover times Constancy
[14]Heights were assigned as the median of measured "large" trees. Tree species not included in the FSVeg database (i.e., deciduous) were assigned maximum height values obtained from the following NRCS webpage - http://plants.usda.gov/
[15]Calculated as relative weight that the species was observed (i.e., observed divided by total constancy)

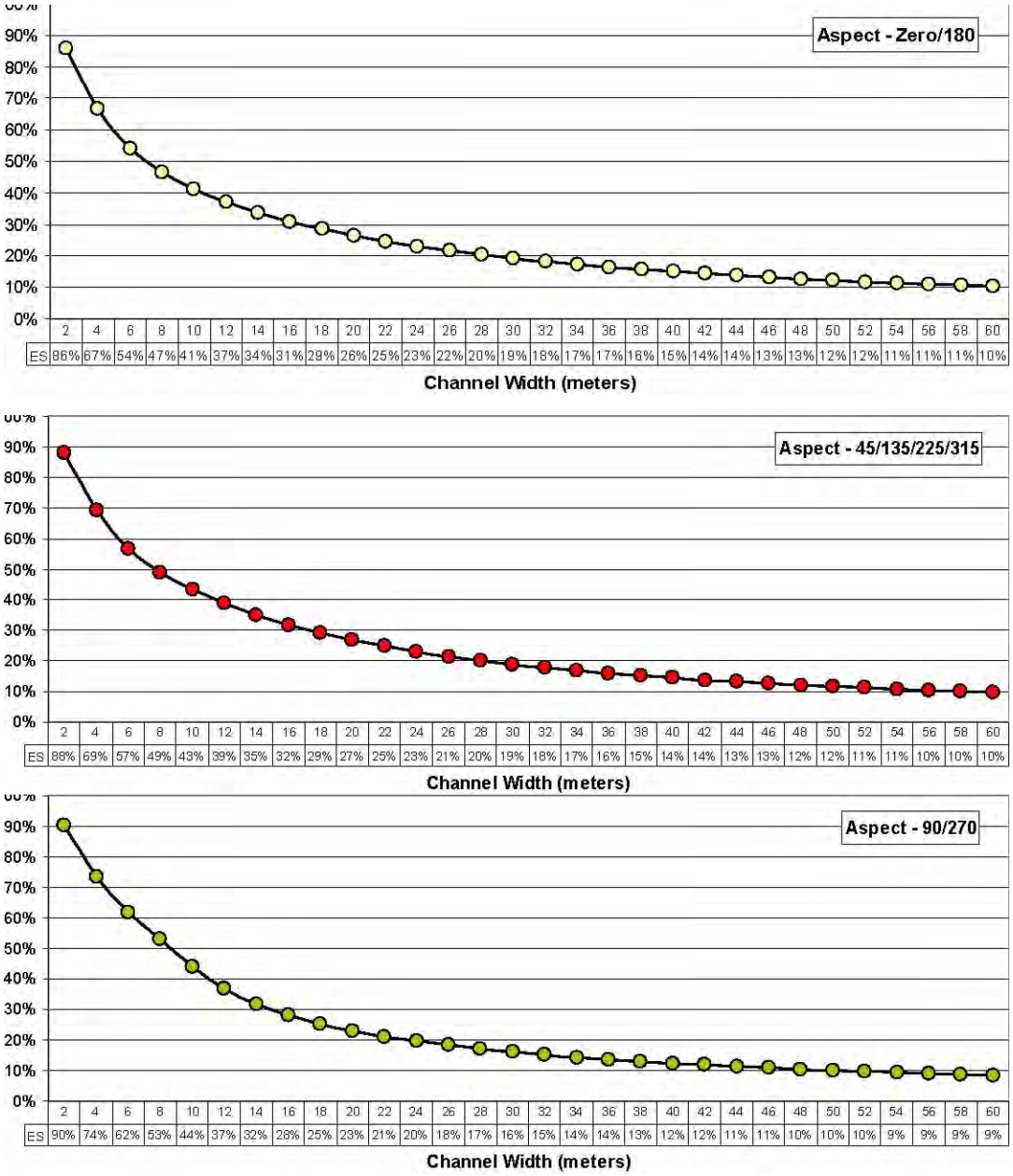
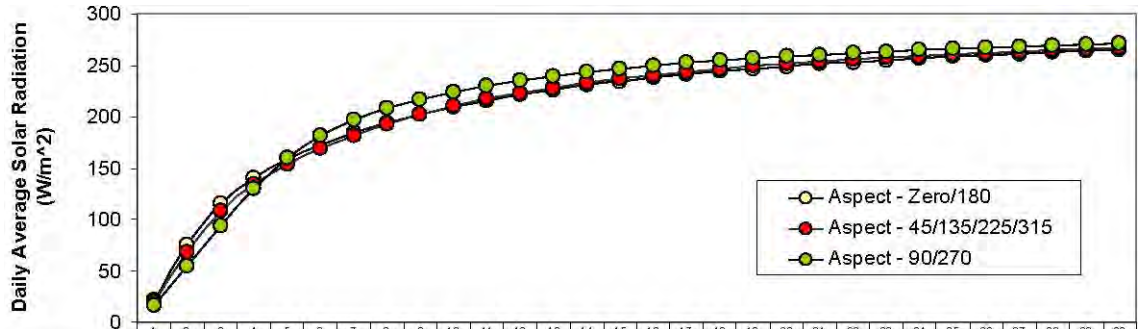


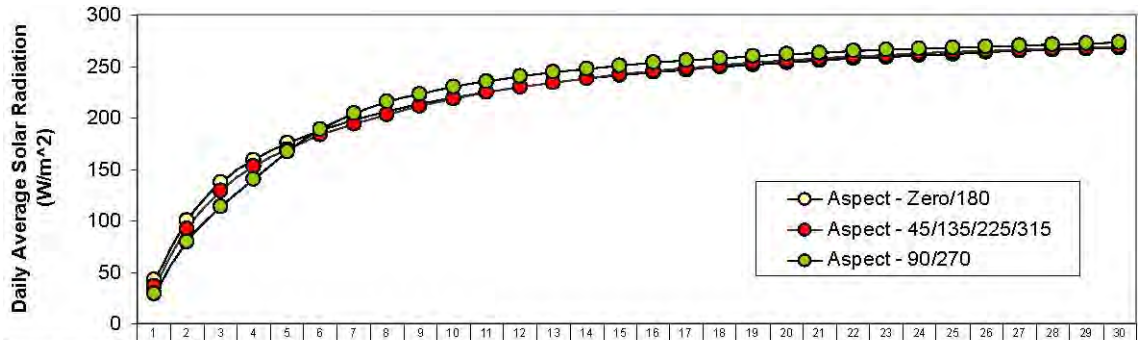
Figure A.2-9. System Potential Effective Shade for "Non-Forest" Assessment Group 2 at Various Stream Aspect and Stream Width Conditions.

Non-Forest Riparian Group 1



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Aspect - Zero/180	21	76	115	140	158	173	184	194	202	210	216	221	226	230	234	238	241	244	246	249	251	253	255	257	258	260	261	262	264	265
Aspect - 45/135/225/315	20	68	108	134	153	169	182	193	202	210	217	223	228	233	237	241	244	247	249	252	254	256	257	259	261	262	263	265	266	267
Aspect - 90/270	16	54	94	130	160	182	197	208	217	224	230	235	240	243	247	250	252	254	257	258	260	262	263	265	266	267	268	269	270	271

Non-Forest Riparian Group 2



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Aspect - Zero/180	42	100	137	159	175	188	198	206	213	220	225	230	234	238	241	244	247	249	252	254	256	258	259	261	262	263	265	266	267	268
Aspect - 45/135/225/315	36	92	129	152	169	183	194	203	211	218	224	230	235	239	242	245	248	251	253	256	258	259	261	263	264	265	266	268	269	270
Aspect - 90/270	29	79	114	140	167	188	204	215	223	230	235	240	244	248	251	253	256	258	260	262	263	265	266	267	268	270	271	271	272	273

Figure A.2-10. Daily Average Solar Radiation Loading at System Potential Effective Shade Conditions for the two "Non-Forest" Riparian Groups in the Pend Oreille Basin.

A2-3. References

Golder. 2003. Pack River Stream Channel Assessment. Golder Associates Inc. October 7, 2003. Redmond, WA.

A.3 Shade Curve Development from Cover/Constancy Data

Unlike shade curve development for the Northern Idaho National Forests in Section A.1 (Idaho Panhandle NF, Clearwater NF, Nez Perce NF) and the Southwest Idaho Ecogroup (Payette NF, Boise NF, Sawtooth NF), which used historic forest composition as the basis for shade modeling data, shade curves developed for southern and eastern Idaho were based on average cover and constancy data collected as part of various vegetation classification studies. These data usually result from a series of plots placed in specific habitat or community types and canopy cover or density recorded for individual plant species found within those plots. If a particular species occurs within all the plots placed in a particular type, then it is said to have 100% constancy. If it does not occur in all plots, then constancy reflects the proportion of plots in which the species occurs. Average cover is simply the average from all the plots for a particular species.

In order to produce shade curves from cover and constancy data, we first selected appropriate habitat or community types that best represent natural, mature, or "climax" plant communities along streams. By doing so, we avoided those types described by various data sources as "seral" or disturbed types. To produce a shade curve for a given plant community type, we first selected species to include, those species most likely to produce shade along a stream flowing through that community type. Typically, only trees and shrubs with mature heights greater than one meter were included. This meant herbaceous forbs and sub-shrubs were not included. Graminoid species (grasses, sedges, rushes, etc) were included in some cases despite their low stature. If the amount of graminoid cover was high (> 15%), then it was typically included. Graminoids were included in shade curve development for the Targhee NF ecological units and for the Salmon-Challis NF potential vegetation types (PVTs). However, they were not included in the development of southern Idaho non-forest shade curves.

The model for shade curve development requires input of an average vegetation cover value, an average vegetation height value, and an average branch overhang value for the community being modeled. To generate these data from cover and constancy data, we used the following procedure.

For each selected species in a type, average cover was multiplied by its constancy to produce a weighted cover value reflective of its frequency of occurrence.

Those weighted covers for all species included were then summed to form the overall weighted cover to be used in the shade curve model.

The overall weighted cover was then used to develop a relative proportions for each species (species weighted cover divided by overall weighted cover).

The relative proportion for a given species was then multiplied by the mature height (determined from literature values) for that species to produce a weighted height.

All weighted heights were then summed into an overall weighted height for the community to be used in the model.

For example, if a particular species has a relative proportion of 50% and a mature height of 20m, then that species is only contributing 10m of height to the overall height of the community. References for mature plant heights included Hitchcock and Cronquist (1973), Brunsfeld and Johnson (1985), Patterson et al. (1985), the USDA Fire Effects database or FEIS (http://www.fs.fed.us/database/feis/index.html), the University of Washington Burke Museum Web site (http://www.washington.edu/burkemuseum/collections/herbarium/index.php), the Natural Resource Conservation Service (NRCS) Web page information (http://plants.usda.gov/) , and, occasionally, best professional judgment.

Branch overhang was determined for each species based on a proportion of its mature height. The proportion varied with size and type of plant. Conifers are typically tall with relatively short branch lengths; thus, they received the smallest branch overhang proportion: that happens to be 10% of their mature height. For example, a conifer species with a mature height of 40m would have a branch overhang of 40m times 10% or 4m. Small shrubs 5m in mature height or less are usually round in shape, thus they received the largest overhang proportion of 50%. Taller deciduous shrubs and trees received the intermediate overhang proportion of 25%. Grasses, although very short in height, do not have much branch extension, thus their overhang proportion is 25% rather than 50%.

This process may produce an overestimate of cover for the community because weighted covers for individual species are summed across species to result in an overall weighted cover. In some cases, data were collected by species without regard to overlap with other species. Thus, the overall cover could result in a value greater than 100%. Only Hansen and Hall (2002) clearly stated in their methods that this was the case, and indeed, overall cover values often exceeded 100% when using their data. As a result, we chose to adjust Hansen and Hall (2002) data to reflect this overlap as will be discussed in section A.3-1, Non-forest Shade Curves. It was not clear to us whether or not other studies had similar data problems, as results generally provided much lower overall cover values when species covers were summed. Therefore, we did not adjust cover data for overlap in the Targhee NF and Salmon-Challis NF shade curve development processes.

A.3.1 Non-forest Shade Curves

Shade curves for shrub and deciduous tree vegetation types in southern Idaho (non-forest areas south of the Salmon-Clearwater divide) were developed using information from Hansen and Hall's (2002) *Classification and Management of USDI Bureau of Land Management's Riparian and Wetland Sites in Eastern and Southern Idaho*. Shade curves were developed for the more typical climax community described by these authors. Community types selected included a variety of deciduous tree and willow and non-willow shrub types. We also developed shade curves for deciduous hardwood dominated areas of the Palouse Prairie and St. Joe River subbasin. Plant species composition and cover/constancy data for these vegetation types are presented in Tables A.3-1 through A.3-22. Shade curves for these plant communities are presented in Figures A.3-1 through A.3-22. The following community types were selected:

- Black cottonwood (*Populus trichocarpa*)

- Quaking aspen (*P. tremuloides*)
- Narrow-leaved cottonwood (*P. angustifolia*)
- Yellow willow (*Salix lutea*)
- Pacific willow (*S. lucida ssp. lasiandra*)
- Geyer willow (*S. geyeriana*)/reedgrass
- Geyer willow (*S. geyeriana*)/sedge
- Coyote (sandbar) willow (*S. exigua*)
- Drummond willow (*S. drummondiana*)/sedge
- Drummond willow (*S. drummondiana*)/reedgrass
- Mountain alder (*Alnus incana*)
- Redosier dogwood (*Cornus sericea*)
- Black hawthorn (*Crataegus douglasii*)
- Water birch (*Betula occidentalis*)
- Chokecherry (*Prunus virginiana*)
- Utah juniper (*Juniperus oesteosperma*)
- Rocky Mountain juniper (*J. scopulorum*)
- Graminoids
- Graminoid/sagebrush
- Box-elder (*Acer negundo*)
- Palouse Hawthorn
- St. Joe Hardwood

Hansen and Hall (2002) clearly state in their field methods that plant species cover was estimated using cover-class estimation of Daubenmire (1959); and that cover for individual species within sample plots was determined without regard of overlap with other species. Thus, total cover likely exceeded 100%. In order to control for overlap and prevent shade curve development based on excessive cover estimates, we adjusted the average cover for every non-coniferous species by reducing it to 75% of its total. Thus, we assumed that each deciduous species had an overlap of 25% with neighboring species. We assumed coniferous species had no overlap with other species. Those community types that were mono-specific likewise had no overlap assumptions.

A.3.2 Targhee National Forest Shade Curves

Shade curves for vegetation types in the Targhee portion of the Caribou-Targhee NF were developed from cover/constancy data reported for a variety of ecological units in the *Targhee National Forest Ecological Unit Inventory, Volumes 1 and 2* (Bowerman, et al. 1999). We developed shade curves for approximately 28 of the 83 units included in the Targhee inventory, including all of the riparian ecological units and common units from five of the eleven major ecological zones on the Forest, mostly coniferous forest type units (see table below). Many of the shrubland and alpine types in the Targhee inventory were not included in our shade curves; however, shade curves could be developed for any of those types should they be needed for a specific Idaho TMDL. Plant species composition and cover/constancy data for the vegetation units we included are presented in Tables A.3-21 through A.3-49. Shade curves for these plant

communities are presented in Figures A.3-21 through A.3-49.In many cases, more than one vegetation/soil type was described for the unit. When we averaged these types, we assumed that the stream would be exposed to each type to the same degree.

Targhee National Forest Ecological Units with Shade Curves

Vegetation Type	Unit Numbers
Dry Forest	1129, 1154
Warm Forest	1315, 1592, 1224
Mid Forest	1316, 1172, 1222
Cool Forest	1000, 1140, 1149, 1150, 1228, 1575, 1594, 1597, 1700, 1720, 1760
Cold, Moist Forest	1225, 1573, 1570
Riparian	2000, 2020, 2040, 2604, 2606, 2608, 2609

Field methods described by Bowerman et al. (1999) include vegetation descriptions collected using a modified version of the Region 1 Ecodata plot method, which included visual estimates of species cover within 1/10-acre (375-m^2) circular plots. Ecodata plot methods may use a variety of cover estimation techniques including cover-class estimation and line interception. It was not clear to us whether or not overlap among species was accounted for in these data. Additionally, there may have been some combination of meadow and forest sampling included together to form a unit as described below. Based on relatively low total cover values for the summation of tree and shrub species, we decided not to adjust for overlap as we did in the Non-forest Shade Curve process described above. The following is a short description of the vegetation sampling concepts provided by one of the authors of the study:

> *The Targhee Ecological Unit vegetation composition tables show the % constancy that a species appeared in the ecological unit plots used for the tables and the average of the actual cover of those species in the plots. When plots were done, the total cover of vegetation in the 1/10th acre circular plot did not necessarily equal 100%. There is quite a bit of open canopy on the Targhee NF. The Forest was trying to gather information that would represent all the vegetation in the area and, ideally, uniform vegetation as close to potential was what we looked for. In locating potential sites for plots, we tossed out some locations right away. No clearcuts or timber sale areas, no areas that had been heavily grazed or disturbed because any of those areas would not present vegetation that was as close to potential as possible. Since this was an ecological survey, not just vegetation, we had to consider getting data from various places in the polygons of the ecological concept. Sometimes the ecological polygons were altered because of data we collected (soil, vegetation, ground truthing,etc.) and we had to collect additional plot data from the margins of the polygons to determine where ecological changes occurred. Going to the field, we had a general idea of where we wanted to locate plots. Once in the field, we looked for locations typical of the area and as 'pristine' as we could find. An ecologist or botanist and soil scientist had to agree on the plot location before we started collecting data. Quick examples would be, there were some areas that had open meadows with islands of trees. We sampled both the islands and the meadows and the whole meadow/island area became an ecological concept.*

A.3.3 Salmon-Challis National Forest Shade Curves

Shade curves for vegetation types in the Salmon-Challis NF were developed from cover/constancy data found in *Forest Habitat Types of Central Idaho* (Steele et al. 1981) as matched, by us, with the Salmon-Challis NF's potential vegetation types (PVTs). Curves were developed for 15 PVTs by selecting a similar habitat type from Steele et al. (1981). Plant species composition and cover/constancy data for these PVTs are presented in Tables A.3-49 through A.3-63. Shade curves for these plant communities are presented in Figures A.3-49 through A.3-63. The PVTs with shade curves are as follows:

- Limper pine
- Ponderosa pine
- Douglas fir/grassland
- Douglas fir/Limber pine
- Douglas fir/Lodgepole pine – steep
- Douglas fir/Lodgepole pine – gentle
- Dry Douglas fir with Ponderosa pine
- Dry Douglas fir without Ponderosa pine
- Grand fir
- Subalpine fir
- Subalpine fir – dry/gentle
- Subalpine fir – dry/steep
- Subalpine fir with Lodgepole pine
- Subalpine fir with Whitebark pine
- Subalpine fir with Douglas fir

Field methods described by Steele et al. (1981) included cover-class estimation of plant species in a single 1/10-acre (375-m^2) plot as opposed to small quadrats described in Daubenmire (1959). Again, it was not clear to us whether or not overlap among species was accounted for in these data. Based on relatively low total cover values for the summation of tree and shrub species, we decided not to adjust for overlap as we did in the Non-forest Shade Curve process described above.

A.3.4 References

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Southern Idaho Non-forest Vegetation Types

Table A.3-1. Black Cottonwood (*Populus trichocarpa*) Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Black Cottonwood	57	1.0	42.8	58.7%	25	*14.7*	0.25	NRCS/BPJ	3.7
dogwood	38	1.0	28.5	39.1%	4	*1.6*	0.5	NRCS/BPJ	0.8
black hawthorn	8	0.3	1.6	2.1%	6.1	*0.1*	0.25	NRCS	0.0
		Total	**72.8**			**16.4**			**4.5**

Table A.3-2. Quaking Aspen (*Populus tremuloides*) Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Rocky Mt juniper	2	0.3	0.7	0.7%	8	*0.1*	0.1	NRCS/BPJ	0.0
aspen	50	1.0	37.5	37.9%	16	*6.1*	0.25	NRCS/BPJ	1.5
Douglas fir	1	0.2	0.2	0.2%	45	*0.1*	0.1	INT-180	0.0
Rocky Mt maple	40	0.2	5.1	5.2%	8	*0.4*	0.25	NRCS/BPJ	0.1
mt alder	16	0.3	4.0	4.0%	5	*0.2*	0.5	Hitchcock	0.1
serviceberry	1	0.2	0.1	0.1%	5	*0.0*	0.5	Hitchcock/BPJ	0.0
water birch	20	0.2	2.6	2.6%	15	*0.4*	0.25	Hitchcock	0.1
dogwood	56	0.8	34.9	35.2%	4	*1.4*	0.5	Brunsfeld	0.7
chokecherry	28	0.5	10.5	10.6%	3.5	*0.4*	0.5	Brunsfeld	0.2
Bebb willow	7	0.3	1.7	1.8%	9	*0.2*	0.25	Brunsfeld	0.0
Booth willow	3	0.2	0.4	0.4%	6	*0.0*	0.25	Brunsfeld	0.0
yellow willow	10	0.2	1.3	1.3%	6	*0.1*	0.25	Brunsfeld	0.0
buffaloberry	1	0.2	0.1	0.1%	3	*0.0*	0.5	Hitchcock/BPJ	0.0
		Total	**98.9**			**9.2**			**2.8**

Table A.3-3. Narrow-leaved Cottonwood (*Populus angustifolia*) Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Narrowleaf cottonwood	50	1.0	37.5	46.2%	18	*8.3*	0.25	NRCS	2.1
Black cottonwood	3	0.3	0.6	0.7%	25	*0.2*	0.25	NRCS/BPJ	0.0
Peachleaf willow	3	0.3	0.6	0.7%	18	*0.1*	0.25	NRCS	0.0
dogwood	45	1.0	33.8	41.6%	4	*1.7*	0.5	Hitchcock	0.8
sandbar willow	22	0.5	8.3	10.2%	6	*0.6*	0.25	NRCS/BPJ	0.2
Pacific willow	3	0.3	0.6	0.7%	16	*0.1*	0.25	Brunsfeld	0.0
		Total	**81.2**			**11.0**			**3.2**

Table A.3-4. Yellow Willow (*Salix lutea*) Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
dogwood	23	0.6	10.7	21.4%	4	*0.9*	0.5	Hitchcock	0.4
Sandbar willow	14	0.4	4.0	8.0%	6	*0.5*	0.25	NRCS/BPJ	0.1
Yellow willow	47	1.0	35.3	70.6%	6	*4.2*	0.25	Brunsfeld	1.1
		Total	**49.9**			**5.6**			**1.6**

Table A.3-5. Pacific Willow (*Salix lucida ssp. lasiandra*) Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Narrowleaf cottonwood	1	0.1	0.0	0.1%	18	*0.0*	0.25	NRCS	0.00
Black cottonwood	1	0.1	0.0	0.1%	25	*0.0*	0.25	NRCS/BPJ	0.00
Peachleaf willow	20	0.1	0.9	1.5%	18	*0.3*	0.25	NRCS	0.07
Mt alder	1	0.1	0.1	0.1%	5	*0.0*	0.5	Hitchcock	0.00
dogwood	21	0.2	3.5	5.8%	4	*0.2*	0.5	Hitchcock	0.12
black hawthorn	6	0.1	0.5	0.8%	6.1	*0.1*	0.25	Hitchcock	0.01
chokecherry	20	0.1	0.9	1.5%	3.5	*0.1*	0.5	Hitchcock	0.03
sandbar willow	1	0.1	0.0	0.1%	6	*0.0*	0.25	NRCS/BPJ	0.00
Geyer willow	3	0.1	0.1	0.2%	6	*0.0*	0.25	Brunsfeld	0.00
Pacific willow	71	1.0	53.3	89.0%	16	*14.2*	0.25	Brunsfeld	3.56
yellow willow	3	0.2	0.5	0.8%	6	*0.0*	0.25	Brunsfeld	0.01
		Total	**59.9**			**14.9**			**3.81**

Table A.3-6. Geyer Willow (*Salix geyeriana*)/Reedgrass Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Booth Willow	2	0.7	1.0	1.9%	6	*0.1*	0.25	Brunsfeld	0.03
Drummond Willow	3	0.3	0.7	1.4%	4	*0.1*	0.5	Brunsfeld	0.03
Geyers Willow	70	1.0	52.5	96.8%	6	*5.8*	0.25	Brunsfeld	1.45
		Total	**54.2**			**6.0**			**1.51**

Table A.3-7. Geyer Willow (*Salix geyeriana*)/Sedge Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Quaking Aspen	1	0.1	0.1	0.1%	16	*0.0*	0.25	NRCS/BPJ	0.00
Bog Birch	10	0.1	0.5	0.9%	3	*0.0*	0.5	Hitchcock	0.01
Booth Willow	45	0.7	22.6	39.3%	6	*2.4*	0.25	Brunsfeld	0.59
Drummond Willow	16	0.3	3.2	5.6%	4	*0.2*	0.5	Brunsfeld	0.11
Sandbar willow	7	0.1	0.7	1.2%	6	*0.1*	0.25	NRCS/BPJ	0.02
Geyer Willow	48	0.8	28.8	50.1%	6	*3.0*	0.25	Brunsfeld	0.75
planeleaf willow	30	0.1	1.6	2.7%	4	*0.1*	0.5	Brunsfeld	0.05
		Total	**57.5**			**5.8**			**1.54**

Table A.3-8. Coyote Willow (*Salix exigua*) Vegetation Type.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Coyote Willow	63	1.0	63.0	100.0%	6	*6.0*	0.25	NRCS/BPJ	1.5
		Total	**63.0**			**6.0**			**1.5**

Table A.3-9. Drummond Willow (*Salix drummondiana*)/Sedge Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Mountain Alder	8	0.3	1.8	3.6%	5	*0.2*	0.5	Hitchcock	0.1
Bog Birch	20	0.2	3.0	6.0%	3	*0.2*	0.5	Hitchcock	0.1
Dogwood	1	0.2	0.2	0.3%	4	*0.0*	0.5	Hitchcock	0.0
Booth Willow	15	0.6	6.8	13.4%	6	*0.8*	0.25	Brunsfeld	0.2
Drummond Willow	48	1.0	36.0	71.5%	4	*2.9*	0.5	Brunsfeld	1.4
Geyer Willow	1	0.3	0.2	0.4%	6	*0.0*	0.25	Brunsfeld	0.0
Mountain Willow	16	0.2	2.4	4.8%	5	*0.2*	0.5	Brunsfeld	0.1
		Total	**50.3**			**4.3**			**1.9**

Table A.3-10. Drummond Willow (*Salix drummondiana*)/Reedgrass Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Spruce	3	0.2	0.6	1.7%	30.5	*0.5*	0.1	NRCS/BPJ	0.05
lodgepole pine	10	0.2	2.0	5.6%	20	*1.1*	0.1	Hitchcock	0.11
Booth willow	2	0.6	0.9	2.5%	6	*0.2*	0.25	Brunsfeld	0.04
Drumond willow	42	1.0	31.5	88.9%	4	*3.6*	0.5	Brunsfeld	1.78
Geyer willow	3	0.2	0.5	1.3%	6	*0.1*	0.25	Brunsfeld	0.02
		Total	**35.5**			**5.4**			**2.00**

Table A.3-11. Mountain Alder (*Alnus incana*) Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Subalpine Fir	1	0.3	0.3	0.5%	30	*0.1*	0.1	NRCS	0.01
Spruce	1	0.3	0.3	0.5%	30.5	*0.1*	0.1	NRCS	0.01
Mountain Alder	60	1.0	45.0	81.7%	5	*4.1*	0.5	Hitchcock	2.04
Water Birch	1	0.3	0.2	0.3%	15	*0.1*	0.25	Hitchcock	0.01
Dogwood	25	0.5	9.4	17.0%	4	*0.7*	0.5	Hitchcock	0.34
		Total	**55.1**			**5.1**			**2.42**

Table A.3-12. Redosier Dogwood (*Cornus sericea*) Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Spruce	1	0.1	0.1	0.1%	30.5	*0.0*	0.1	NRCS/BPJ	0.00
Water Birch	3	0.1	0.2	0.3%	15	*0.0*	0.25	Hitchcock	0.01
Dogwood	88	1.0	66.0	97.5%	4	*3.9*	0.5	Hitchcock	1.95
Chockcherry	2	0.3	0.5	0.7%	3.5	*0.0*	0.5	Hitchcock	0.01
Sandbar Willow	2	0.3	0.5	0.7%	6	*0.0*	0.25	NRCS/BPJ	0.01
Pacific Willow	3	0.1	0.2	0.3%	16	*0.1*	0.25	Brunsfeld	0.01
Yellow Willow	3	0.1	0.2	0.3%	6	*0.0*	0.25	Brunsfeld	0.00
			67.7			**4.1**			**2.01**

Table A.3-13. Black Hawthorn (*Crataegus douglasii*) Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Black Hawthorn	46	0.8	29.0	73.5%	6.1	*4.5*	0.25	Hitchcock	1.1
Dogwood	11	0.3	2.6	6.7%	4	*0.3*	0.5	Hitchcock	0.1
Succulent Hawthorn	52	0.2	7.8	19.8%	4.6	*0.9*	0.5	MSUExt	0.5
		Total	**39.4**			**5.7**			**1.7**

Table A.3-14. Water Birch (*Betula occidentalis*) Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Water Birch	58	1.0	43.5	86.3%	15	*12.9*	0.25	Hitchcock	3.2
Dogwood	13	0.6	5.5	10.8%	4	*0.4*	0.5	Hitchcock	0.2
Bebbs Willow	6	0.3	1.4	2.9%	4.6	*0.1*	0.5	Brunsfeld	0.1
		Total	**50.4**			**13.5**			**3.5**

Table A.3-15. Chokecherry (*Prunus virginiana*) Vegetation Type.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Chokecherry	61	1.0	61.0	100.0%	3.5	*3.5*	0.5	Hitchcock	1.8
		Total	**61.0**			**3.5**			**1.8**

Table A.3-16. Utah Juniper (*Juniperus osteosperma*) Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Utah juniper	40	1.0	40.0	46.8%	8	*3.7*	0.1	NRCS	0.37
sumac	75	0.7	37.7	44.1%	2	*0.9*	0.5	Hitchcock	0.44
Chokecherry	10	0.3	2.5	2.9%	3.5	*0.1*	0.5	Hitchcock	0.05
Sandbar Willow	3	0.7	1.5	1.8%	6	*0.1*	0.25	NRCS/BPJ	0.03
Ribes sp	7	0.7	3.5	4.1%	1	*0.0*	0.5	FEIS/BPJ	0.02
mtn snowberry	1	0.3	0.2	0.3%	1.5	*0.0*	0.5	Hitchcock	0.00
		Total	**85.4**			**4.9**			**0.92**

Table A.3-17. Rocky Mountain Juniper (*Juniperus scopulorum*) Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
RM juniper	60	1.0	60.0	56.7%	15	*8.5*	0.1	NRCS	0.85
Doug fir	3	0.3	1.0	0.9%	45	*0.4*	0.1	INT-180	0.04
RM maple	20	0.3	5.0	4.7%	9	*0.4*	0.25	NRCS	0.11
Bigtooth maple	3	0.3	0.7	0.7%	9	*0.1*	0.25	NRCS	0.02
water birch	10	0.7	5.0	4.8%	15	*0.7*	0.25	Hitchcock	0.18
dogwood	28	1.0	21.0	19.9%	4	*0.8*	0.5	Hitchcock	0.40
Chokecherry	20	0.7	10.1	9.5%	3.5	*0.3*	0.5	Hitchcock	0.17
Sandbar Willow	3	0.3	0.7	0.7%	6	*0.0*	0.25	NRCS/BPJ	0.01
Ribes sp	2	0.3	0.5	0.5%	1	*0.0*	0.5	FEIS/BPJ	0.00
Yellow willow	2	0.7	1.0	1.0%	1.5	*0.0*	0.5	Hitchcock	0.01
blue elderberry	3	0.3	0.7	0.7%	4	*0.0*	0.5	INT-180	0.01
		Total	**105.7**			**11.3**			**1.79**

Table A.3-18. Graminoid (Grasses and Grass-like) Vegetation Type.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Graminoids	100	1.0	100.0	100.0%	0.7	*0.7*	0.25	BPJ	0.175
		Total	**100.0**			**0.7**			**0.175**

Table A.3-19. Graminoid/Sagebrush Vegetation Type.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Graminoids	70	1.0	70.0	70.0%	0.7	*0.5*	0.25	BPJ	0.1225
Big sagebrush	30	1.0	30.0	30.0%	1.2	*0.4*	0.25	NRCS	0.09
		Total	**100.0**			**0.9**			**0.2125**

Table A.3-20. Box-elder (*Acer negundo*) Vegetation Type. Corrected for 25% Overlap.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Box-elder	63	1.0	47.3	82.2%	18	*14.8*	0.25	NRCS	3.7
dogwood	14	0.5	5.0	8.8%	4	*0.4*	0.5	NRCS/BPJ	0.2
chokecherry	21	0.3	5.2	9.0%	3.5	*0.3*	0.5	Brunsfeld	0.2
		Total	**57.5**			**15.5**			**4.0**

Table A.3-21. Palouse Hawthorn Vegetation Type.

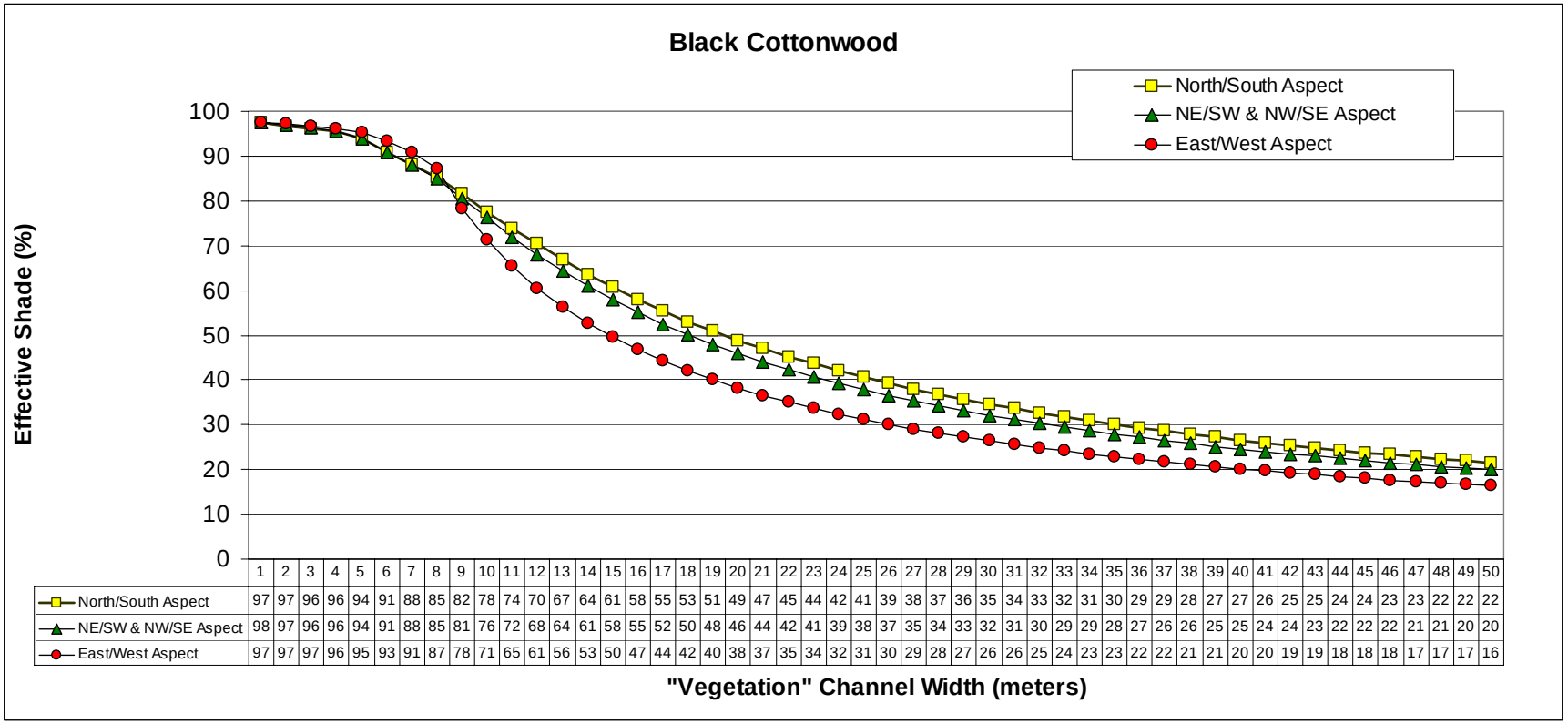
Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang		Wt Overhang
Black Hawthorn	84	1.0	83.5	100.0%	6.1	*6.1*	0.25	Hitchcock	1.5
			83.5			**6.1**			**1.5**

Table A.3-22. St. Joe Hardwood Vegetation Type.

Species	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
western larch	5	0.3	1.5	2.5%	61	*1.6*	0.1	NRCS	0.16
Douglas fir	5	1.0	5.0	8.5%	61	*5.2*	0.1	NRCS	0.52
Sitka alder	70	1.0	52.5	89.0%	3	*2.7*	0.5	Hitchcock	1.33
		Total	**59.0**			**9.4**			**2.01**

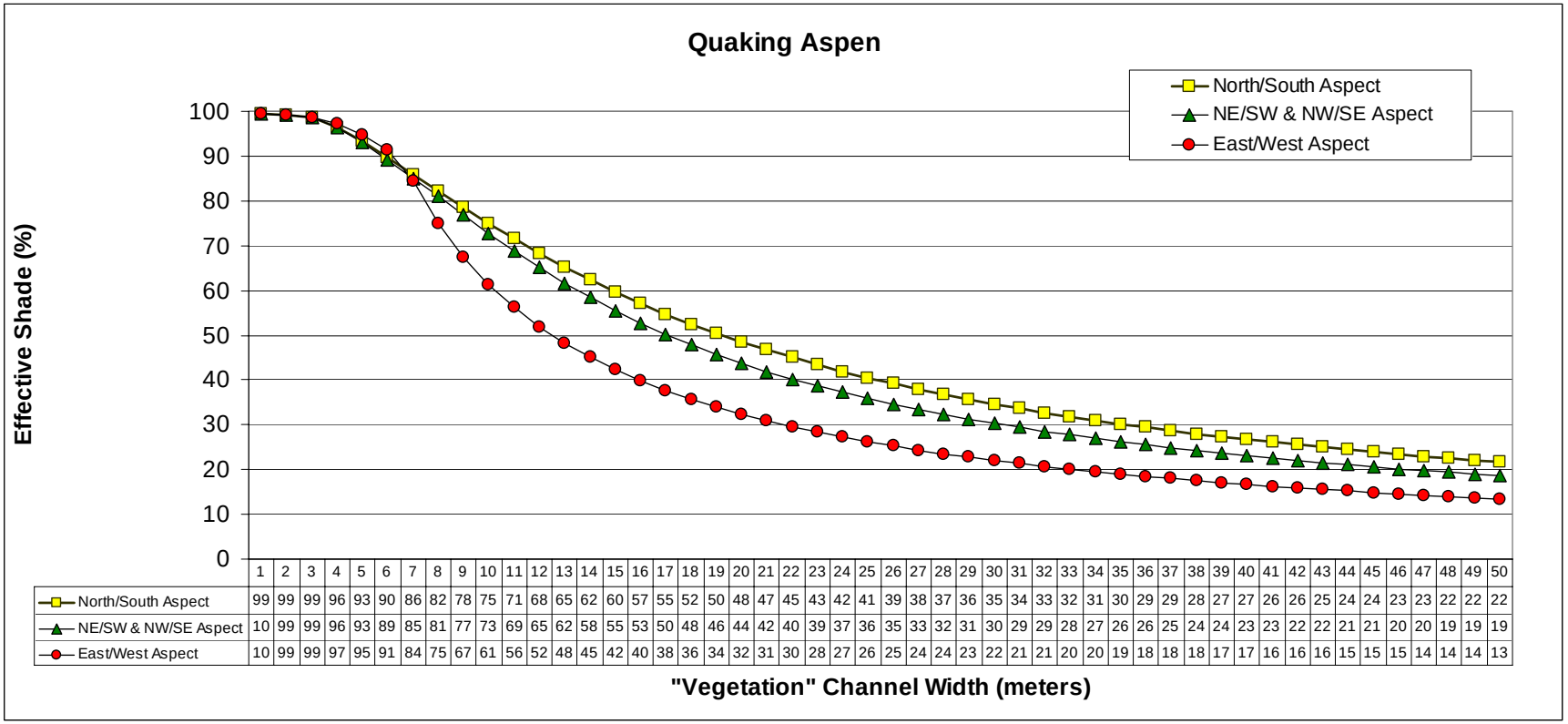
Species = plant species included in the development of a community's shade curve.
Ave CC = Average canopy cover for each species.
CC*Const = Average canopy cover for an individual species times its constancy value. Those tables with an overlap correction, this value has been reduced by 25% for deciduous species (Ave CC x Constancy x 0.75).
Relative Proportion = an individual species portion of the total cover times constancy value.
Height = mature height for each species determined from literature values or best professional judgment.
H*RP = height for an individual species times its relative proportion.
Overhang = branch overhang percent of height based on plant type and size; conifers = 10%, deciduous trees and tall shrubs (>5m) = 25%, low shrubs = 50%.
Source = literature source for each species mature height.
Wt Overhang = branch overhang distance for each species determined from a percentage of its height.
Total = the overall weighted canopy cover is the sum of the CC*Const column, the overall weighted height is the sum of the H*RP column, the overall weighted overhang is the sum of the Wt Overhang column.

Figure A.3-1. Black Cottonwood (*Populus trichocarpa*) Vegetation Type. Corrected for 25% Overlap.



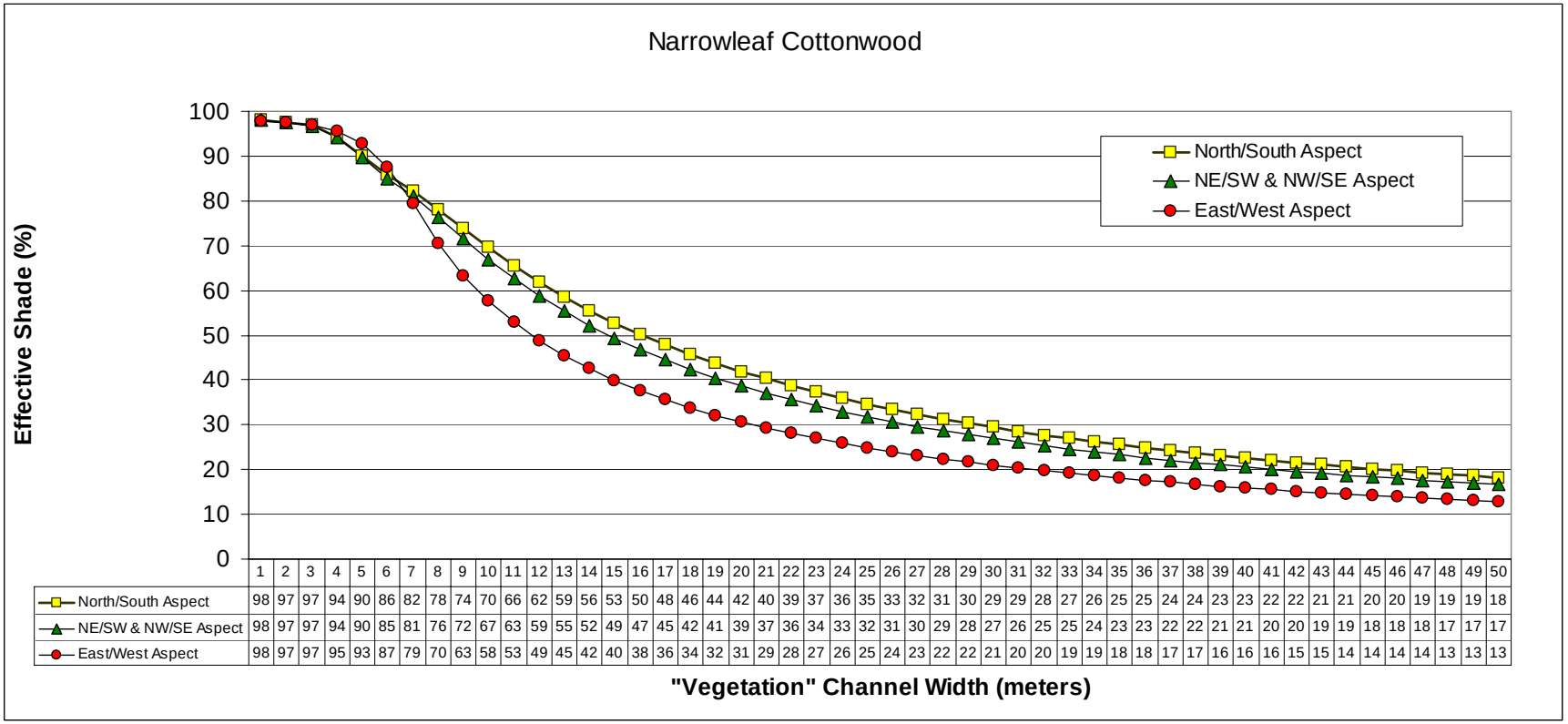
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	97	97	96	96	94	91	88	85	82	78	74	70	67	64	61	58	55	53	51	49	47	45	44	42	41	39	38	37	36	35	34	33	32	31	30	29	29	28	27	27	26	25	25	24	24	23	23	22	22	22
NE/SW & NW/SE Aspect	98	97	96	96	94	91	88	85	81	76	72	68	64	61	58	55	52	50	48	46	44	42	41	39	38	37	35	34	33	32	31	30	29	29	28	27	26	26	25	25	24	24	23	22	22	22	21	21	20	20
East/West Aspect	97	97	97	96	95	93	91	87	78	71	65	61	56	53	50	47	44	42	40	38	37	35	34	32	31	30	29	28	27	26	26	25	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16

Figure A.3-2. Quaking Aspen (*Populus tremuloides*) Vegetation Type. Corrected for 25% Overlap.



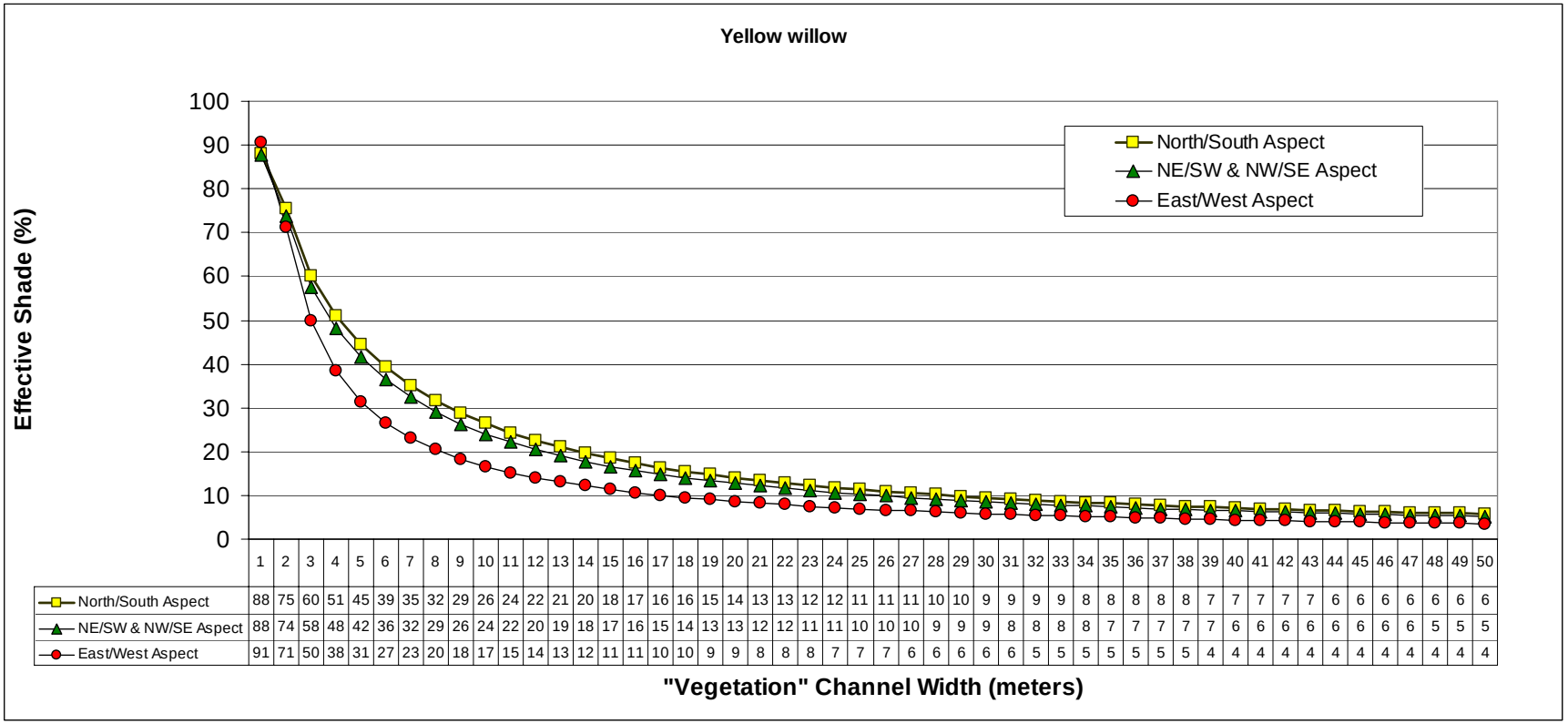
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	99	99	99	96	93	90	86	82	78	75	71	68	65	62	60	57	55	52	50	48	47	45	43	42	41	39	38	37	36	35	34	33	32	31	30	29	29	28	27	27	26	26	25	24	24	23	23	22	22	22
NE/SW & NW/SE Aspect	10	99	99	96	93	89	85	81	77	73	69	65	62	58	55	53	50	48	46	44	42	40	39	37	36	35	33	32	31	30	29	29	28	27	26	26	25	24	24	23	23	22	22	21	21	20	20	19	19	19
East/West Aspect	10	99	99	97	95	91	84	75	67	61	56	52	48	45	42	40	38	36	34	32	31	30	28	27	26	25	24	24	23	22	21	21	20	20	19	18	18	18	17	17	16	16	16	15	15	15	14	14	14	13

Figure A.3-3. Narrow-leaved Cottonwood (*Populus angustifolia*) Vegetation Type. Corrected for 25% Overlap.



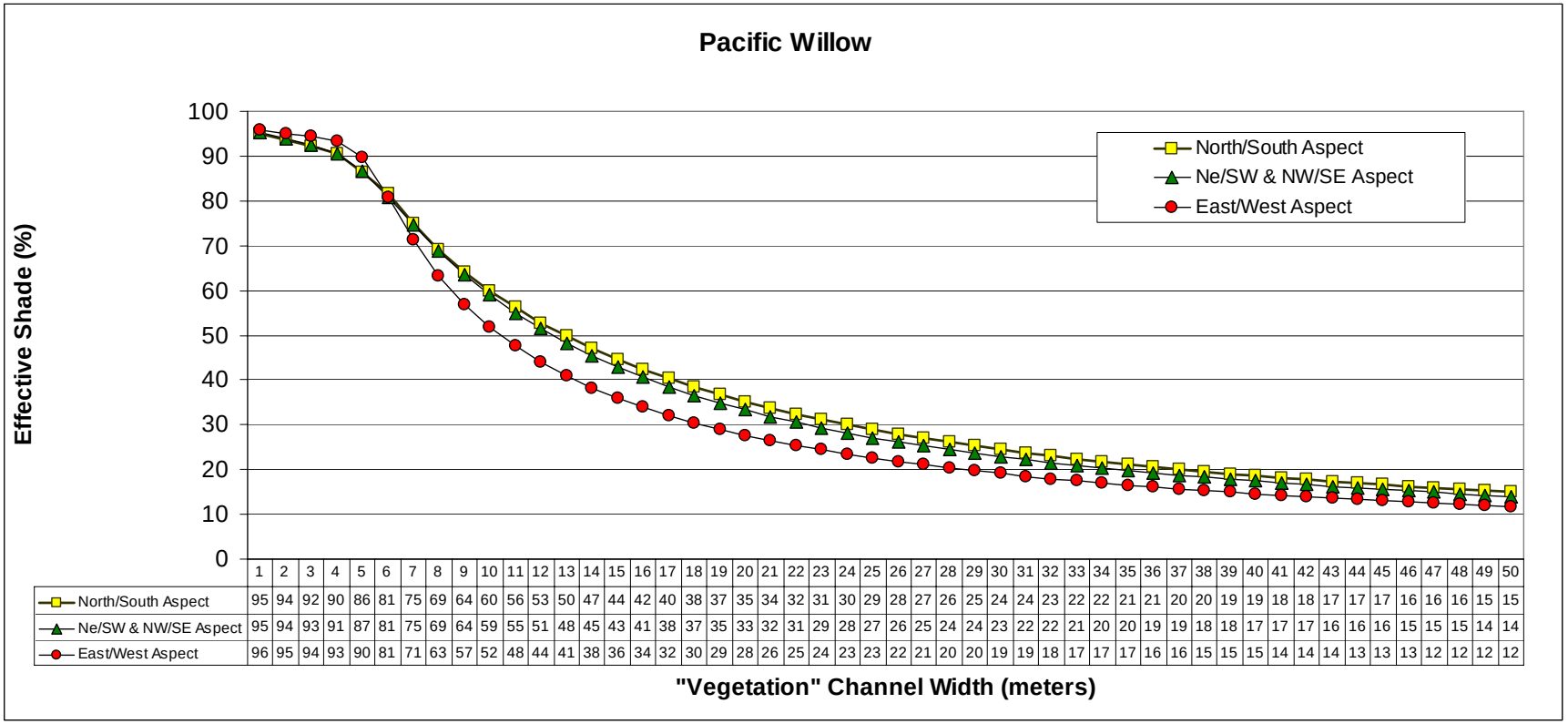
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	98	97	97	94	90	86	82	78	74	70	66	62	59	56	53	50	48	46	44	42	40	39	37	36	35	33	32	31	30	29	29	28	27	26	25	25	24	24	23	23	22	22	21	21	20	20	19	19	19	18
NE/SW & NW/SE Aspect	98	97	97	94	90	85	81	76	72	67	63	59	55	52	49	47	45	42	41	39	37	36	34	33	32	31	30	29	28	27	26	25	25	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17
East/West Aspect	98	97	97	95	93	87	79	70	63	58	53	49	45	42	40	38	36	34	32	31	29	28	27	26	25	24	23	22	22	21	20	20	19	19	18	18	17	17	16	16	16	15	15	14	14	14	14	13	13	13

Figure A.3-4. Yellow Willow (*Salix lutea*) Vegetation Type. Corrected for 25% Overlap.



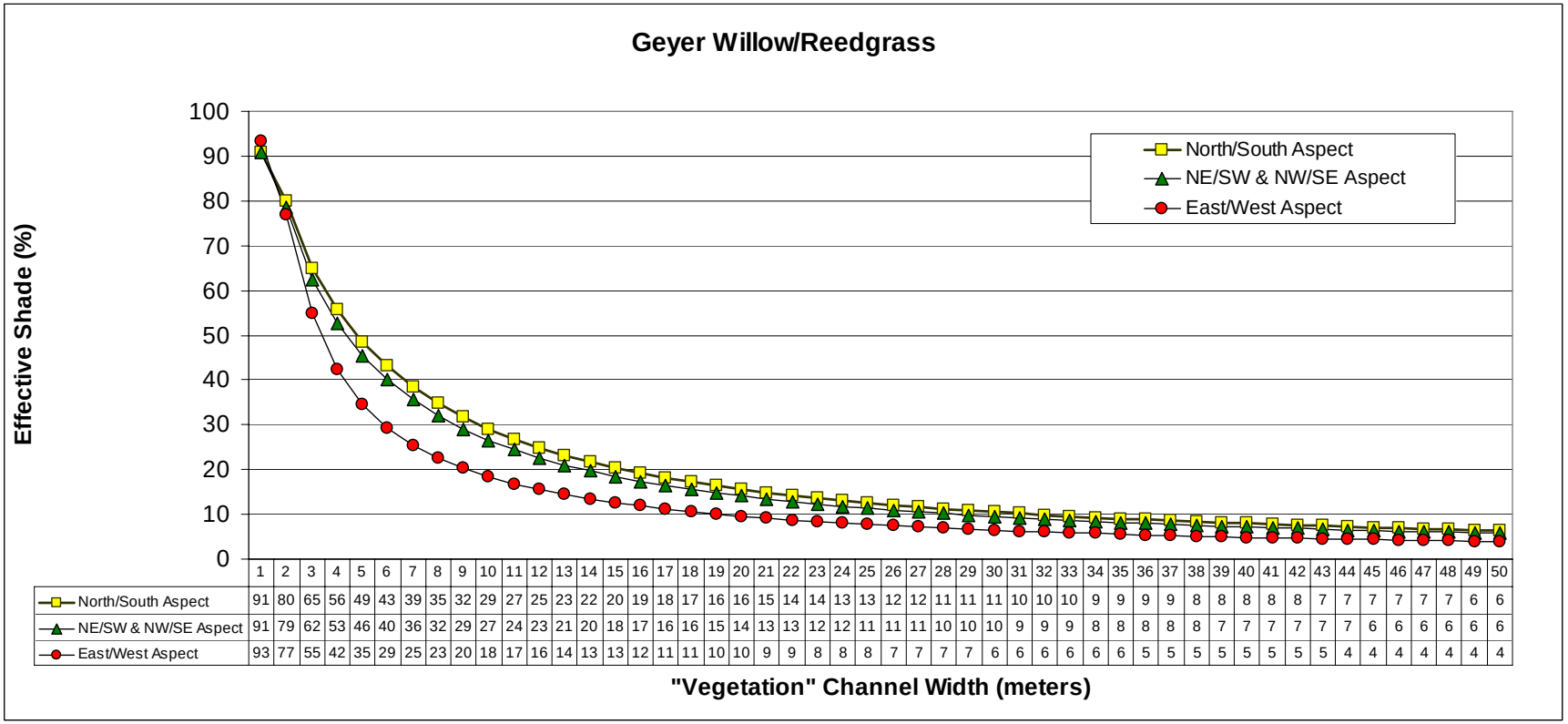
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	88	75	60	51	45	39	35	32	29	26	24	22	21	20	18	17	16	16	15	14	13	13	12	12	11	11	11	10	10	9	9	9	9	8	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6
NE/SW & NW/SE Aspect	88	74	58	48	42	36	32	29	26	24	22	20	19	18	17	16	15	14	13	13	12	12	11	11	10	10	10	9	9	9	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6	6	5	5	5
East/West Aspect	91	71	50	38	31	27	23	20	18	17	15	14	13	12	11	11	10	10	9	9	8	8	8	7	7	7	6	6	6	6	6	5	5	5	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4	4

Figure A.3-5. Pacific Willow (*Salix lucida ssp. lasiandra*) Vegetation Type. Corrected for 25% Overlap.



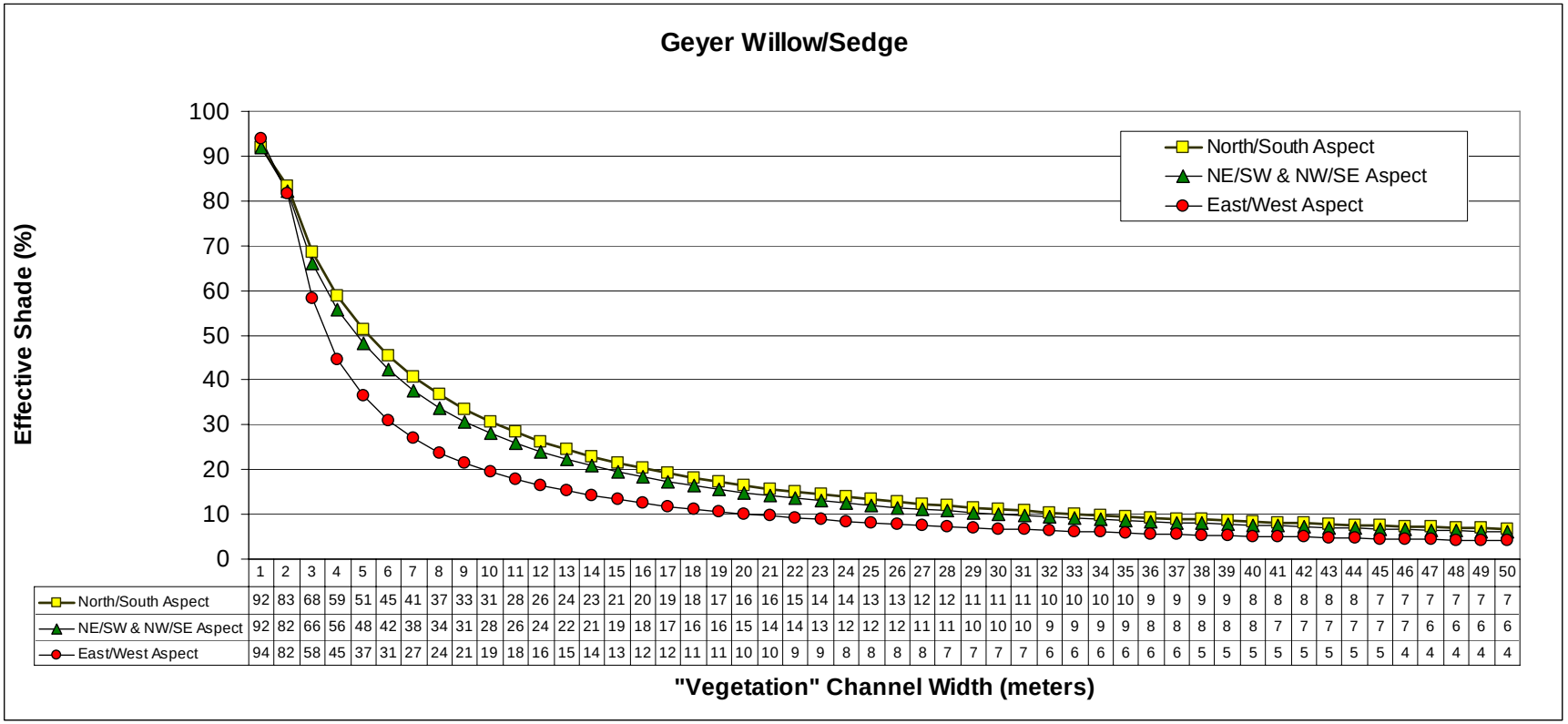
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	95	94	92	90	86	81	75	69	64	60	56	53	50	47	44	42	40	38	37	35	34	32	31	30	29	28	27	26	25	24	24	23	22	22	21	21	20	20	19	19	18	18	17	17	17	16	16	16	15	15
Ne/SW & NW/SE Aspect	95	94	93	91	87	81	75	69	64	59	55	51	48	45	43	41	38	37	35	33	32	31	29	28	27	26	25	24	24	23	22	22	21	20	20	19	19	18	18	17	17	17	16	16	16	15	15	15	14	14
East/West Aspect	96	95	94	93	90	81	71	63	57	52	48	44	41	38	36	34	32	30	29	28	26	25	24	23	23	22	21	20	20	19	19	18	17	17	17	16	16	15	15	15	14	14	14	13	13	13	12	12	12	12

Figure A.3-6. Geyer Willow (*Salix geyeriana*)/Reedgrass Vegetation Type. Corrected for 25% Overlap.



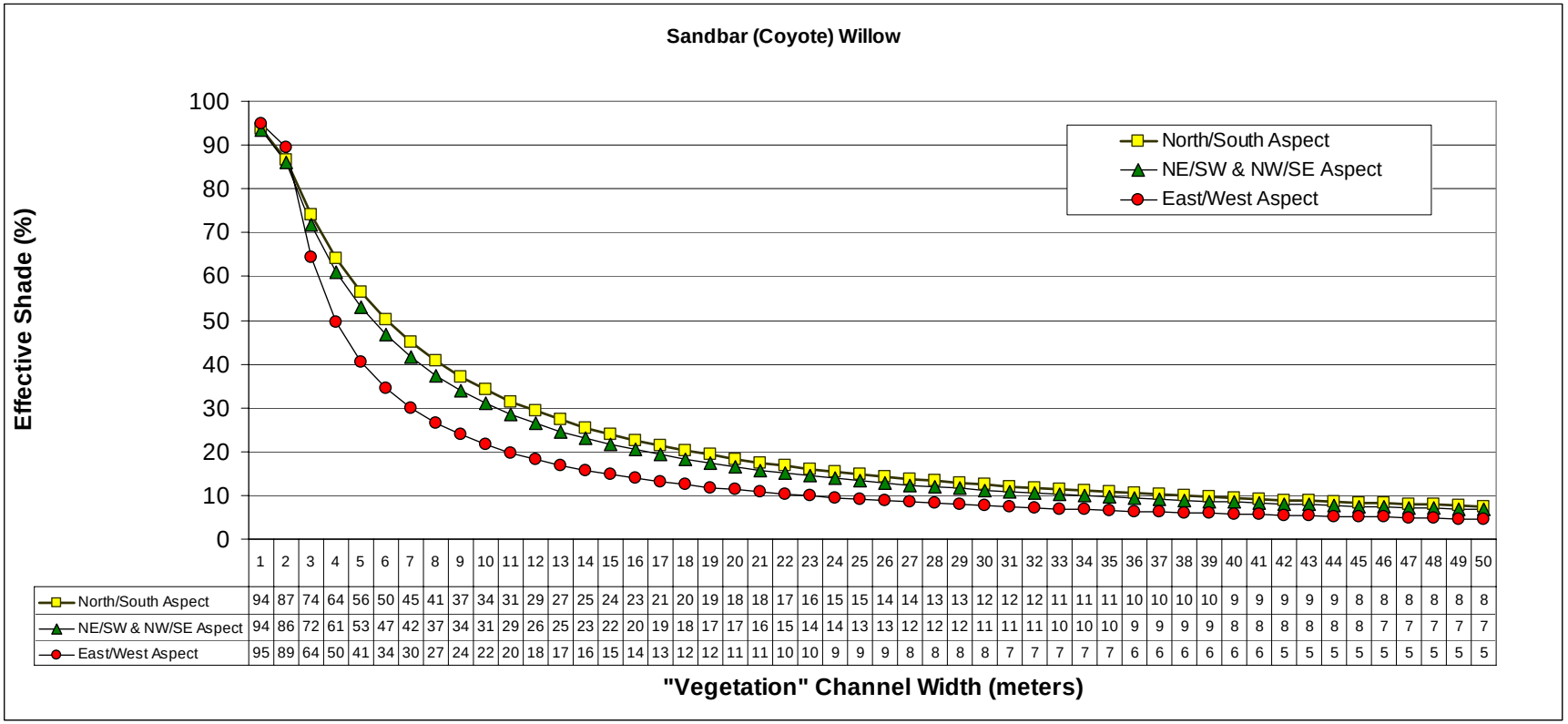
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	91	80	65	56	49	43	39	35	32	29	27	25	23	22	20	19	18	17	16	16	15	14	14	13	13	12	12	11	11	11	10	10	10	9	9	9	9	8	8	8	8	8	7	7	7	7	7	7	6	6
NE/SW & NW/SE Aspect	91	79	62	53	46	40	36	32	29	27	24	23	21	20	18	17	16	16	15	14	13	13	12	12	11	11	11	10	10	10	9	9	9	8	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6
East/West Aspect	93	77	55	42	35	29	25	23	20	18	17	16	14	13	13	12	11	11	10	10	9	9	8	8	8	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	4	4	4	4	4	4	4

Figure A.3-7. Geyer Willow (*Salix geyeriana*)/Sedge Vegetation Type. Corrected for 25% Overlap.



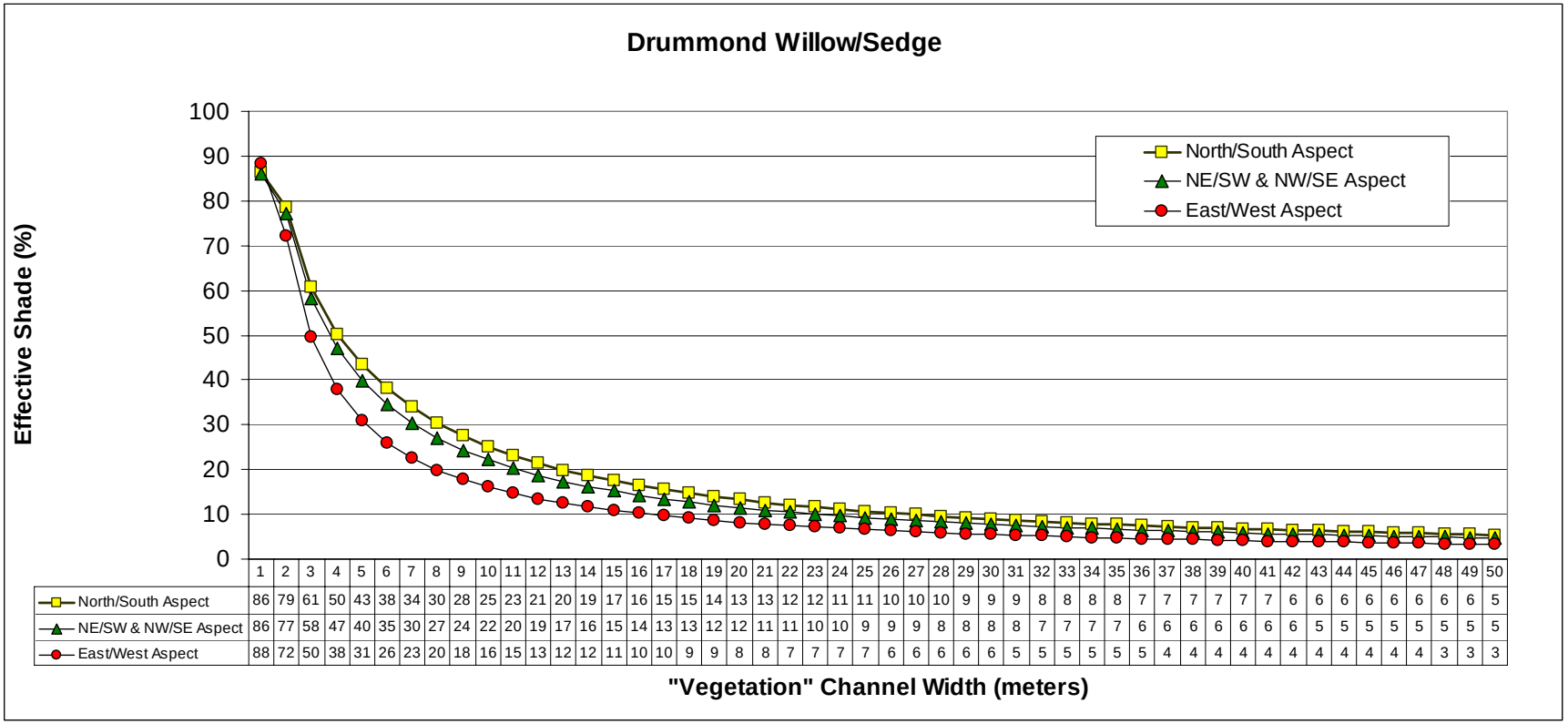
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	92	83	68	59	51	45	41	37	33	31	28	26	24	23	21	20	19	18	17	16	16	15	14	14	13	13	12	12	11	11	11	10	10	10	10	9	9	9	9	8	8	8	8	8	7	7	7	7	7	7
NE/SW & NW/SE Aspect	92	82	66	56	48	42	38	34	31	28	26	24	22	21	19	18	17	16	16	15	14	14	13	12	12	12	11	11	10	10	10	9	9	9	9	8	8	8	8	8	7	7	7	7	7	7	6	6	6	6
East/West Aspect	94	82	58	45	37	31	27	24	21	19	18	16	15	14	13	12	12	11	11	10	10	9	9	8	8	8	8	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	4	4	4	4	4

Figure A.3-8. Coyote Willow (*Salix exigua*) Vegetation Type.



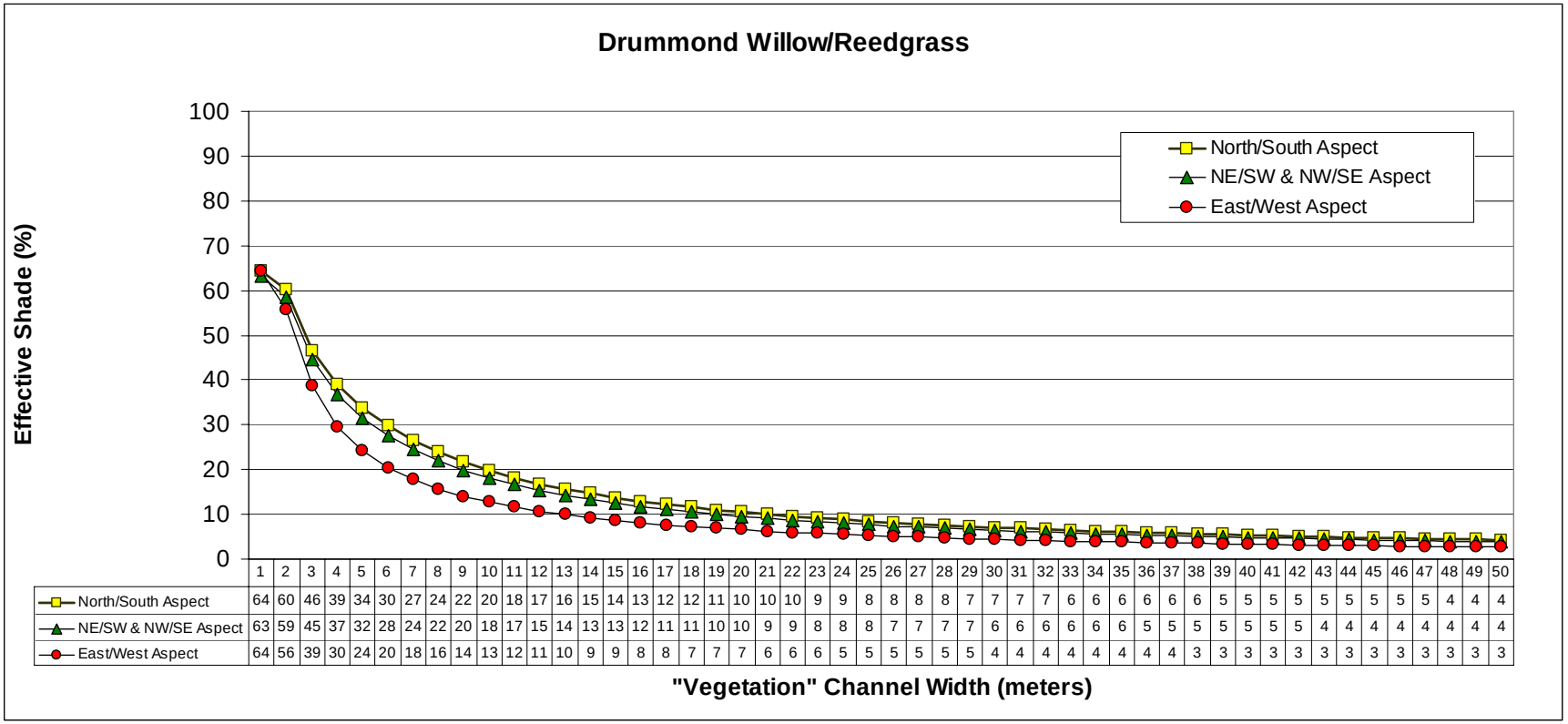
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	94	87	74	64	56	50	45	41	37	34	31	29	27	25	24	23	21	20	19	18	18	17	16	15	15	14	14	13	13	12	12	12	11	11	11	10	10	10	10	9	9	9	9	9	8	8	8	8	8	8
NE/SW & NW/SE Aspect	94	86	72	61	53	47	42	37	34	31	29	26	25	23	22	20	19	18	17	17	16	15	14	14	13	13	12	12	12	11	11	11	10	10	10	9	9	9	9	8	8	8	8	8	8	7	7	7	7	7
East/West Aspect	95	89	64	50	41	34	30	27	24	22	20	18	17	16	15	14	13	12	12	11	11	10	10	9	9	9	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5

Figure A.3-9. Drummond Willow (*Salix drummondiana*)/Sedge Vegetation Type. Corrected for 25% Overlap.



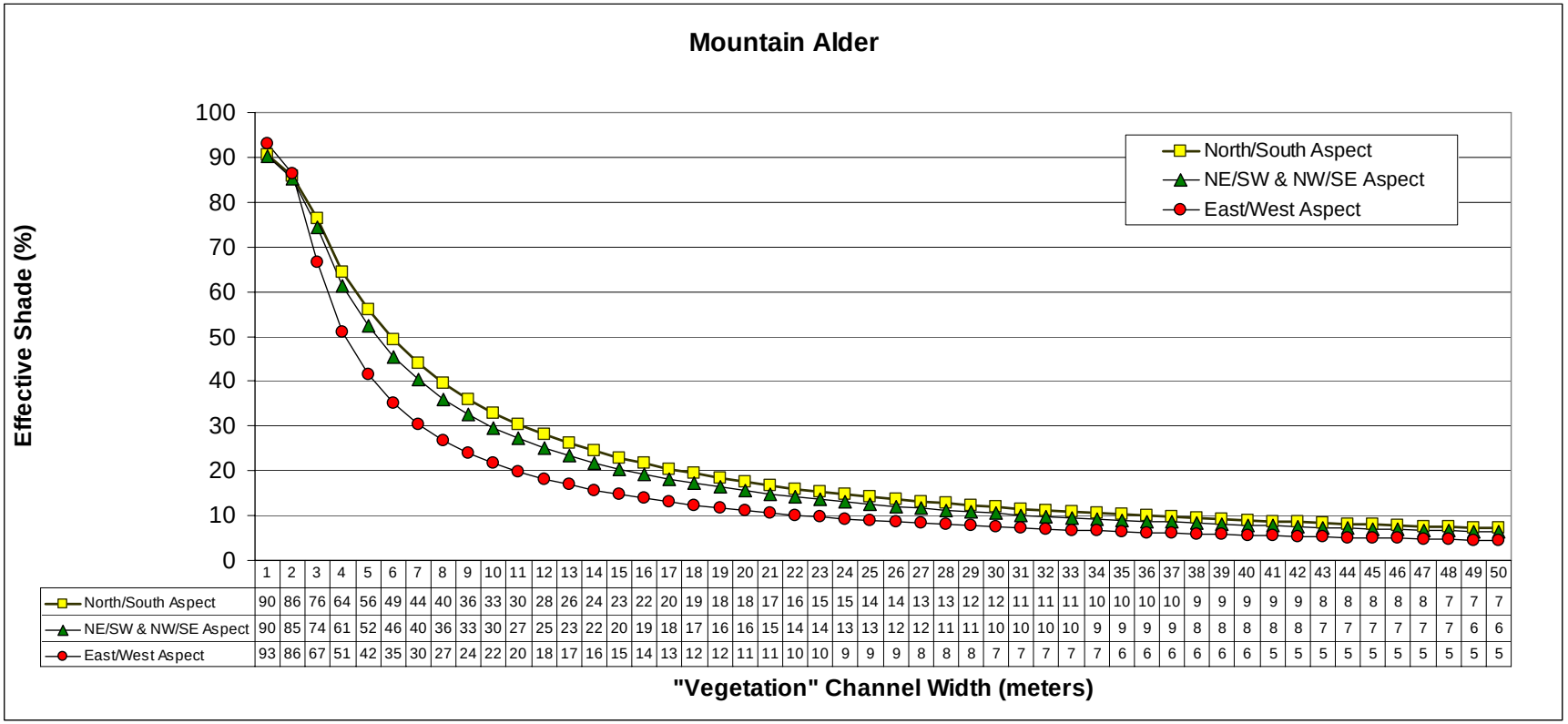
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	86	79	61	50	43	38	34	30	28	25	23	21	20	19	17	16	15	15	14	13	13	12	12	11	11	10	10	10	9	9	9	8	8	8	8	7	7	7	7	7	7	6	6	6	6	6	6	6	6	5
NE/SW & NW/SE Aspect	86	77	58	47	40	35	30	27	24	22	20	19	17	16	15	14	13	13	12	12	11	11	10	10	9	9	9	8	8	8	8	7	7	7	7	6	6	6	6	6	6	6	5	5	5	5	5	5	5	5
East/West Aspect	88	72	50	38	31	26	23	20	18	16	15	13	12	12	11	10	10	9	9	8	8	7	7	7	7	6	6	6	6	6	5	5	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4	3	3	3

Figure A.3-10. Drummond Willow (*Salix drummondiana*)/Reedgrass Vegetation Type. Corrected for 25% Overlap.



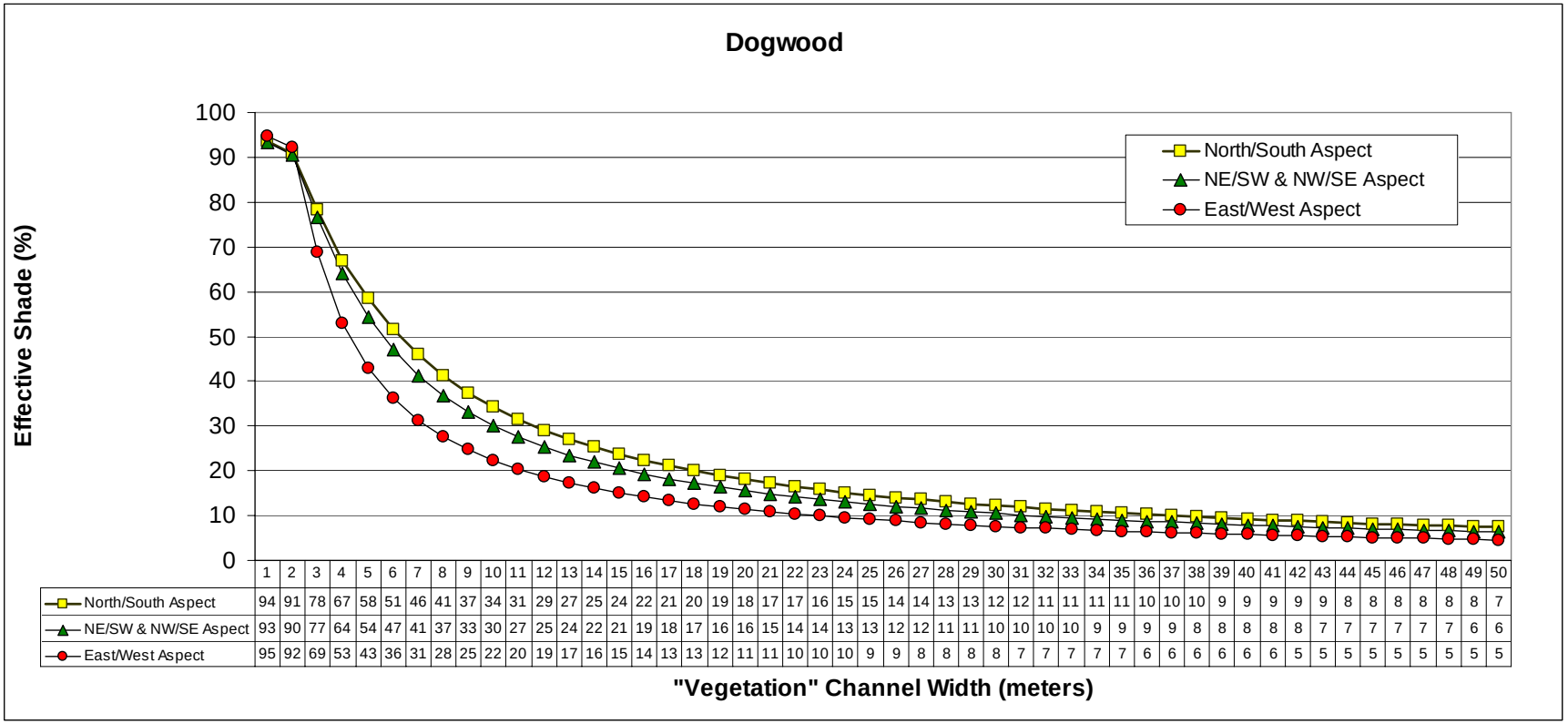
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	64	60	46	39	34	30	27	24	22	20	18	17	16	15	14	13	12	12	11	10	10	10	9	9	8	8	8	8	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5	4	4	4
NE/SW & NW/SE Aspect	63	59	45	37	32	28	24	22	20	18	17	15	14	13	13	12	11	11	10	10	9	9	8	8	8	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	4	4	4	4	4	4	4	4	4
East/West Aspect	64	56	39	30	24	20	18	16	14	13	12	11	10	9	9	8	8	7	7	7	6	6	6	5	5	5	5	5	5	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3

Figure A.3-11. Mountain Alder (*Alnus incana*) Vegetation Type. Corrected for 25% Overlap.



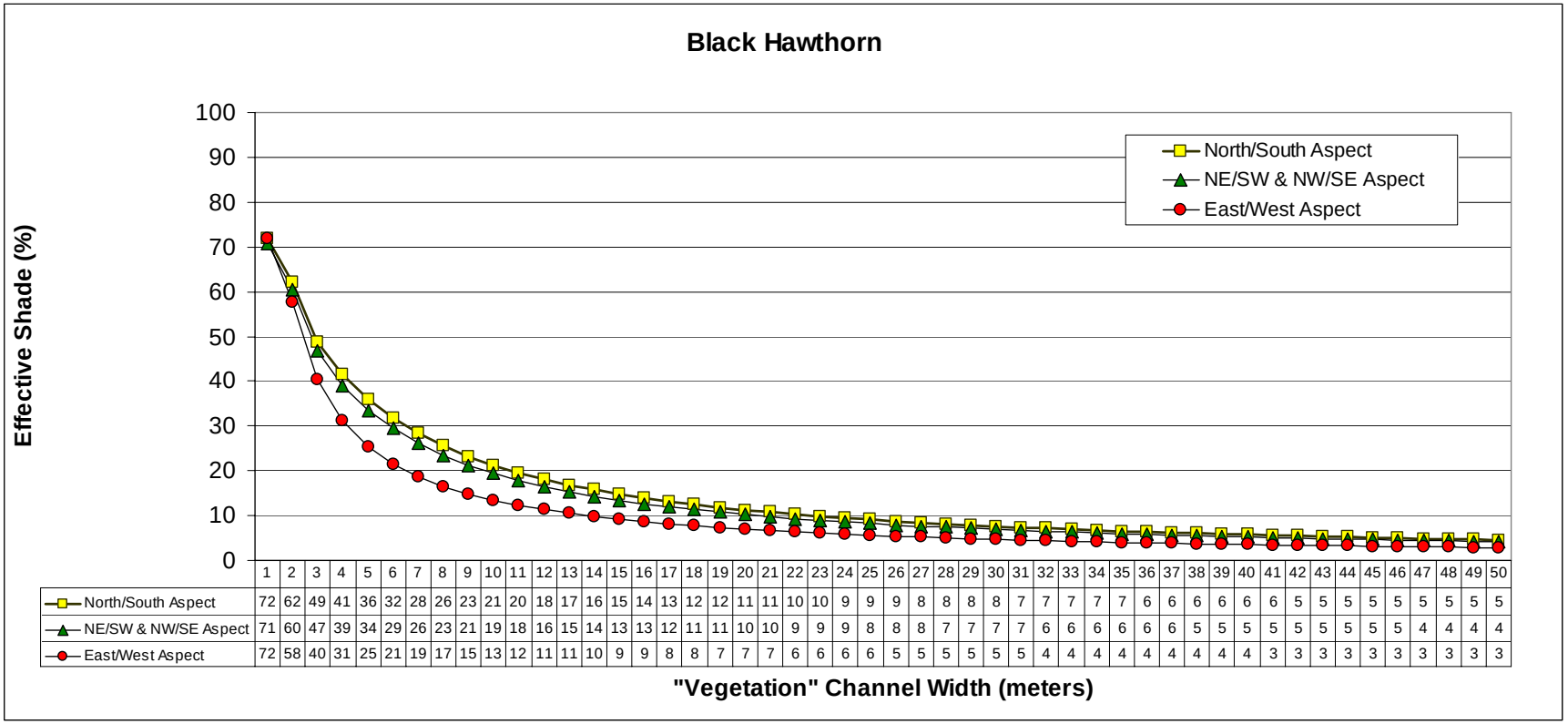
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	90	86	76	64	56	49	44	40	36	33	30	28	26	24	23	22	20	19	18	18	17	16	15	15	14	14	13	13	12	12	11	11	11	10	10	10	10	9	9	9	9	9	8	8	8	8	8	7	7	7
NE/SW & NW/SE Aspect	90	85	74	61	52	46	40	36	33	30	27	25	23	22	20	19	18	17	16	16	15	14	14	13	13	12	12	11	11	10	10	10	10	9	9	9	9	8	8	8	8	8	7	7	7	7	7	7	6	6
East/West Aspect	93	86	67	51	42	35	30	27	24	22	20	18	17	16	15	14	13	12	12	11	11	10	10	9	9	9	8	8	8	7	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5	5

Figure A.3-12. Redosier Dogwood (*Cornus sericea*) Vegetation Type. Corrected for 25% Overlap.



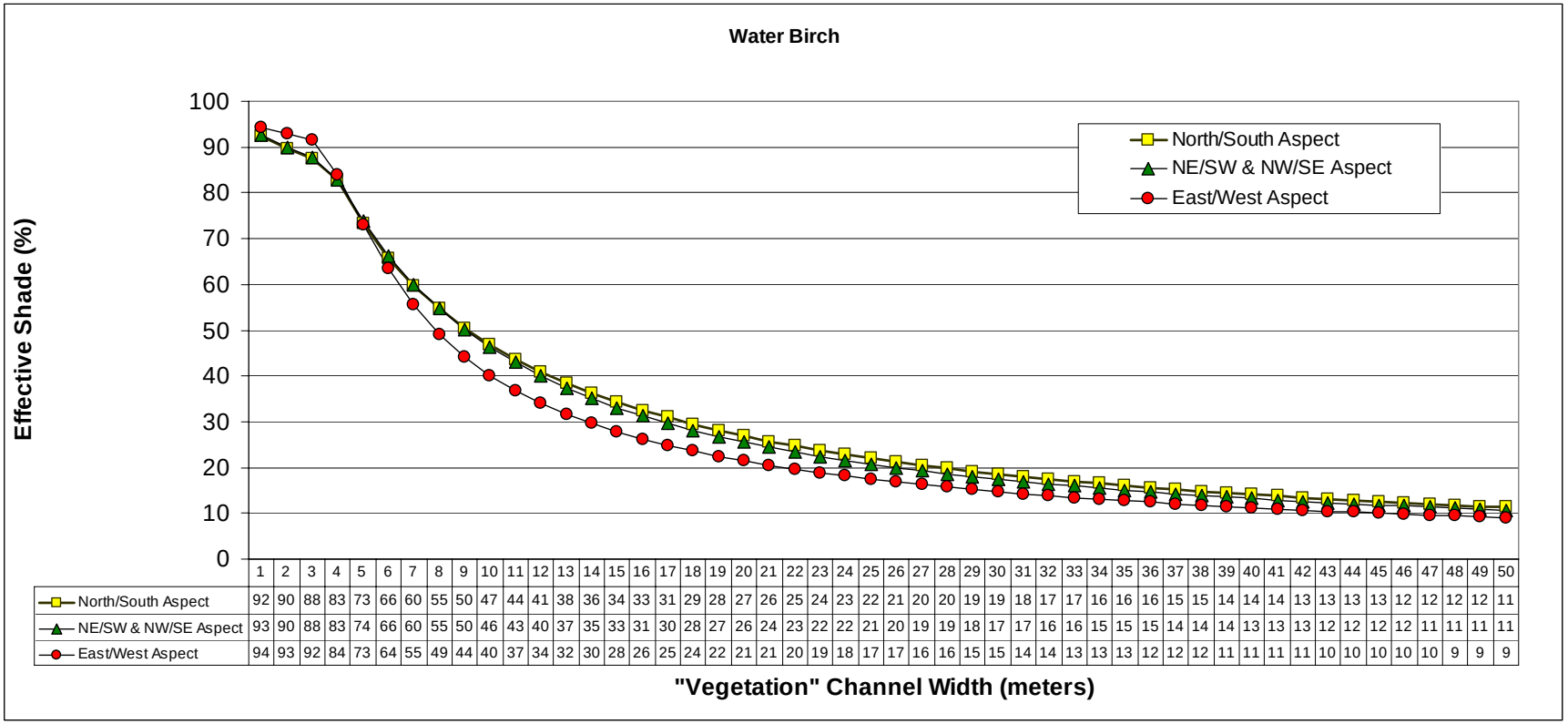
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	94	91	78	67	58	51	46	41	37	34	31	29	27	25	24	22	21	20	19	18	17	17	16	15	15	14	14	13	13	12	12	11	11	11	11	10	10	10	9	9	9	9	9	8	8	8	8	8	8	7
NE/SW & NW/SE Aspect	93	90	77	64	54	47	41	37	33	30	27	25	24	22	21	19	18	17	16	16	15	14	14	13	13	12	12	11	11	10	10	10	10	9	9	9	9	8	8	8	8	8	7	7	7	7	7	7	6	6
East/West Aspect	95	92	69	53	43	36	31	28	25	22	20	19	17	16	15	14	13	13	12	11	11	10	10	10	9	9	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5

Figure A.3-13. Black Hawthorn (*Crataegus douglasii*) Vegetation Type. Corrected for 25% Overlap.



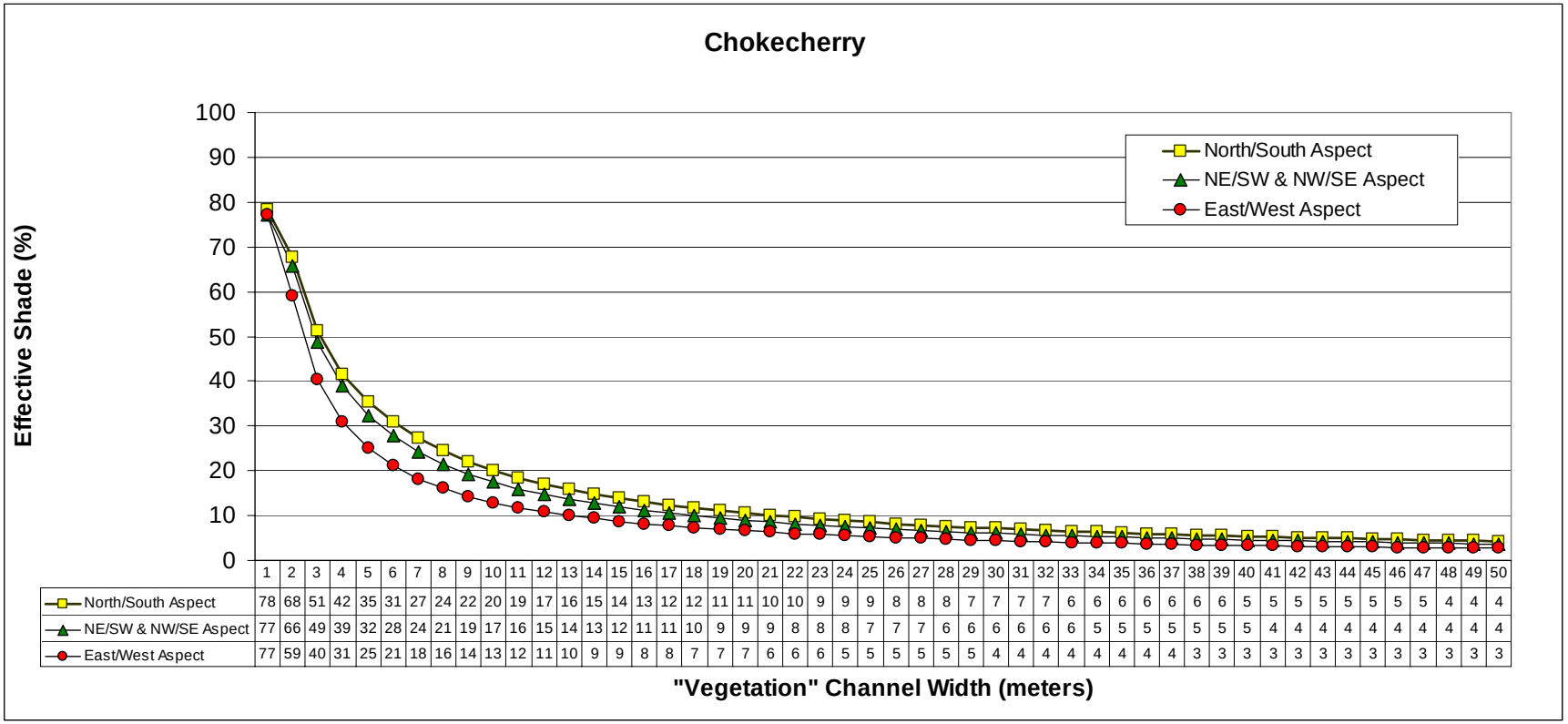
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	72	62	49	41	36	32	28	26	23	21	20	18	17	16	15	14	13	12	12	11	11	10	10	9	9	9	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5
NE/SW & NW/SE Aspect	71	60	47	39	34	29	26	23	21	19	18	16	15	14	13	13	12	11	11	10	10	9	9	9	8	8	8	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5	4	4	4	4
East/West Aspect	72	58	40	31	25	21	19	17	15	13	12	11	11	10	9	9	8	8	7	7	7	6	6	6	6	5	5	5	5	5	5	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3

Figure A.3-14. Water Birch (*Betula occidentalis*) Vegetation Type. Corrected for 25% Overlap.



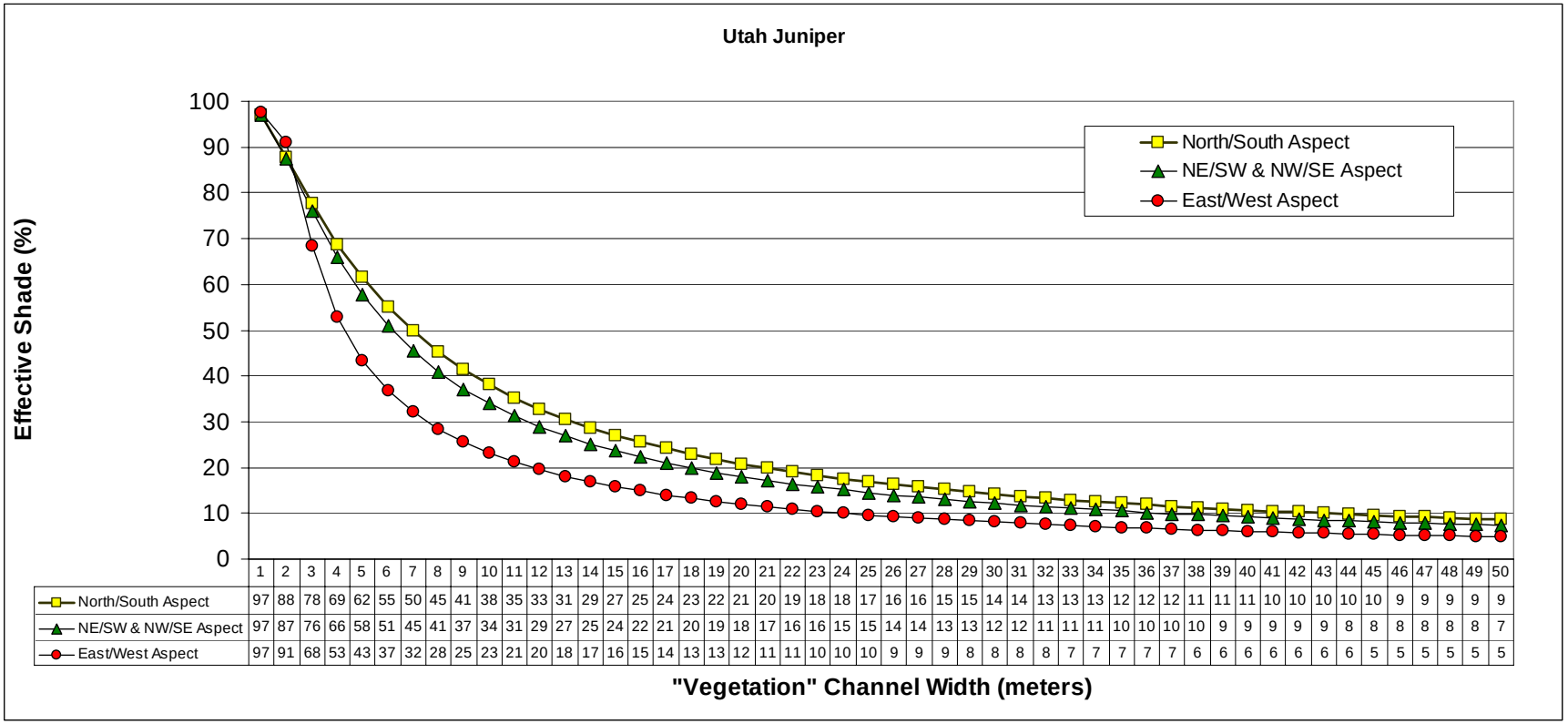
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	92	90	88	83	73	66	60	55	50	47	44	41	38	36	34	33	31	29	28	27	26	25	24	23	22	21	20	20	19	19	18	17	17	16	16	16	15	15	14	14	14	13	13	13	13	12	12	12	12	11
NE/SW & NW/SE Aspect	93	90	88	83	74	66	60	55	50	46	43	40	37	35	33	31	30	28	27	26	24	23	22	22	21	20	19	19	18	17	17	16	16	15	15	15	14	14	14	13	13	13	12	12	12	12	11	11	11	11
East/West Aspect	94	93	92	84	73	64	55	49	44	40	37	34	32	30	28	26	25	24	22	21	21	20	19	18	17	17	16	16	15	15	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10	10	10	9	9	9

Figure A.3-15. Chokecherry (*Prunus virginiana*) Vegetation Type.



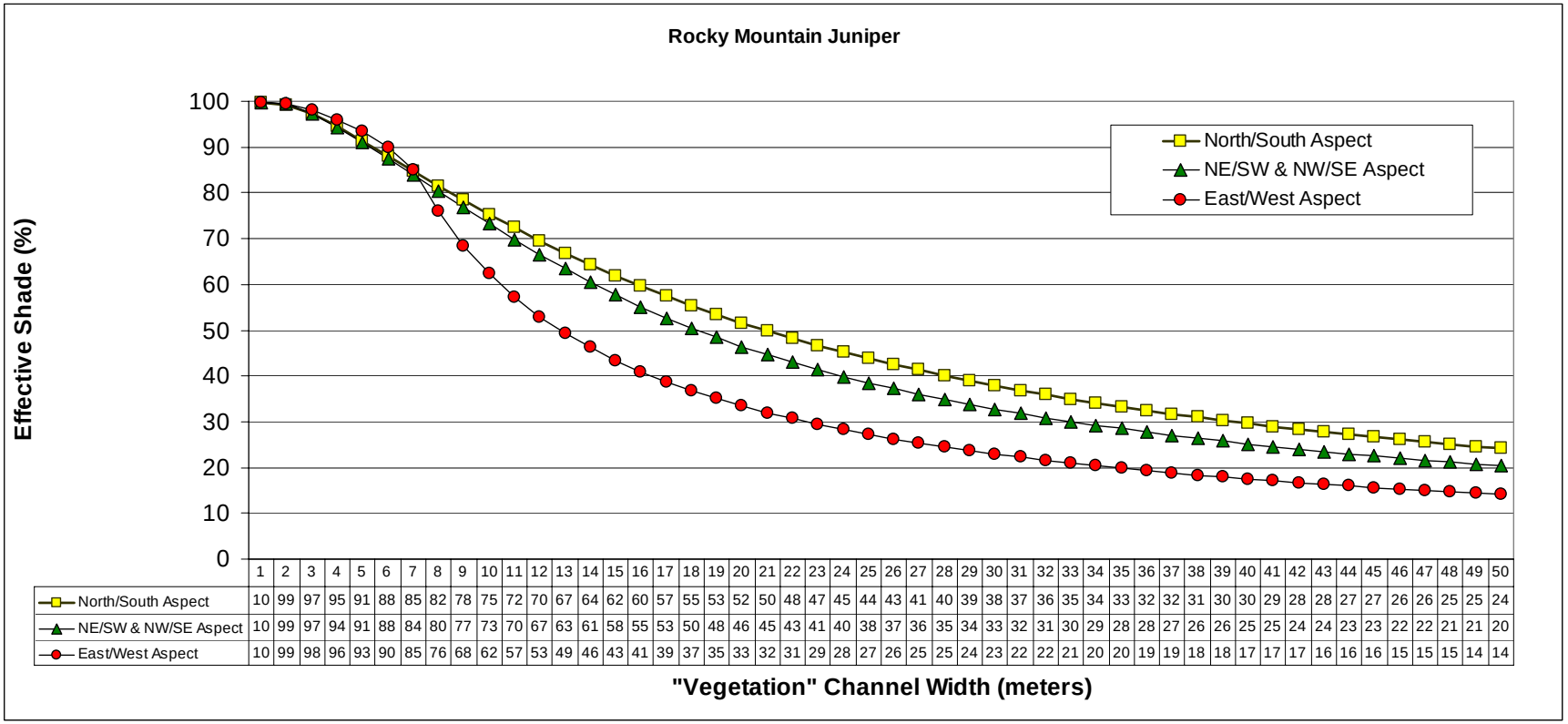
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	78	68	51	42	35	31	27	24	22	20	19	17	16	15	14	13	12	12	11	11	10	10	9	9	9	8	8	8	7	7	7	7	6	6	6	6	6	6	6	5	5	5	5	5	5	5	5	4	4	4
NE/SW & NW/SE Aspect	77	66	49	39	32	28	24	21	19	17	16	15	14	13	12	11	11	10	9	9	9	8	8	8	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	4	4	4	4	4	4	4	4	4	4
East/West Aspect	77	59	40	31	25	21	18	16	14	13	12	11	10	9	9	8	8	7	7	7	6	6	6	5	5	5	5	5	5	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3

Figure A.3-16. Utah Juniper (*Juniperus osteosperma*) Vegetation Type. Corrected for 25% Overlap.



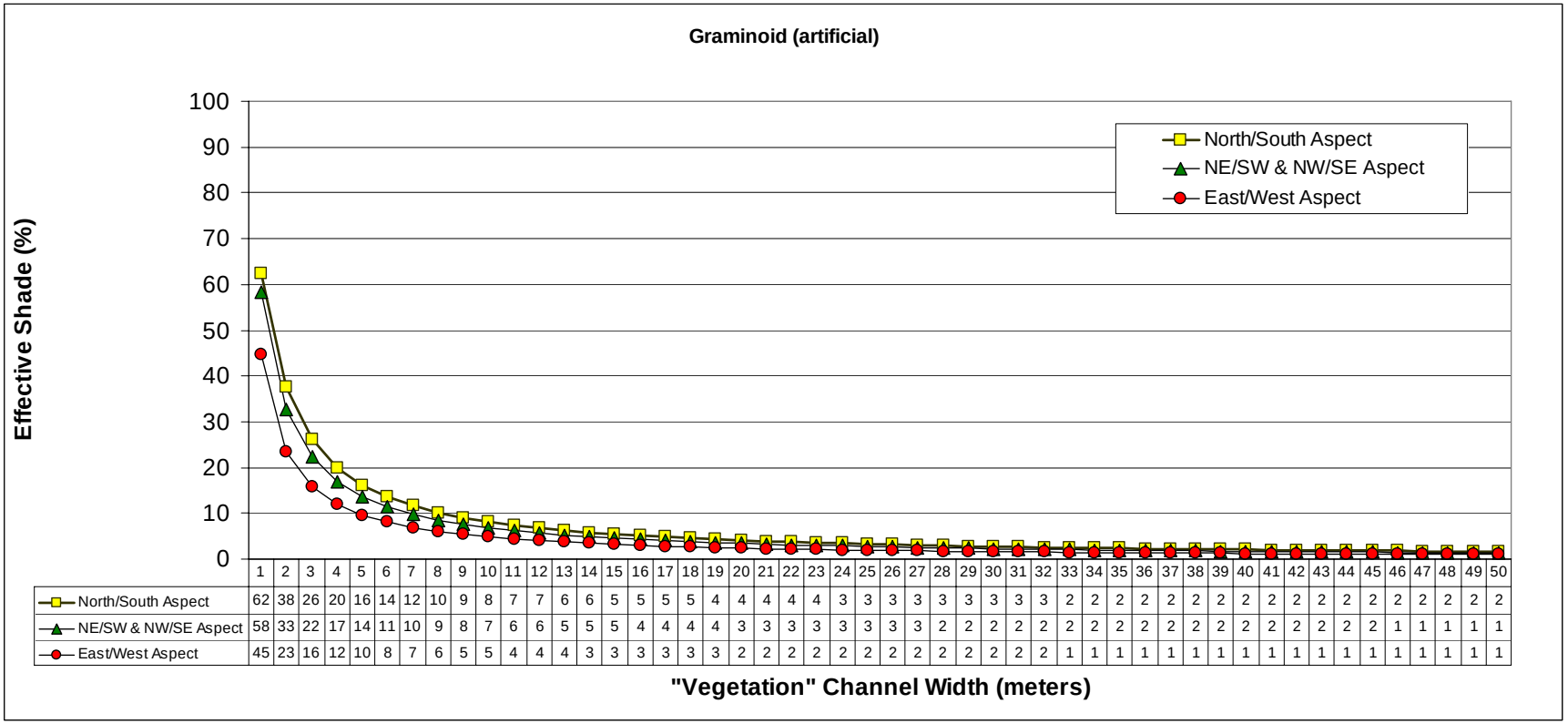
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	97	88	78	69	62	55	50	45	41	38	35	33	31	29	27	25	24	23	22	21	20	19	18	18	17	16	16	15	15	14	14	13	13	13	12	12	12	11	11	11	10	10	10	10	10	9	9	9	9	9
NE/SW & NW/SE Aspect	97	87	76	66	58	51	45	41	37	34	31	29	27	25	24	22	21	20	19	18	17	16	16	15	15	14	14	13	13	12	12	11	11	11	10	10	10	10	9	9	9	9	9	8	8	8	8	8	8	7
East/West Aspect	97	91	68	53	43	37	32	28	25	23	21	20	18	17	16	15	14	13	13	12	11	11	10	10	10	9	9	9	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6	5	5	5	5	5	5

Figure A.3-17. Rocky Mountain Juniper (*Juniperus scopulorum*) Vegetation Type. Corrected for 25% Overlap.



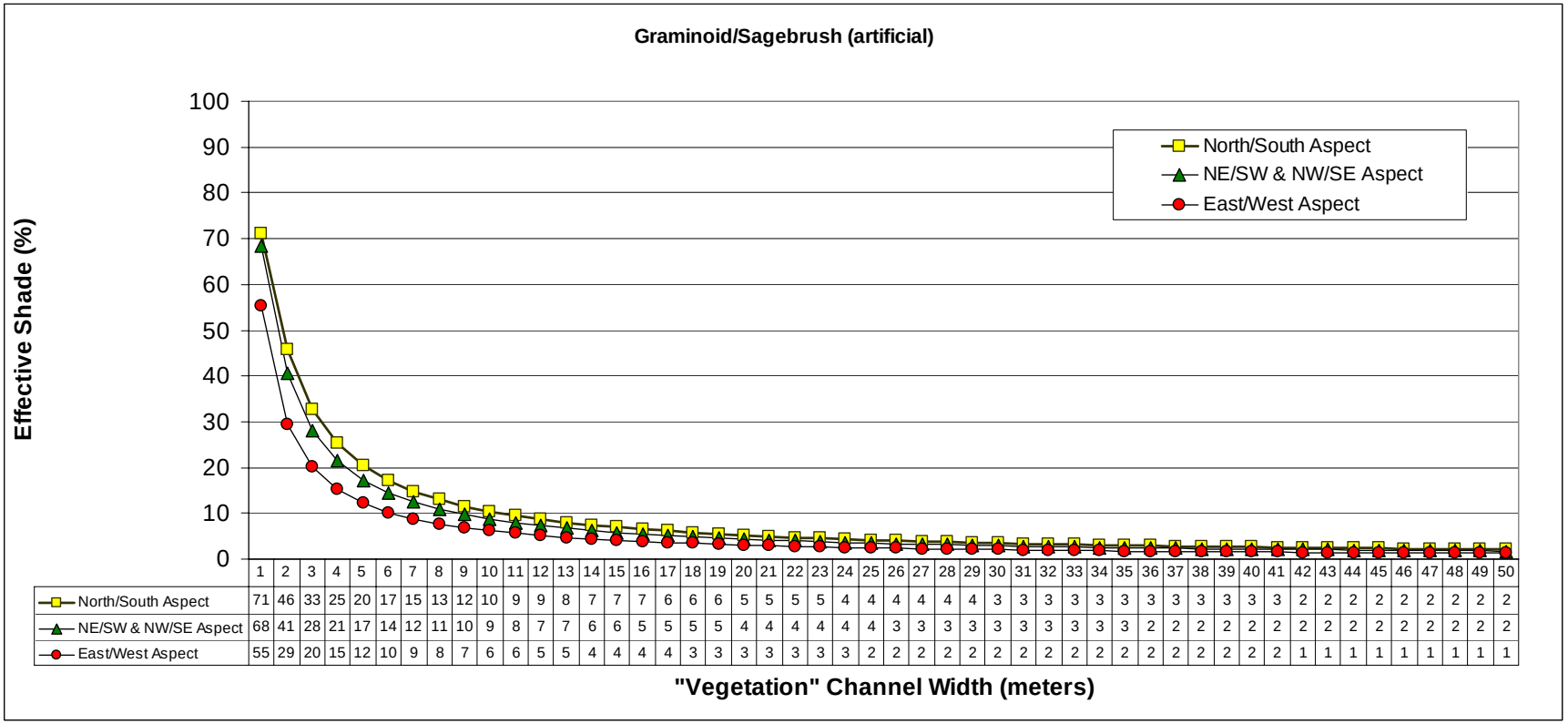
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	10	99	97	95	91	88	85	82	78	75	72	70	67	64	62	60	57	55	53	52	50	48	47	45	44	43	41	40	39	38	37	36	35	34	33	32	32	31	30	30	29	28	28	27	27	26	26	25	25	24
NE/SW & NW/SE Aspect	10	99	97	94	91	88	84	80	77	73	70	67	63	61	58	55	53	50	48	46	45	43	41	40	38	37	36	35	34	33	32	31	30	29	28	28	27	26	26	25	25	24	24	23	23	22	22	21	21	20
East/West Aspect	10	99	98	96	93	90	85	76	68	62	57	53	49	46	43	41	39	37	35	33	32	31	29	28	27	26	25	25	24	23	22	22	21	20	20	19	19	18	18	17	17	17	16	16	16	15	15	15	14	14

Figure A.3-18. Graminoid (Grasses and Grass-like) Vegetation Type.



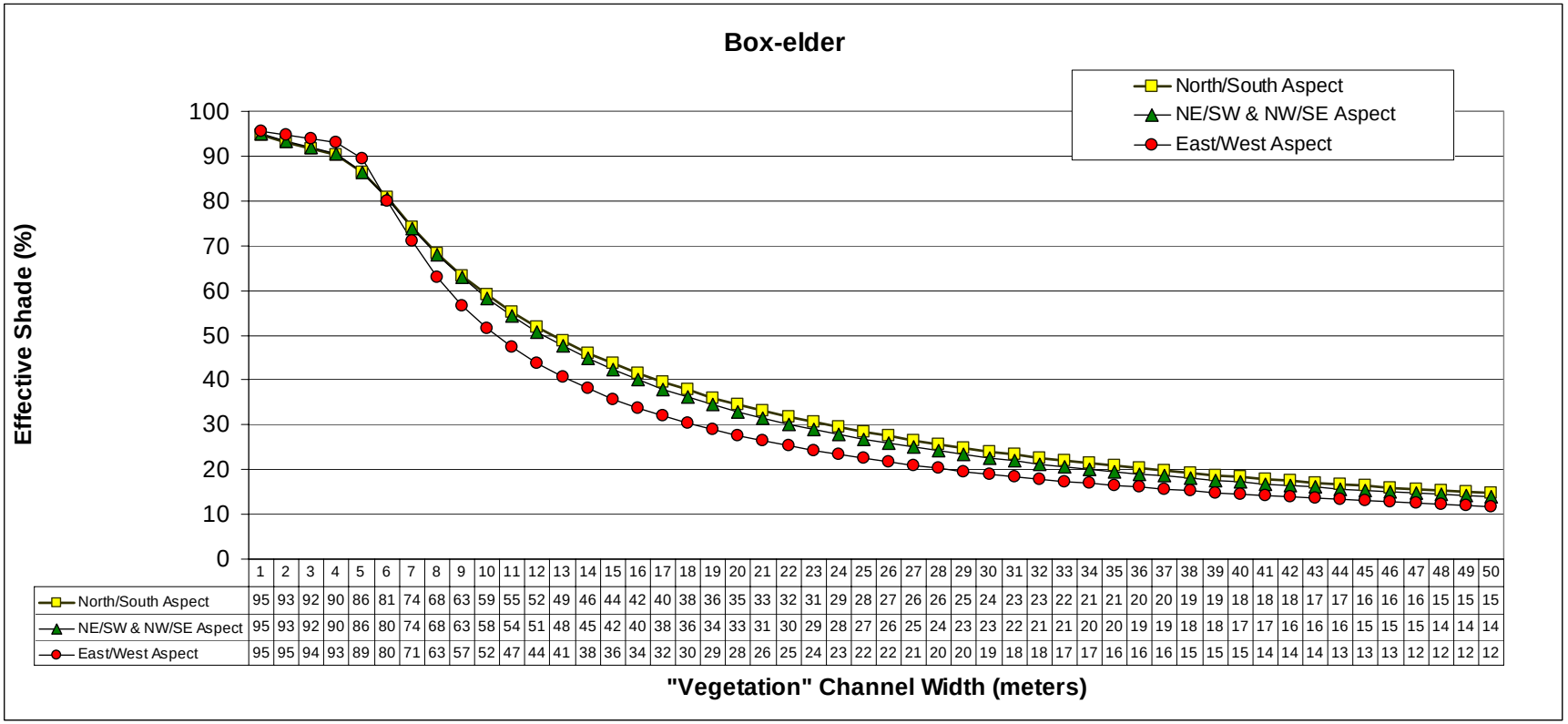
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	62	38	26	20	16	14	12	10	9	8	7	7	6	6	5	5	5	5	4	4	4	4	4	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
NE/SW & NW/SE Aspect	58	33	22	17	14	11	10	9	8	7	6	6	5	5	5	4	4	4	4	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1
East/West Aspect	45	23	16	12	10	8	7	6	5	5	4	4	4	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Figure A.3-19. Graminoid/Sagebrush Vegetation Type.



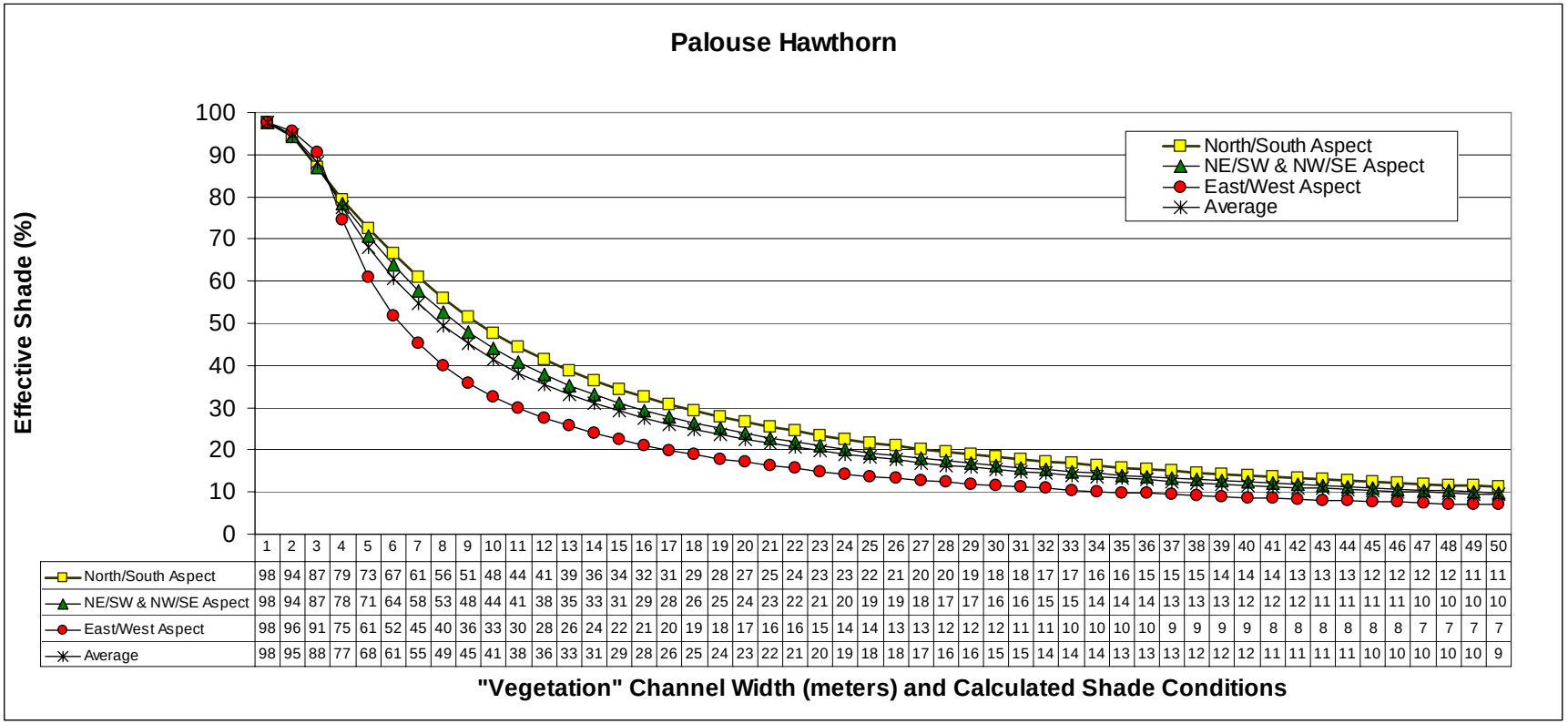
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	71	46	33	25	20	17	15	13	12	10	9	9	8	7	7	7	6	6	6	5	5	5	5	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2
NE/SW & NW/SE Aspect	68	41	28	21	17	14	12	11	10	9	8	7	7	6	6	5	5	5	5	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
East/West Aspect	55	29	20	15	12	10	9	8	7	6	6	5	5	4	4	4	4	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1

Figure A.3-20. Box-elder Vegetation Type. Corrected for 25% Overlap.



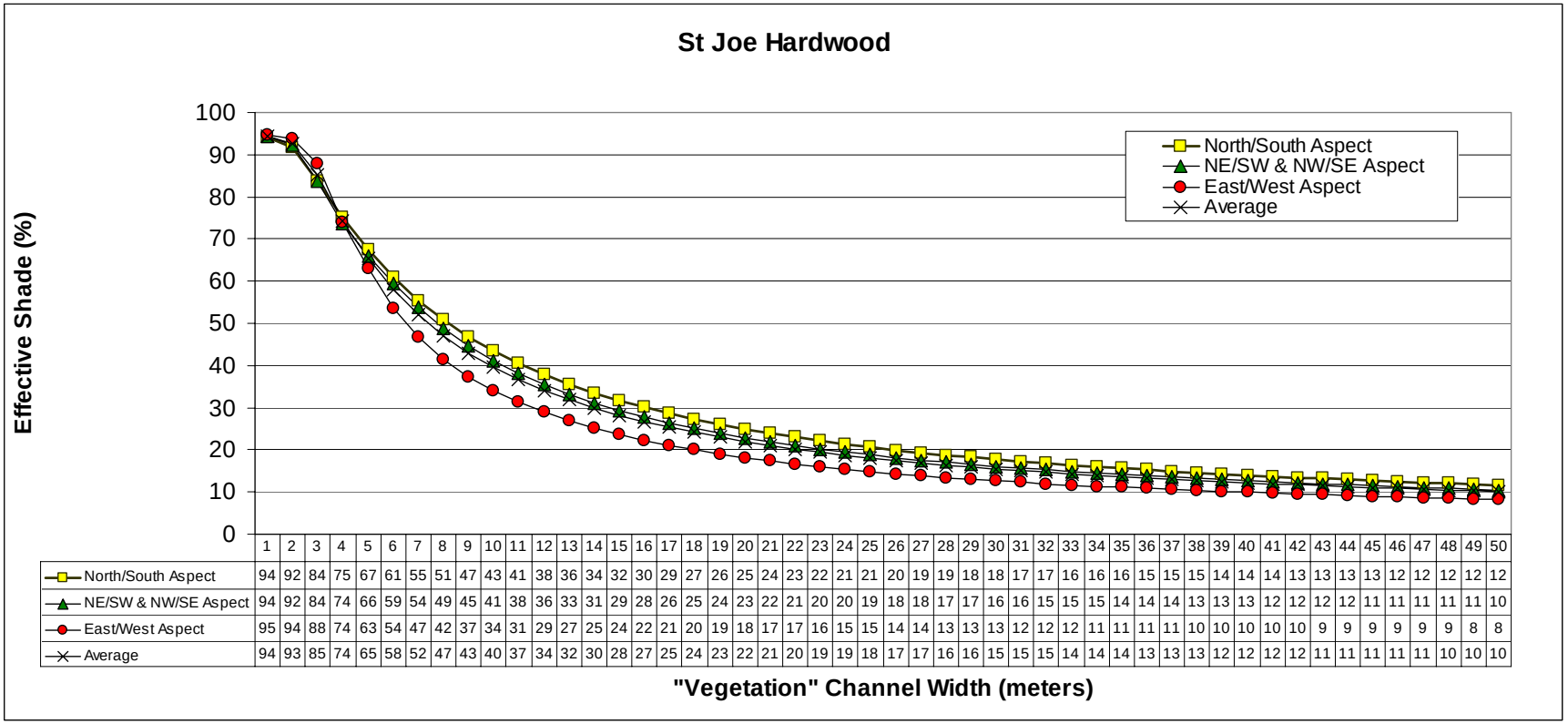
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	95	93	92	90	86	81	74	68	63	59	55	52	49	46	44	42	40	38	36	35	33	32	31	29	28	27	26	26	25	24	23	23	22	21	21	20	20	19	19	18	18	18	17	17	16	16	16	15	15	15
NE/SW & NW/SE Aspect	95	93	92	90	86	80	74	68	63	58	54	51	48	45	42	40	38	36	34	33	31	30	29	28	27	26	25	24	23	23	22	21	21	20	20	19	19	18	18	17	17	16	16	16	15	15	15	14	14	14
East/West Aspect	95	95	94	93	89	80	71	63	57	52	47	44	41	38	36	34	32	30	29	28	26	25	24	23	22	22	21	20	20	19	18	18	17	17	16	16	16	15	15	15	14	14	14	13	13	13	12	12	12	12

Figure A.3-21. Palouse Hawthorn Vegetation Type.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	98	94	87	79	73	67	61	56	51	48	44	41	39	36	34	32	31	29	28	27	25	24	23	23	22	21	20	20	19	18	18	17	17	16	16	15	15	15	14	14	14	13	13	13	12	12	12	12	11	11
NE/SW & NW/SE Aspect	98	94	87	78	71	64	58	53	48	44	41	38	35	33	31	29	28	26	25	24	23	22	21	20	19	19	18	17	17	16	16	15	15	14	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10	10
East/West Aspect	98	96	91	75	61	52	45	40	36	33	30	28	26	24	22	21	20	19	18	17	16	16	15	14	14	13	13	12	12	12	11	11	10	10	10	10	9	9	9	9	8	8	8	8	8	8	7	7	7	7
Average	98	95	88	77	68	61	55	49	45	41	38	36	33	31	29	28	26	25	24	23	22	21	20	19	18	18	17	16	16	15	15	14	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10	10	10	9

Figure A.3-22. St Joe Hardwood Vegetation Type.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	94	92	84	75	67	61	55	51	47	43	41	38	36	34	32	30	29	27	26	25	24	23	22	21	21	20	19	19	18	18	17	17	16	16	16	15	15	15	14	14	14	13	13	13	13	12	12	12	12	12
NE/SW & NW/SE Aspect	94	92	84	74	66	59	54	49	45	41	38	36	33	31	29	28	26	25	24	23	22	21	20	20	19	18	18	17	17	16	16	15	15	15	14	14	14	13	13	13	12	12	12	12	11	11	11	11	11	10
East/West Aspect	95	94	88	74	63	54	47	42	37	34	31	29	27	25	24	22	21	20	19	18	17	17	16	15	15	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10	10	10	9	9	9	9	9	9	8	8
Average	94	93	85	74	65	58	52	47	43	40	37	34	32	30	28	27	25	24	23	22	21	20	19	19	18	17	17	16	16	15	15	15	14	14	14	13	13	13	12	12	12	12	11	11	11	11	11	10	10	10

Table A.3-21. Dry Forest Vegetation Type #1129.

#1129	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PIFL2/LEKI2 Fritz									
RM Juniper	5	0.5	2.5	7.4%	15	*1.1*	0.1	NRCS	0.11
Limber pine	13	0.6	7.4	21.7%	20	*4.3*	0.1	NRCS	0.43
Doug fir	5	0.5	2.7	7.8%	61	*4.8*	0.1	NRCS	0.48
RM Juniper sapling	5	0.3	1.4	4.0%	7.6	*0.3*	0.1	NRCS	0.03
Limber pine sapling	1	0.3	0.3	0.8%	7.6	*0.1*	0.1	NRCS	0.01
Doug fir sapling	1	0.2	0.1	0.4%	12	*0.0*	0.1	NRCS	0.00
CL Mtn Mahogany	19	0.7	13.1	38.6%	5.8	*2.2*	0.25	FEIS/BPJ	0.56
Common juniper	1	0.2	0.1	0.3%	3	*0.0*	0.5	NRCS	0.00
Ribes sp	2	0.2	0.4	1.1%	1	*0.0*	0.5	FEIS/BPJ	0.01
Buffaloberry	1	0.1	0.0	0.1%	3	*0.0*	0.5	FEIS/BPJ	0.00
mtn snowberry	1	0.2	0.1	0.3%	1.5	*0.0*	0.5	Hitchcock	0.00
grass sp.	30	0.2	5.9	17.5%	0.7	*0.1*	0.25	BPJ	0.03
			33.9			**13.0**			**1.7**
PSME/JUCO6g Gany									
Engelmann spruce	9	0.1	1.2	3.6%	36.6	*1.3*	0.1	NRCS	0.13
Limber pine	8	0.5	3.9	12.0%	20	*2.4*	0.1	NRCS	0.24
Doug fir	17	1.0	17.0	52.7%	61	*32.1*	0.1	NRCS	3.21
RM Juniper sapling	1	0.3	0.5	1.4%	7.6	*0.1*	0.1	NRCS	0.01
E. spruce sapling	2	0.1	0.1	0.3%	9	*0.0*	0.1	NRCS	0.00
Limber pine sapling	1	0.8	0.8	2.5%	7.6	*0.2*	0.1	NRCS	0.02
Doug fir sapling	2	1.0	1.7	5.3%	12	*0.6*	0.1	NRCS	0.06
RM maple	1	0.3	0.2	0.6%	9	*0.1*	0.25	NRCS	0.01
Common juniper	5	0.9	4.6	14.1%	3	*0.4*	0.5	NRCS	0.21
Ribes sp	2	0.3	0.4	1.2%	1	*0.0*	0.5	FEIS/BPJ	0.01
Buffaloberry	1	0.3	0.5	1.4%	3	*0.0*	0.5	FEIS/BPJ	0.02
mtn snowberry	1	0.5	0.5	1.5%	1.5	*0.0*	0.5	Hitchcock	0.01
grass sp.	7	0.2	1.1	3.4%	0.7	*0.0*	0.25	BPJ	0.01
			32.3			**37.4**			**3.95**
		Average	**33.1**			**25.2**			**2.8**

Table A.3-22. Dry Forest Vegetation Type #1154.

#1154	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PSME/FEID Pikaden									
RM Juniper	1	0.1	0.1	0.3%	15	*0.0*	0.1	NRCS	0.00
Limber pine	5	0.3	1.5	6.0%	20	*1.2*	0.1	NRCS	0.12
Doug fir	12	1.0	12.1	49.7%	61	*30.3*	0.1	NRCS	3.03
RM Juniper sapling	1	0.1	0.1	0.3%	7.6	*0.0*	0.1	NRCS	0.00
Limber pine sapling	1	0.3	0.3	1.4%	7.6	*0.1*	0.1	NRCS	0.01
Doug fir sapling	2	0.9	1.7	7.0%	12	*0.8*	0.1	NRCS	0.08
RM maple	1	0.1	0.1	0.3%	9	*0.0*	0.25	NRCS	0.01
CL Mtn Mahogany	1	0.1	0.1	0.3%	5.8	*0.0*	0.25	FEIS/BPJ	0.00
Common juniper	1	0.6	0.7	3.0%	3	*0.1*	0.5	NRCS	0.05
Ribes sp	2	0.2	0.3	1.3%	1	*0.0*	0.5	FEIS/BPJ	0.01
mtn snowberry	2	1.0	1.9	7.8%	1.5	*0.1*	0.5	Hitchcock	0.06
graminoid	13	0.4	5.5	22.7%	0.7	*0.2*	0.25	BPJ	0.04
			24.4			**32.9**			**3.4**
PSME/JUCO6 Pikaden									
RM Juniper	1	0.1	0.1	0.1%	36.6	*0.0*	0.1	NRCS	0.00
Lodgepole pine	1	0.1	0.1	0.3%	30	*0.1*	0.1	NRCS	0.01
Limber pine	10	0.4	3.7	7.7%	20	*1.5*	0.1	NRCS	0.15
Doug fir	18	0.9	15.4	32.2%	61	*19.6*	0.1	NRCS	1.96
RM Juniper sapling	1	0.1	0.1	0.1%	7.6	*0.0*	0.1	NRCS	0.00
E. spruce sapling	1	0.1	0.1	0.1%	9	*0.0*	0.1	NRCS	0.00
Limber pine sapling	1	0.4	0.3	0.6%	7.6	*0.0*	0.1	NRCS	0.00
Doug fir sapling	13	0.8	10.0	20.8%	12	*2.5*	0.1	NRCS	0.25
Common juniper	19	0.9	16.6	34.7%	3	*1.0*	0.5	NRCS	0.52
Ribes sp	1	0.2	0.1	0.3%	1	*0.0*	0.5	FEIS/BPJ	0.00
mtn snowberry	1	0.6	0.6	1.3%	1.5	*0.0*	0.5	Hitchcock	0.01
graminoid	3	0.3	0.8	1.7%	0.7	*0.0*	0.25	BPJ	0.00
			47.9			**24.9**			**2.92**
		Average	**36.1**			**28.9**			**3.2**

Table A.3-23. Warm Forest Vegetation Type #1315.

#1315	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/OSCH, PAMY Edgeway									
subalpine fir	14	0.8	11.7	21.8%	15	3.3	0.1	NRCS	0.33
Engelmann spruce	3	0.1	0.3	0.5%	37	0.2	0.1	INT-180	0.02
lodgepole	8	0.2	1.4	2.7%	30	0.8	0.1	NRCS	0.08
aspen	16	0.5	7.3	13.7%	20	2.7	0.25	NRCS	0.69
Doug fir	15	0.6	9.5	17.8%	61	10.9	0.1	NRCS	1.09
sapling subalpine fir	3	1.0	3.2	6.0%	4.5	0.3	0.1	NRCS	0.03
sapling spruce	1	0.1	0.0	0.1%	9	0.0	0.1	NRCS	0.00
sapling aspen	6	0.5	3.4	6.4%	12	0.8	0.25	NRCS	0.19
sapling Doug fir	2	0.5	0.7	1.3%	12	0.2	0.1	NRCS	0.02
RM maple	0	0.3	0.1	0.2%	9	0.0	0.25	NRCS	0.00
serviceberry	7	0.7	4.8	9.0%	5	0.5	0.5	Hitchcock	0.23
hawthorn	2	0.1	0.2	0.3%	6.1	0.0	0.25	Hitchcock	0.01
twinberry	1	0.2	0.1	0.2%	2	0.0	0.5	Hitchcock	0.00
Utah honeysuckle	1	0.5	0.5	0.8%	2	0.0	0.5	INT-180	0.01
chokecherry	3	0.2	0.5	0.9%	7.6	0.1	0.25	NRCS	0.02
Ribes sp	1	0.2	0.2	0.4%	1	0.0	0.5	BPJ	0.00
scoulers willow	1	0.1	0.1	0.2%	15	0.0	0.25	Brunsfeld	0.01
buffaloberry	2	0.1	0.2	0.3%	3	0.0	0.5	FIES/BPJ	0.01
mtn ash	1	0.7	0.4	0.7%	4	0.0	0.5	UW Burke	0.01
common snowberry	5	0.2	0.9	1.7%	2	0.0	0.5	INT-180	0.02
mtn snowberry	3	0.7	2.2	4.2%	1.5	0.1	0.5	Hitchcock	0.03
graminoid	23	0.3	5.7	10.6%	0.7	0.1	0.25	BPJ	0.02
			53.4			**19.9**			**2.8**
ABLA/VAGL,PAMY Koffgo									
subalpine fir	11	0.9	9.4	24.3%	15	3.7	0.1	NRCS	0.37
Engelmann spruce	5	0.3	1.4	3.6%	37	1.3	0.1	INT-180	0.13
lodgepole	14	1.0	14.0	36.5%	30	10.9	0.1	NRCS	1.09
Doug fir	9	0.6	5.2	13.7%	61	8.3	0.1	NRCS	0.83
sapling subalpine fir	3	0.9	2.6	6.9%	4.5	0.3	0.1	NRCS	0.03
sapling spruce	1	0.1	0.1	0.2%	9	0.0	0.1	NRCS	0.00
sapling lodgepole	1	0.7	0.8	2.0%	9	0.2	0.1	NRCS	0.02
sapling Doug fir	1	0.4	0.5	1.4%	12	0.2	0.1	NRCS	0.02
serviceberry	0	0.4	0.1	0.3%	5	0.0	0.5	Hitchcock	0.01
Utah honeysuckle	1	1.0	0.9	2.3%	2	0.0	0.5	INT-180	0.02
sticky currant	1	0.1	0.1	0.2%	1	0.0	0.5	BPJ	0.00
scoulers willow	1	0.1	0.1	0.2%	15	0.0	0.25	Brunsfeld	0.01
mtn ash	0	0.7	0.3	0.7%	4	0.0	0.5	UW Burke	0.01
common snowberry	7	0.1	1.0	2.6%	2	0.1	0.5	INT-180	0.03
mtn snowberry	1	0.4	0.5	1.3%	1.5	0.0	0.5	Hitchcock	0.01
graminoid	3	0.4	1.4	3.8%	0.7	0.0	0.25	BPJ	0.01
			38.4			**25.2**			**2.6**
PSME/ARTRV Povey									
lodgepole	4	0.1	0.2	0.6%	30	0.2	0.1	NRCS	0.02
RM juniper	1	0.1	0.0	0.1%	15	0.0	0.1	INT-180	0.00
limber pine	1	0.1	0.0	0.1%	20	0.0	0.1	NRCS	0.00
Doug fir	7	0.3	2.1	6.0%	61	3.7	0.1	NRCS	0.37
sapling juniper	1	0.1	0.0	0.1%	7.6	0.0	0.1	NRCS	0.00
sapling Doug fir	1	0.3	0.3	0.9%	9	0.1	0.1	BPJ	0.01
sapling lodgepole	3	0.1	0.2	0.4%	9	0.0	0.1	NRCS	0.00
sapling aspen	2	0.2	0.4	1.0%	12	0.1	0.25	NRCS	0.03
RM maple	1	0.1	0.1	0.1%	9	0.0	0.25	NRCS	0.00
big tooth maple	22	0.2	3.6	10.0%	9	0.9	0.25	NRCS	0.22
serviceberry	2	0.4	0.6	1.8%	5	0.1	0.5	Hitchcock	0.05
ceanothus	34	0.4	12.9	36.1%	3	1.1	0.5	INT-180	0.54
ninebark	2	0.1	0.1	0.3%	2	0.0	0.5	INT-180	0.00
chokecherry	4	0.8	3.2	9.0%	7.6	0.7	0.25	NRCS	0.17
mtn snowberry	5	0.9	4.2	11.8%	1.5	0.2	0.5	Hitchcock	0.09
graminoid	45	0.2	7.8	21.8%	0.7	0.2	0.25	BPJ	0.04
			35.8			**7.2**			**1.54**
		Average	**42.5**			**17.4**			**2.3**

Table A.3-24. Warm Forest Vegetation Type #1592.

#1592	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PSME/SYAL Lagall									
lodgepole	1	0.2	0.3	0.4%	30	*0.1*	0.1	NRCS	0.01
aspen	7	0.4	2.7	3.9%	20	*0.8*	0.25	NRCS	0.19
Doug fir	21	0.5	11.3	16.2%	61	*9.9*	0.1	NRCS	0.99
sapling limber pine	1	0.0	0.0	0.1%	7.6	*0.0*	0.1	NRCS	0.00
sapling Doug fir	3	0.4	1.0	1.5%	9	*0.1*	0.1	BPJ	0.01
sapling lodgepole	2	0.3	0.4	0.5%	9	*0.0*	0.1	NRCS	0.00
sapling aspen	15	0.7	10.4	14.8%	12	*1.8*	0.25	NRCS	0.44
RM maple	2	0.1	0.1	0.2%	9	*0.0*	0.25	NRCS	0.00
serviceberry	5	0.9	4.4	6.2%	5	*0.3*	0.5	Hitchcock	0.16
ceanothus	16	0.4	5.8	8.4%	3	*0.3*	0.5	INT-180	0.13
hawthorn	2	0.1	0.2	0.3%	6.1	*0.0*	0.25	Hitchcock	0.00
Utah honeysuckle	2	0.1	0.1	0.2%	2	*0.0*	0.5	INT-180	0.00
chokecherry	7	0.9	6.6	9.4%	7.6	*0.7*	0.25	NRCS	0.18
scoulers willow	3	0.3	0.7	0.9%	15	*0.1*	0.25	Brunsfeld	0.03
mtn ash	3	0.4	1.0	1.5%	4	*0.1*	0.5	UW Burke	0.03
common snowberry	18	0.7	12.6	18.0%	2	*0.4*	0.5	INT-180	0.18
mtn snowberry	6	0.3	2.0	2.9%	1.5	*0.0*	0.5	Hitchcock	0.02
graminoid	42	0.2	10.3	14.7%	0.7	*0.1*	0.25	BPJ	0.03
			69.9			**14.8**			**2.42**

Table A.3-25. Warm Forest Vegetation Type #1224.

#1224	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/VAGL, PAMY Huckridge									
subalpine fir	11	0.6	6.1	14.1%	15	*2.1*	0.1	NRCS	0.21
Engelmann spruce	10	0.1	0.5	1.2%	37	*0.4*	0.1	INT-180	0.04
lodgepole	14	0.9	12.0	27.9%	30	*8.4*	0.1	NRCS	0.84
aspen	5	0.1	0.3	0.6%	20	*0.1*	0.25	NRCS	0.03
Doug fir	21	0.3	6.8	15.9%	61	*9.7*	0.1	NRCS	0.97
sapling subalpine fir	3	0.5	1.6	3.7%	4.5	*0.2*	0.1	NRCS	0.02
sapling spruce	1	0.1	0.1	0.1%	9	*0.0*	0.1	NRCS	0.00
sapling lodgepole	2	0.8	1.5	3.4%	9	*0.3*	0.1	NRCS	0.03
sapling aspen	1	0.2	0.2	0.5%	12	*0.1*	0.25	NRCS	0.02
sapling Doug fir	2	0.5	1.2	2.7%	12	*0.3*	0.1	NRCS	0.03
RM maple	0	0.1	0.0	0.1%	9	*0.0*	0.25	NRCS	0.00
serviceberry	2	0.7	1.3	3.0%	5	*0.2*	0.5	Hitchcock	0.08
common juniper	1	0.1	0.0	0.1%	3	*0.0*	0.5	NRCS	0.00
Utah honeysuckle	3	0.8	2.2	5.2%	2	*0.1*	0.5	INT-180	0.05
chokecherry	1	0.1	0.0	0.1%	7.6	*0.0*	0.25	NRCS	0.00
Ribes sp	1	0.2	0.1	0.2%	1	*0.0*	0.5	BPJ	0.00
willow	6	0.1	0.7	1.5%	6	*0.1*	0.25	Brunsfeld	0.02
scoulers willow	1	0.2	0.2	0.4%	15	*0.1*	0.25	Brunsfeld	0.01
elderberry	1	0.1	0.0	0.1%	3	*0.0*	0.5	INT-180	0.00
buffaloberry	0	0.2	0.1	0.1%	3	*0.0*	0.5	FIES/BPJ	0.00
mtn ash	1	0.6	0.4	0.9%	4	*0.0*	0.5	UW Burke	0.02
common snowberry	9	0.3	2.8	6.5%	2	*0.1*	0.5	INT-180	0.07
mtn snowberry	2	0.2	0.3	0.6%	1.5	*0.0*	0.5	Hitchcock	0.00
graminoid	22	0.2	4.8	11.2%	0.7	*0.1*	0.25	BPJ	0.02
			42.9			**22.3**			**2.5**
ABLA/VAGL,PAMY Koffgo									
subalpine fir	11	0.9	9.4	24.3%	15	*3.7*	0.1	NRCS	0.37
Engelmann spruce	5	0.3	1.4	3.6%	37	*1.3*	0.1	INT-180	0.13
lodgepole	14	1.0	14.0	36.5%	30	*10.9*	0.1	NRCS	1.09
Doug fir	9	0.6	5.2	13.7%	61	*8.3*	0.1	NRCS	0.83
sapling subalpine fir	3	0.9	2.6	6.9%	4.5	*0.3*	0.1	NRCS	0.03
sapling spruce	1	0.1	0.1	0.2%	9	*0.0*	0.1	NRCS	0.00
sapling lodgepole	1	0.7	0.8	2.0%	9	*0.2*	0.1	NRCS	0.02
sapling Doug fir	1	0.4	0.5	1.4%	12	*0.2*	0.1	NRCS	0.02
serviceberry	0	0.4	0.1	0.3%	5	*0.0*	0.5	Hitchcock	0.01
Utah honeysuckle	1	1.0	0.9	2.3%	2	*0.0*	0.5	INT-180	0.02
sticky currant	1	0.1	0.1	0.2%	1	*0.0*	0.5	BPJ	0.00
scoulers willow	1	0.1	0.1	0.2%	15	*0.0*	0.25	Brunsfeld	0.01
mtn ash	0	0.7	0.3	0.7%	4	*0.0*	0.5	UW Burke	0.01
common snowberry	7	0.1	1.0	2.6%	2	*0.1*	0.5	INT-180	0.03
mtn snowberry	1	0.4	0.5	1.3%	1.5	*0.0*	0.5	Hitchcock	0.01
graminoid	3	0.4	1.4	3.8%	0.7	*0.0*	0.25	BPJ	0.01
			38.4			**25.2**			**2.6**
PSME/ARTRV Povey									
lodgepole	4	0.1	0.2	0.6%	30	*0.2*	0.1	NRCS	0.02
RM juniper	1	0.1	0.0	0.1%	15	*0.0*	0.1	INT-180	0.00
limber pine	1	0.1	0.0	0.1%	20	*0.0*	0.1	NRCS	0.00
Doug fir	7	0.3	2.1	6.0%	61	*3.7*	0.1	NRCS	0.37
sapling juniper	1	0.1	0.0	0.1%	7.6	*0.0*	0.1	NRCS	0.00
sapling Doug fir	1	0.3	0.3	0.9%	9	*0.1*	0.1	BPJ	0.01
sapling lodgepole	3	0.1	0.2	0.4%	9	*0.0*	0.1	NRCS	0.00
sapling aspen	2	0.2	0.4	1.0%	12	*0.1*	0.25	NRCS	0.03
RM maple	1	0.1	0.1	0.1%	9	*0.0*	0.25	NRCS	0.00
big tooth maple	22	0.2	3.6	10.0%	9	*0.9*	0.25	NRCS	0.22
serviceberry	2	0.4	0.6	1.8%	5	*0.1*	0.5	Hitchcock	0.05
ceanothus	34	0.4	12.9	36.1%	3	*1.1*	0.5	INT-180	0.54
ninebark	2	0.1	0.1	0.3%	2	*0.0*	0.5	INT-180	0.00
chokecherry	4	0.8	3.2	9.0%	7.6	*0.7*	0.25	NRCS	0.17
mtn snowberry	5	0.9	4.2	11.8%	1.5	*0.2*	0.5	Hitchcock	0.09
graminoid	45	0.2	7.8	21.8%	0.7	*0.2*	0.25	BPJ	0.04
			35.8			**7.2**			**1.54**
		Average	**39.0**			**18.2**			**2.2**

Table A.3-26. Mid Forest Vegetation Type #1316.

#1316	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/VAGL,PAMY Koffgo									
subalpine fir	11	0.9	9.4	24.3%	15	*3.7*	0.1	NRCS	0.37
Engelmann spruce	5	0.3	1.4	3.6%	37	*1.3*	0.1	INT-180	0.13
lodgepole	14	1.0	14.0	36.5%	30	*10.9*	0.1	NRCS	1.09
Doug fir	9	0.6	5.2	13.7%	61	*8.3*	0.1	NRCS	0.83
sapling subalpine fir	3	0.9	2.6	6.9%	4.5	*0.3*	0.1	NRCS	0.03
sapling spruce	1	0.1	0.1	0.2%	9	*0.0*	0.1	NRCS	0.00
sapling lodgepole	1	0.7	0.8	2.0%	9	*0.2*	0.1	NRCS	0.02
sapling Doug fir	1	0.4	0.5	1.4%	12	*0.2*	0.1	NRCS	0.02
serviceberry	0	0.4	0.1	0.3%	5	*0.0*	0.5	Hitchcock	0.01
Utah honeysuckle	1	1.0	0.9	2.3%	2	*0.0*	0.5	INT-180	0.02
sticky currant	1	0.1	0.1	0.2%	1	*0.0*	0.5	BPJ	0.00
scoulers willow	1	0.1	0.1	0.2%	15	*0.0*	0.25	Brunsfeld	0.01
mtn ash	0	0.7	0.3	0.7%	4	*0.0*	0.5	UW Burke	0.01
common snowberry	7	0.1	1.0	2.6%	2	*0.1*	0.5	INT-180	0.03
mtn snowberry	1	0.4	0.5	1.3%	1.5	*0.0*	0.5	Hitchcock	0.01
graminoid	3	0.4	1.4	3.8%	0.7	*0.0*	0.25	BPJ	0.01
			38.4			**25.2**			**2.6**
ABLA/THOC Koffgo									
subalpine fir	8	1.0	7.8	25.2%	15	*3.8*	0.1	NRCS	0.38
whitebark pine	11	0.8	8.0	25.7%	15	*3.8*	0.1	NRCS	0.38
sapling subalpine fir	6	1.0	5.5	17.8%	4.5	*0.8*	0.1	NRCS	0.08
sapling whitebark	2	0.8	1.4	4.4%	4.5	*0.2*	0.1	NRCS	0.02
serviceberry	1	0.3	0.1	0.4%	5	*0.0*	0.5	Hitchcock	0.01
Ribes sp.	4	1.0	4.2	13.6%	1	*0.1*	0.5	BPJ	0.07
mtn ash	0	0.5	0.2	0.5%	4	*0.0*	0.5	UW Burke	0.01
chokecherry	1	0.3	0.1	0.4%	7.6	*0.0*	0.25	NRCS	0.01
mtn snowberry	1	0.3	0.1	0.4%	1.5	*0.0*	0.5	Hitchcock	0.00
graminoid	9	0.4	3.7	11.8%	0.7	*0.1*	0.25	BPJ	0.02
			31.0			**8.9**			**0.98**
		Average	**34.7**			**17.0**			**1.8**

Table A.3-27. Mid Forest Vegetation Type #1172.

#1172	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/ACGL Gany									
subalpine fir	4	0.5	2.1	4.9%	15	*0.7*	0.1	NRCS	0.07
Engelmann spruce	7	0.3	1.8	4.1%	37	*1.5*	0.1	INT-180	0.15
Doug fir	18	1.0	17.8	41.6%	61	*25.3*	0.1	NRCS	2.53
sapling subalpine fir	3	0.8	2.3	5.3%	4.5	*0.2*	0.1	NRCS	0.02
sapling spruce	1	0.1	0.1	0.1%	9	*0.0*	0.1	NRCS	0.00
sapling whitebark	1	0.1	0.1	0.1%	4.5	*0.0*	0.1	NRCS	0.00
sapling Doug fir	1	0.6	0.7	1.6%	12	*0.2*	0.1	NRCS	0.02
RM maple	7	1.0	6.5	15.2%	9	*1.4*	0.25	NRCS	0.34
serviceberry	4	0.9	3.5	8.1%	5	*0.4*	0.5	Hitchcock	0.20
dogwood	1	0.1	0.1	0.1%	4	*0.0*	0.5	Hitchcock	0.00
Utah honeysuckle	1	0.6	0.6	1.4%	2	*0.0*	0.5	INT-180	0.01
ninebark	3	0.3	0.6	1.5%	2	*0.0*	0.5	INT-180	0.01
chokecherry	1	0.3	0.3	0.7%	7.6	*0.1*	0.25	NRCS	0.01
Ribes sp	0	0.3	0.1	0.2%	1	*0.0*	0.5	BPJ	0.00
scoulers willow	1	0.3	0.1	0.3%	15	*0.0*	0.25	Brunsfeld	0.01
buffaloberry	1	0.4	0.2	0.4%	3	*0.0*	0.5	FIES/BPJ	0.01
mtn ash	2	0.8	1.4	3.3%	4	*0.1*	0.5	UW Burke	0.07
common snowberry	1	0.3	0.1	0.3%	2	*0.0*	0.5	INT-180	0.00
mtn snowberry	3	0.5	1.3	2.9%	1.5	*0.0*	0.5	Hitchcock	0.02
graminoid	9	0.4	3.3	7.8%	0.7	*0.1*	0.25	BPJ	0.01
			42.8			**30.2**			**3.5**
PSME/BERE, SYOR2 Fritz									
RM juniper	5	0.4	1.8	5.3%	15	*0.8*	0.1	INT-180	0.08
limber pine	3	0.4	1.2	3.4%	20	*0.7*	0.1	NRCS	0.07
Doug fir	21	1.0	20.7	60.9%	61	*37.2*	0.1	NRCS	3.72
sapling juniper	2	0.2	0.4	1.1%	7.6	*0.1*	0.1	NRCS	0.01
sapling Doug fir	3	0.5	1.4	4.0%	9	*0.4*	0.1	BPJ	0.04
sapling spruce	1	0.1	0.0	0.1%	9	*0.0*	0.1	NRCS	0.00
sapling whitebark	1	0.1	0.0	0.1%	4.5	*0.0*	0.25	NRCS	0.00
sapling limber	0	0.1	0.0	0.0%	7.6	*0.0*	0.1	NRCS	0.00
RM maple	1	0.5	0.3	0.8%	9	*0.1*	0.25	NRCS	0.02
big tooth maple	1	0.1	0.0	0.1%	9	*0.0*	0.25	NRCS	0.00
serviceberry	0	0.4	0.1	0.4%	5	*0.0*	0.5	Hitchcock	0.01
ceanothus	1	0.3	0.2	0.5%	3	*0.0*	0.5	INT-180	0.01
common juniper	3	0.1	0.3	0.8%	3	*0.0*	0.5	NRCS	0.01
ninebark	1	0.1	0.0	0.1%	2	*0.0*	0.5	INT-180	0.00
chokecherry	8	0.6	4.9	14.3%	7.6	*1.1*	0.25	NRCS	0.27
sticky currant	1	0.2	0.1	0.3%	2	*0.0*	0.5	INT-180	0.00
mtn snowberry	1	0.9	0.7	2.1%	1.5	*0.0*	0.5	Hitchcock	0.02
graminoid	9	0.2	1.9	5.7%	0.7	*0.0*	0.25	BPJ	0.01
			34.0			**40.4**			**4.26**
		Average	**38.4**			**35.3**			**3.9**

Table A.3-28. Mid Forest Vegetation Type #1222.

#1222	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/ACGL Koffgo									
subalpine fir	1	0.5	0.5	0.7%	15	0.1	0.1	NRCS	0.01
lodgepole	5	0.5	2.6	3.6%	30	1.1	0.1	NRCS	0.11
Doug fir	12	0.8	9.2	12.9%	61	7.8	0.1	NRCS	0.78
sapling subalpine fir	2	0.5	0.9	1.2%	4.5	0.1	0.1	NRCS	0.01
sapling spruce	16	0.3	3.9	5.4%	9	0.5	0.1	NRCS	0.05
sapling lodgepole	1	0.3	0.1	0.2%	9	0.0	0.1	NRCS	0.00
sapling aspen	1	0.3	0.1	0.2%	12	0.0	0.25	NRCS	0.01
sapling Doug fir	1	0.8	0.6	0.8%	12	0.1	0.1	NRCS	0.01
RM maple	7	0.5	3.5	4.9%	9	0.4	0.25	NRCS	0.11
serviceberry	8	1.0	7.5	10.4%	5	0.5	0.5	Hitchcock	0.26
ceanothus	2	0.3	0.5	0.7%	3	0.0	0.5	INT-180	0.01
Utah honeysuckle	4	0.8	3.1	4.3%	2	0.1	0.5	INT-180	0.04
ninebark	1	0.3	0.3	0.3%	2	0.0	0.5	INT-180	0.00
chokecherry	10	0.3	2.5	3.5%	7.6	0.3	0.25	NRCS	0.07
scoulers willow	10	0.8	7.2	10.0%	15	1.5	0.25	Brunsfeld	0.38
buffaloberry	17	0.5	8.3	11.5%	3	0.3	0.5	FIES/BPJ	0.17
mtn ash	9	1.0	9.0	12.5%	4	0.5	0.5	UW Burke	0.25
common snowberry	10	0.5	5.0	7.0%	2	0.1	0.5	INT-180	0.07
mtn snowberry	8	0.3	2.0	2.8%	1.5	0.0	0.5	Hitchcock	0.02
graminoid	9	0.6	5.1	7.1%	0.7	0.0	0.25	BPJ	0.01
			71.8			**13.6**			**2.4**
PSME/SYAL Lagall									
lodgepole	1	0.2	0.3	0.4%	30	0.1	0.1	NRCS	0.01
aspen	7	0.4	2.7	3.9%	20	0.8	0.25	NRCS	0.19
Doug fir	21	0.5	11.3	16.2%	61	9.9	0.1	NRCS	0.99
sapling limber pine	1	0.0	0.0	0.1%	7.6	0.0	0.1	NRCS	0.00
sapling Doug fir	3	0.4	1.0	1.5%	9	0.1	0.1	BPJ	0.01
sapling lodgepole	2	0.3	0.4	0.5%	9	0.0	0.1	NRCS	0.00
sapling aspen	15	0.7	10.4	14.8%	12	1.8	0.25	NRCS	0.44
RM maple	2	0.1	0.1	0.2%	9	0.0	0.25	NRCS	0.00
serviceberry	5	0.9	4.4	6.2%	5	0.3	0.5	Hitchcock	0.16
ceanothus	16	0.4	5.8	8.4%	3	0.3	0.5	INT-180	0.13
hawthorn	2	0.1	0.2	0.3%	6.1	0.0	0.25	Hitchcock	0.00
Utah honeysuckle	2	0.1	0.1	0.2%	2	0.0	0.5	INT-180	0.00
chokecherry	7	0.9	6.6	9.4%	7.6	0.7	0.25	NRCS	0.18
scoulers willow	3	0.3	0.7	0.9%	15	0.1	0.25	Brunsfeld	0.03
mtn ash	3	0.4	1.0	1.5%	4	0.1	0.5	UW Burke	0.03
common snowberry	18	0.7	12.6	18.0%	2	0.4	0.5	INT-180	0.18
mtn snowberry	6	0.3	2.0	2.9%	1.5	0.0	0.5	Hitchcock	0.02
graminoid	42	0.2	10.3	14.7%	0.7	0.1	0.25	BPJ	0.03
			69.9			**14.8**			**2.42**
#1222	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang		Wt Overhang
ABLA/ACGL Rhylow									
subalpine fir	7	0.7	4.8	10.1%	15	1.5	0.1	NRCS	0.15
RM juniper	1	0.3	0.3	0.6%	15	0.1	0.1	INT-180	0.01
lodgepole	5	0.1	0.5	1.0%	30	0.3	0.1	NRCS	0.03
limber pine	3	0.2	0.6	1.3%	20	0.3	0.1	NRCS	0.03
aspen	15	0.1	1.5	3.1%	20	0.6	0.25	NRCS	0.16
Doug fir	18	0.8	14.4	30.1%	61	18.4	0.1	NRCS	1.84
sapling subalpine fir	1	0.5	0.4	0.7%	4.5	0.0	0.1	NRCS	0.00
sapling aspen	1	0.3	0.2	0.5%	12	0.1	0.25	NRCS	0.02
sapling Doug fir	1	0.3	0.2	0.3%	12	0.0	0.1	NRCS	0.00
RM maple	13	0.5	6.4	13.4%	9	1.2	0.25	NRCS	0.30
serviceberry	4	0.5	1.8	3.8%	5	0.2	0.5	Hitchcock	0.09
ceanothus	15	0.3	4.5	9.5%	3	0.3	0.5	INT-180	0.14
Utah honeysuckle	1	0.7	0.4	0.7%	2	0.0	0.5	INT-180	0.01
chokecherry	4	0.8	3.4	7.2%	7.6	0.5	0.25	NRCS	0.14
scoulers willow	2	0.1	0.2	0.4%	15	0.1	0.25	Brunsfeld	0.02
mtn ash	6	0.5	3.2	6.6%	4	0.3	0.5	UW Burke	0.13
common snowberry	1	0.1	0.1	0.1%	2	0.0	0.5	INT-180	0.00
mtn snowberry	5	0.6	3.1	6.5%	1.5	0.1	0.5	Hitchcock	0.05
graminoid	8	0.3	2.0	4.1%	0.7	0.0	0.25	BPJ	0.01
			47.9			**24.0**			**3.12**
		Average	**63.2**			**17.5**			**2.6**

Table A.3-29. Cool Forest Vegetation Type #1000.

#1000	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PICO/VASC Islandpark									
lodgepole	1	0.2	0.3	2.4%	30	*0.7*	0.1	NRCS	0.07
sapling Doug fir	2	0.3	0.4	3.9%	12	*0.5*	0.1	NRCS	0.05
sapling lodgepole	7	0.6	4.0	37.7%	9	*3.4*	0.1	NRCS	0.34
sapling aspen	1	0.1	0.1	1.3%	12	*0.2*	0.25	NRCS	0.04
serviceberry	2	0.4	1.0	9.0%	5	*0.5*	0.5	Hitchcock	0.23
Utah honeysuckle	11	0.3	3.1	28.7%	2	*0.6*	0.5	INT-180	0.29
willow	5	0.1	0.7	6.5%	6	*0.4*	0.25	BPJ	0.10
scoulers willow	2	0.1	0.3	2.6%	15	*0.4*	0.25	Brunsfeld	0.10
mtn ash	2	0.3	0.4	3.9%	4	*0.2*	0.5	UW Burke	0.08
common snowberry	3	0.1	0.4	3.9%	2	*0.1*	0.5	INT-180	0.04
			10.7			**6.8**			**1.32**
PSME/SYAL Potrmound									
lodgepole	4	0.7	2.6	10.7%	30	*3.2*	0.1	NRCS	0.32
aspen	3	0.7	1.8	7.2%	20	*1.4*	0.25	NRCS	0.36
sapling lodgepole	9	0.7	5.9	24.0%	9	*2.2*	0.1	NRCS	0.22
sapling aspen	10	0.7	6.6	26.7%	12	*3.2*	0.25	NRCS	0.80
serviceberry	3	0.3	1.0	4.0%	5	*0.2*	0.5	Hitchcock	0.10
ceanothus	3	0.3	1.0	4.0%	3	*0.1*	0.5	INT-180	0.06
chokecherry	2	0.7	1.1	4.5%	7.6	*0.3*	0.25	NRCS	0.09
common snowberry	3	1.0	3.0	12.1%	2	*0.2*	0.5	INT-180	0.12
mtn snowberry	3	0.7	1.7	6.7%	1.5	*0.1*	0.5	Hitchcock	0.05
			24.7			**11.0**			**2.12**
		Average	**17.7**			**8.9**			**1.7**

Table A.3-30. Cool Forest Vegetation Type #1140.

#1140	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/THOC Nearl									
subalpine fir	12	0.7	8.0	20.7%	15	*3.1*	0.1	NRCS	0.31
Engelmann spruce	18	0.3	5.9	15.4%	37	*5.7*	0.1	NRCS	0.57
lodgepole	2	0.3	0.5	1.4%	30	*0.4*	0.1	NRCS	0.04
aspen	5	0.3	1.5	3.9%	20	*0.8*	0.25	NRCS	0.20
Doug fir	11	0.8	8.3	21.6%	61	*13.2*	0.1	NRCS	1.32
sapling subalpine fir	4	0.6	2.0	5.1%	4.5	*0.2*	0.1	NRCS	0.02
sapling spruce	7	0.2	1.6	4.1%	9	*0.4*	0.1	NRCS	0.04
sapling aspen	5	0.3	1.7	4.3%	12	*0.5*	0.25	NRCS	0.13
sapling Doug fir	1	0.6	0.6	1.4%	12	*0.2*	0.1	NRCS	0.02
serviceberry	1	0.2	0.2	0.4%	5	*0.0*	0.5	Hitchcock	0.01
Utah honeysuckle	1	0.3	0.2	0.4%	2	*0.0*	0.5	INT-180	0.00
Ribes sp.	4	0.2	0.7	1.9%	1	*0.0*	0.5	BPJ	0.01
elderberry	1	0.2	0.1	0.3%	3	*0.0*	0.5	INT-180	0.00
buffaloberry	1	0.1	0.1	0.1%	3	*0.0*	0.5	FIES/BPJ	0.00
mtn snowberry	1	0.8	1.1	2.8%	1.5	*0.0*	0.5	Hitchcock	0.02
graminoid	24	0.3	6.1	16.0%	0.7	*0.1*	0.25	BPJ	0.03
			38.5			**24.7**			**2.72**

Table A.3-31. Cool Forest Vegetation Type #1149.

#1149	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PSME/CARU, CARU Edgway									
lodgepole	1	0.0	0.0	0.1%	30	*0.0*	0.1	NRCS	0.00
aspen	10	0.3	2.4	4.9%	20	*1.0*	0.25	NRCS	0.25
Doug fir	27	0.9	25.1	51.1%	61	*31.1*	0.1	NRCS	3.11
sapling subalpine fir	1	0.0	0.0	0.0%	4.5	*0.0*	0.1	NRCS	0.00
sapling lodgepole	1	0.1	0.0	0.1%	9	*0.0*	0.1	NRCS	0.00
sapling limber	1	0.1	0.1	0.2%	7.6	*0.0*	0.1	NRCS	0.00
sapling aspen	14	0.4	5.7	11.5%	12	*1.4*	0.25	NRCS	0.35
sapling Doug fir	2	0.7	1.5	3.1%	12	*0.4*	0.1	NRCS	0.04
RM maple	1	0.1	0.0	0.1%	4.6	*0.0*	0.5	NRCS	0.00
serviceberry	1	0.2	0.1	0.2%	5	*0.0*	0.5	Hitchcock	0.01
Utah honeysuckle	1	0.0	0.0	0.0%	2	*0.0*	0.5	INT-180	0.00
chokecherry	1	0.2	0.2	0.4%	7.6	*0.0*	0.25	NRCS	0.01
Ribes sp.	1	0.1	0.0	0.1%	1	*0.0*	0.5	BPJ	0.00
willow	1	0.0	0.0	0.1%	6	*0.0*	0.25	BPJ	0.00
buffaloberry	1	0.0	0.0	0.1%	3	*0.0*	0.5	FIES/BPJ	0.00
mtn ash	1	0.0	0.0	0.0%	4	*0.0*	0.5	UW Burke	0.00
common snowberry	1	0.0	0.0	0.0%	2	*0.0*	0.5	INT-180	0.00
mtn snowberry	5	1.0	4.7	9.6%	1.5	*0.1*	0.5	Hitchcock	0.07
graminoid	47	0.2	9.0	18.4%	0.7	*0.1*	0.25	BPJ	0.03
			49.2			**34.3**			**3.87**

Table A.3-32. Cool Forest Vegetation Type #1150.

#1150	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/CARU, CARU Rhylow									
subalpine fir	7	0.6	4.3	14.1%	15	*2.1*	0.1	NRCS	0.21
RM juniper	1	0.3	0.3	0.9%	15	*0.1*	0.1	NRCS	0.01
lodgepole	5	0.1	0.5	1.5%	30	*0.4*	0.1	NRCS	0.04
limber pine	3	0.2	0.5	1.8%	20	*0.4*	0.1	NRCS	0.04
aspen	15	0.1	1.4	4.4%	20	*0.9*	0.25	NRCS	0.22
Doug fir	18	0.7	13.0	42.0%	61	*25.6*	0.1	NRCS	2.56
sapling subalpine fir	1	0.5	0.3	1.0%	4.5	*0.0*	0.1	NRCS	0.00
sapling aspen	1	0.3	0.2	0.7%	12	*0.1*	0.25	NRCS	0.02
sapling Doug fir	1	0.3	0.1	0.4%	12	*0.1*	0.1	NRCS	0.01
serviceberry	1	0.3	0.1	0.4%	5	*0.0*	0.5	Hitchcock	0.01
twinberry	1	0.1	0.0	0.1%	2	*0.0*	0.5	Hitchcock	0.00
Utah honeysuckle	1	0.5	0.7	2.3%	2	*0.0*	0.5	INT-180	0.02
chokecherry	1	0.2	0.2	0.7%	7.6	*0.1*	0.25	NRCS	0.01
Ribes sp.	2	0.2	0.3	0.9%	1	*0.0*	0.5	BPJ	0.00
mtn ash	1	0.5	0.3	0.9%	4	*0.0*	0.5	UW Burke	0.02
common snowberry	1	0.1	0.1	0.3%	2	*0.0*	0.5	INT-180	0.00
mtn snowberry	2	0.6	1.3	4.1%	1.5	*0.1*	0.5	Hitchcock	0.03
graminoid	32	0.2	7.3	23.5%	0.7	*0.2*	0.25	BPJ	0.04
			30.8			**30.1**			**3.26**

Table A.3-33. Cool Forest Vegetation Type #1228.

#1228	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PSME/CARU, CARU Nopla									
lodgepole	6	0.7	4.4	19.0%	30	*5.7*	0.1	NRCS	0.57
aspen	2	0.1	0.2	0.8%	20	*0.2*	0.25	NRCS	0.04
Doug fir	12	0.7	8.1	34.9%	61	*21.3*	0.1	NRCS	2.13
sapling lodgepole	5	0.7	3.6	15.5%	9	*1.4*	0.1	NRCS	0.14
sapling aspen	5	0.3	1.2	5.3%	12	*0.6*	0.25	NRCS	0.16
sapling Doug fir	4	0.7	2.7	11.7%	12	*1.4*	0.1	NRCS	0.14
serviceberry	1	0.4	0.3	1.2%	5	*0.1*	0.5	Hitchcock	0.03
Utah honeysuckle	1	0.1	0.1	0.3%	2	*0.0*	0.5	INT-180	0.00
chokecherry	1	0.1	0.1	0.3%	7.6	*0.0*	0.25	NRCS	0.00
Ribes sp.	1	0.1	0.0	0.1%	1	*0.0*	0.5	BPJ	0.00
scouler willow	1	0.1	0.0	0.1%	15	*0.0*	0.25	Brunsfeld	0.00
mtn ash	1	0.1	0.1	0.3%	4	*0.0*	0.5	UW Burke	0.01
common snowberry	3	0.3	1.0	4.3%	2	*0.1*	0.5	INT-180	0.04
mtn snowberry	6	0.3	1.4	6.2%	1.5	*0.1*	0.5	Hitchcock	0.05
			23.1			**30.9**			**3.32**

Table A.3-34. Cool Forest Vegetation Type #1575.

#1575	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/CARU, CARU Koffgo									
subalpine fir	2	0.2	0.4	1.7%	15	*0.3*	0.1	NRCS	0.03
lodgepole	5	0.8	3.6	17.4%	30	*5.2*	0.1	NRCS	0.52
Doug fir	10	0.5	5.4	25.8%	61	*15.7*	0.1	NRCS	1.57
sapling subalpine fir	1	0.5	0.4	1.7%	4.5	*0.1*	0.1	NRCS	0.01
sapling whitebark	1	0.1	0.1	0.4%	4.5	*0.0*	0.1	NRCS	0.00
sapling lodgepole	4	1.0	4.2	20.1%	9	*1.8*	0.1	NRCS	0.18
sapling aspen	6	0.4	2.1	10.0%	12	*1.2*	0.25	NRCS	0.30
sapling Doug fir	3	0.8	2.5	12.0%	12	*1.4*	0.1	NRCS	0.14
serviceberry	1	0.4	0.2	1.0%	5	*0.1*	0.5	Hitchcock	0.03
ceanothus	1	0.1	0.0	0.2%	3	*0.0*	0.5	INT-180	0.00
Utah honeysuckle	1	0.7	0.6	3.1%	2	*0.1*	0.5	INT-180	0.03
chokecherry	1	0.1	0.1	0.4%	7.6	*0.0*	0.25	NRCS	0.01
sticky currant	1	0.1	0.0	0.2%	1	*0.0*	0.5	BPJ	0.00
mtn ash	1	0.3	0.2	0.8%	4	*0.0*	0.5	UW Burke	0.02
common snowberry	2	0.2	0.4	1.7%	2	*0.0*	0.5	INT-180	0.02
mtn snowberry	2	0.5	0.7	3.4%	1.5	*0.1*	0.5	Hitchcock	0.03
			20.9			**26.0**			**2.9**
ABLA/VAGL, VAGL Koffgo									
subalpine fir	6	0.7	3.8	10.5%	15	*1.6*	0.1	NRCS	0.16
Engelmann spruce	4	0.2	0.7	1.9%	37	*0.7*	0.1	NRCS	0.07
whitebark pine	1	0.0	0.0	0.1%	15	*0.0*	0.1	NRCS	0.00
lodgepole	7	0.7	4.6	12.7%	30	*3.8*	0.1	NRCS	0.38
Doug fir	12	0.9	10.3	28.2%	61	*17.2*	0.1	NRCS	1.72
sapling subalpine fir	9	0.6	5.6	15.4%	4.5	*0.7*	0.1	NRCS	0.07
sapling spruce	1	0.1	0.1	0.2%	9	*0.0*	0.1	NRCS	0.00
sapling whitebark	2	0.1	0.2	0.5%	4.5	*0.0*	0.1	NRCS	0.00
sapling lodgepole	4	0.6	2.2	6.1%	9	*0.5*	0.1	NRCS	0.05
sapling aspen	4	0.1	0.6	1.5%	12	*0.2*	0.25	NRCS	0.05
sapling Doug fir	4	0.8	3.2	8.7%	12	*1.0*	0.1	NRCS	0.10
RM maple	1	0.1	0.1	0.2%	4.6	*0.0*	0.5	NRCS	0.00
serviceberry	2	0.3	0.6	1.5%	5	*0.1*	0.5	Hitchcock	0.04
Utah honeysuckle	3	1.0	3.0	8.2%	2	*0.2*	0.5	INT-180	0.08
Ribes sp.	1	0.1	0.2	0.5%	1	*0.0*	0.5	BPJ	0.00
scoulers willow	2	0.1	0.2	0.6%	15	*0.1*	0.25	Brunsfeld	0.02
buffaloberry	2	0.2	0.4	1.1%	3	*0.0*	0.5	FIES/BPJ	0.02
mtn ash	1	0.6	0.7	2.0%	4	*0.1*	0.5	UW Burke	0.04
mtn snowberry	1	0.1	0.0	0.1%	1.5	*0.0*	0.5	Hitchcock	0.00
			36.5			**26.3**			**2.81**
		Average	**28.7**			**26.1**			**2.8**

Table A.3-35. Cool Forest Vegetation Type #1594.

#1594	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/VAGL, VAGL Koffgo									
subalpine fir	6	0.7	3.8	9.6%	15	*1.4*	0.1	NRCS	0.14
Engelmann spruce	4	0.2	0.7	1.8%	37	*0.6*	0.1	NRCS	0.06
whitebark pine	1	0.0	0.0	0.0%	15	*0.0*	0.1	NRCS	0.00
lodgepole	7	0.7	4.6	11.5%	30	*3.5*	0.1	NRCS	0.35
Doug fir	12	0.9	10.3	25.7%	61	*15.7*	0.1	NRCS	1.57
sapling subalpine fir	9	0.6	5.6	14.0%	4.5	*0.6*	0.1	NRCS	0.06
sapling spruce	1	0.1	0.1	0.2%	9	*0.0*	0.1	NRCS	0.00
sapling whitebark	2	0.1	0.2	0.5%	4.5	*0.0*	0.1	NRCS	0.00
sapling lodgepole	4	0.6	2.2	5.5%	9	*0.5*	0.1	NRCS	0.05
sapling aspen	4	0.1	0.6	1.4%	12	*0.2*	0.25	NRCS	0.04
sapling Doug fir	4	0.8	3.2	8.0%	12	*1.0*	0.1	NRCS	0.10
RM maple	1	0.1	0.1	0.2%	4.6	*0.0*	0.5	NRCS	0.00
serviceberry	2	0.3	0.6	1.4%	5	*0.1*	0.5	Hitchcock	0.04
Utah honeysuckle	3	1.0	3.0	7.5%	2	*0.1*	0.5	INT-180	0.07
Ribes sp.	1	0.1	0.2	0.4%	1	*0.0*	0.5	BPJ	0.00
scoulers willow	2	0.1	0.2	0.6%	15	*0.1*	0.25	Brunsfeld	0.02
buffaloberry	2	0.2	0.4	1.0%	3	*0.0*	0.5	FIES/BPJ	0.01
mtn ash	1	0.6	0.7	1.8%	4	*0.1*	0.5	UW Burke	0.04
mtn snowberry	1	0.1	0.0	0.1%	1.5	*0.0*	0.5	Hitchcock	0.00
graminoid	19	0.2	3.6	8.9%	0.7	*0.1*	0.25	BPJ	0.02
			40.1			**24.0**			**2.58**

Table A.3-36. Cool Forest Vegetation Type #1597.

#1597	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/SPBE2 Koffgo									
subalpine fir	6	0.6	3.6	8.8%	15	*1.3*	0.1	NRCS	0.13
limber pine	3	0.1	0.2	0.5%	20	*0.1*	0.1	NRCS	0.01
lodgepole	7	0.2	1.4	3.4%	30	*1.0*	0.1	NRCS	0.10
Doug fir	20	1.0	20.1	48.6%	61	*29.6*	0.1	NRCS	2.96
sapling subalpine fir	12	0.6	6.7	16.1%	4.5	*0.7*	0.1	NRCS	0.07
sapling limber	1	0.1	0.1	0.2%	7.6	*0.0*	0.1	NRCS	0.00
sapling lodgepole	12	0.1	1.7	4.1%	9	*0.4*	0.1	NRCS	0.04
sapling aspen	1	0.1	0.0	0.1%	12	*0.0*	0.25	NRCS	0.00
sapling Doug fir	4	0.9	3.1	7.4%	12	*0.9*	0.1	NRCS	0.09
RM maple	1	0.6	0.3	0.8%	4.6	*0.0*	0.5	NRCS	0.02
serviceberry	1	0.3	0.2	0.4%	5	*0.0*	0.5	Hitchcock	0.01
ceanothus	2	0.1	0.1	0.3%	3	*0.0*	0.5	INT-180	0.01
common juniper	1	0.1	0.0	0.1%	3	*0.0*	0.5	NRCS	0.00
Utah honeysuckle	2	0.6	1.2	2.9%	2	*0.1*	0.5	INT-180	0.03
chokecherry	2	0.2	0.4	1.0%	7.6	*0.1*	0.25	NRCS	0.02
Ribes sp.	1	0.2	0.2	0.4%	1	*0.0*	0.5	BPJ	0.00
buffaloberry	2	0.3	0.5	1.2%	3	*0.0*	0.5	FIES/BPJ	0.02
mtn ash	1	0.1	0.1	0.2%	4	*0.0*	0.5	UW Burke	0.00
mtn snowberry	2	0.6	1.5	3.6%	1.5	*0.1*	0.5	Hitchcock	0.03
			41.4			**34.4**			**3.54**

Table A.3-37. Cool Forest Vegetation Type #1700.

#1700	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PICO Perfa									
lodgepole	9	0.6	5.4	12.8%	30	*3.9*	0.1	NRCS	0.39
sapling lodgepole	30	0.8	24.1	57.3%	9	*5.2*	0.1	NRCS	0.52
sapling limber	1	0.2	0.1	0.2%	7.6	*0.0*	0.1	NRCS	0.00
sapling aspen	4	0.4	1.7	4.0%	12	*0.5*	0.25	NRCS	0.12
twinberry	1	0.2	0.1	0.2%	2	*0.0*	0.5	Hitchcock	0.00
Utah honeysuckle	1	0.2	0.1	0.2%	2	*0.0*	0.5	INT-180	0.00
Bebbs willow	3	0.4	1.1	2.6%	4.6	*0.1*	0.5	Brunsfeld	0.06
scoulers willow	2	0.4	0.6	1.4%	15	*0.2*	0.25	Brunsfeld	0.05
common snowberry	1	0.2	0.1	0.2%	2	*0.0*	0.5	INT-180	0.00
grass	30	0.3	8.8	20.9%	0.7	*0.1*	0.25	BPJ	0.04
			42.0			**10.0**			**1.2**
ABLA/VASC, CARU Koffgo									
lodgepole	16	0.8	11.8	36.2%	30	*10.9*	0.1	NRCS	1.09
sapling lodgepole	10	0.8	7.8	24.0%	9	*2.2*	0.1	NRCS	0.22
sapling limber	1	0.1	0.0	0.1%	7.6	*0.0*	0.1	NRCS	0.00
sapling Doug fir	2	0.4	0.7	2.0%	12	*0.2*	0.1	NRCS	0.02
serviceberry	1	0.1	0.1	0.2%	5	*0.0*	0.5	Hitchcock	0.00
Utah honeysuckle	1	0.3	0.4	1.2%	2	*0.0*	0.5	INT-180	0.01
willow	1	0.1	0.0	0.1%	6	*0.0*	0.25	BPJ	0.00
scoulers willow	2	0.3	0.4	1.2%	15	*0.2*	0.25	Brunsfeld	0.05
grass	54	0.2	11.3	34.9%	0.7	*0.2*	0.25	BPJ	0.06
			32.5			**13.7**			**1.45**
		Average	**37.3**			**11.9**			**1.3**

Table A.3-38. Cool Forest Vegetation Type #1720.

#1720	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/VAGL, VAGL Flagstone									
lodgepole	13	0.4	5.5	17.4%	30	*5.2*	0.1	NRCS	0.52
subalpine fir	1	0.1	0.1	0.2%	15	*0.0*	0.1	NRCS	0.00
Doug fir	12	0.3	3.0	9.6%	61	*5.9*	0.1	NRCS	0.59
sapling lodgepole	8	0.4	2.8	8.8%	9	*0.8*	0.1	NRCS	0.08
sapling subalpine fir	1	0.1	0.1	0.2%	4.5	*0.0*	0.1	NRCS	0.00
sapling whitebark	2	0.1	0.1	0.2%	4.5	*0.0*	0.1	NRCS	0.00
sapling aspen	3	0.2	0.5	1.7%	12	*0.2*	0.25	NRCS	0.05
sapling Doug fir	4	0.4	1.5	4.8%	12	*0.6*	0.1	NRCS	0.06
serviceberry	1	0.1	0.1	0.3%	5	*0.0*	0.5	Hitchcock	0.01
ceanothus	2	0.1	0.1	0.3%	3	*0.0*	0.5	INT-180	0.00
chokecherry	5	0.1	0.3	0.8%	7.6	*0.1*	0.25	NRCS	0.02
Utah honeysuckle	7	0.7	5.3	17.0%	2	*0.3*	0.5	INT-180	0.17
willow	3	0.2	0.5	1.7%	6	*0.1*	0.25	BPJ	0.03
scoulers willow	2	0.2	0.3	1.1%	15	*0.2*	0.25	Brunsfeld	0.04
mtn ash	2	0.4	0.8	2.4%	4	*0.1*	0.5	UW Burke	0.05
common snowberry	2	0.1	0.2	0.5%	2	*0.0*	0.5	INT-180	0.00
mtn snowberry	5	0.1	0.5	1.7%	1.5	*0.0*	0.5	Hitchcock	0.01
grass	65	0.2	9.8	31.2%	0.7	*0.2*	0.25	BPJ	0.05
			31.4			**13.8**			**1.7**
ABLA/VASC, CARU Koffgo									
lodgepole	16	0.8	11.8	36.2%	30	*10.9*	0.1	NRCS	1.09
sapling lodgepole	10	0.8	7.8	24.0%	9	*2.2*	0.1	NRCS	0.22
sapling limber	1	0.1	0.0	0.1%	7.6	*0.0*	0.1	NRCS	0.00
sapling Doug fir	2	0.4	0.7	2.0%	12	*0.2*	0.1	NRCS	0.02
serviceberry	1	0.1	0.1	0.2%	5	*0.0*	0.5	Hitchcock	0.00
Utah honeysuckle	1	0.3	0.4	1.2%	2	*0.0*	0.5	INT-180	0.01
willow	1	0.1	0.0	0.1%	6	*0.0*	0.25	BPJ	0.00
scoulers willow	2	0.3	0.4	1.2%	15	*0.2*	0.25	Brunsfeld	0.05
grass	54	0.2	11.3	34.9%	0.7	*0.2*	0.25	BPJ	0.06
			32.5			**13.7**			**1.45**
		Average	**31.9**			**13.8**			**1.6**

Table A.3-39. Cold, Moist Forest Vegetation Type #1225.

#1225	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PIAL Lasac									
whitebark pine	1	0.4	0.3	0.9%	15	*0.1*	0.1	INT-180	0.01
lodgepole	12	1.0	12.2	37.7%	30	*11.3*	0.1	NRCS	1.13
Doug fir	3	0.1	0.4	1.1%	61	*0.7*	0.1	NRCS	0.07
sapling subalpine fir	1	0.3	0.2	0.5%	4.5	*0.0*	0.1	NRCS	0.00
sapling whitebark	1	0.8	0.8	2.3%	4.5	*0.1*	0.1	BPJ	0.01
sapling lodgepole	5	1.0	5.1	15.8%	9	*1.4*	0.1	NRCS	0.14
sapling Doug fir	1	0.5	0.5	1.5%	12	*0.2*	0.1	NRCS	0.02
serviceberry	1	0.4	0.2	0.7%	5	*0.0*	0.5	Hitchcock	0.02
ceanothus	1	0.4	0.2	0.7%	3	*0.0*	0.5	INT-180	0.01
common juniper	1	0.1	0.1	0.2%	3	*0.0*	0.5	NRCS	0.00
Utah honeysuckle	1	0.8	0.8	2.5%	2	*0.1*	0.5	INT-180	0.03
Ribes sp.	2	0.3	0.4	1.2%	1	*0.0*	0.5	FIES/BPJ	0.01
scoulers willow	1	0.1	0.1	0.4%	15	*0.1*	0.25	Brunsfeld	0.01
mtn ash	1	0.6	0.7	2.1%	4	*0.1*	0.5	UW Burke	0.04
graminoid	20	0.5	10.5	32.4%	0.7	*0.2*	0.25	BPJ	0.06
			32.4			**14.3**			**1.6**
ABLA/VASC, VASC Castan									
lodgepole	10	0.8	7.8	23.2%	30	*7.0*	0.1	NRCS	0.70
sapling subalpine fir	2	0.4	0.6	1.8%	4.5	*0.1*	0.1	NRCS	0.01
sapling whitebark	2	0.4	0.7	2.0%	4.5	*0.1*	0.1	BPJ	0.01
sapling lodgepole	9	1.0	8.6	25.7%	9	*2.3*	0.1	NRCS	0.23
sapling Doug fir	1	0.8	1.0	3.1%	12	*0.4*	0.1	NRCS	0.04
Rky Mtn maple	1	0.2	0.1	0.3%	9	*0.0*	0.25	NRCS	0.01
Mtn alder	1	0.2	0.1	0.3%	5	*0.0*	0.5	NRCS	0.01
serviceberry	2	0.2	0.4	1.2%	5	*0.1*	0.5	Hitchcock	0.03
common juniper	1	0.2	0.1	0.3%	3	*0.0*	0.5	NRCS	0.00
Utah honeysuckle	3	0.8	2.4	7.2%	2	*0.1*	0.5	INT-180	0.07
Ribes sp.	2	0.3	0.5	1.3%	1	*0.0*	0.5	FIES/BPJ	0.01
willow	1	0.2	0.1	0.3%	6	*0.0*	0.25	Brunsfeld	0.00
scoulers willow	1	0.2	0.1	0.3%	15	*0.0*	0.25	Brunsfeld	0.01
buffaloberry	1	0.2	0.1	0.3%	3	*0.0*	0.5	FIES/BPJ	0.00
mtn ash	1	0.4	0.3	0.8%	4	*0.0*	0.5	UW Burke	0.02
graminoid	18	0.6	10.7	31.9%	0.7	*0.2*	0.25	BPJ	0.06
			33.5			**10.4**			**1.20**
		Average	**32.9**			**12.4**			**1.4**

Table A.3-40. Cold, Moist Forest Vegetation Type #1573.

#1573	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/VASC Oleo									
subalpine fir	2	0.7	1.2	2.7%	15	*0.4*	0.1	NRCS	0.04
whitebark pine	1	0.1	0.1	0.2%	15	*0.0*	0.1	INT-180	0.00
lodgepole	11	1.0	11.4	26.1%	30	*7.8*	0.1	NRCS	0.78
sapling subalpine fir	5	0.7	3.6	8.3%	4.5	*0.4*	0.1	NRCS	0.04
sapling whitebark	2	0.7	1.2	2.7%	4.5	*0.1*	0.1	BPJ	0.01
sapling lodgepole	10	1.0	9.8	22.4%	9	*2.0*	0.1	NRCS	0.20
sapling Doug fir	1	0.3	0.2	0.5%	12	*0.1*	0.1	NRCS	0.01
serviceberry	1	0.1	0.1	0.1%	5	*0.0*	0.5	Hitchcock	0.00
Utah honeysuckle	2	0.7	1.6	3.7%	2	*0.1*	0.5	INT-180	0.04
scoulers willow	1	0.2	0.1	0.2%	15	*0.0*	0.25	Brunsfeld	0.01
mtn ash	1	0.2	0.2	0.5%	4	*0.0*	0.5	UW Burke	0.01
graminoid	19	0.7	14.2	32.4%	0.7	*0.2*	0.25	BPJ	0.06
			43.7			**11.2**			**1.2**
PIAL/CARO5, PICO Lasac									
lodgepole	11	1.0	10.6	46.0%	30	*13.8*	0.1	NRCS	1.38
whitebark pine	1	0.5	0.5	2.2%	15	*0.3*	0.1	INT-180	0.03
sapling subalpine fir	1	0.3	0.3	1.1%	4.5	*0.0*	0.1	NRCS	0.00
sapling whitebark	2	1.0	1.5	6.5%	4.5	*0.3*	0.1	BPJ	0.03
sapling lodgepole	3	1.0	2.7	11.7%	9	*1.1*	0.1	NRCS	0.11
graminoid	13	0.6	7.5	32.5%	0.7	*0.2*	0.25	BPJ	0.06
			23.0			**15.8**			**1.61**
		Average	**33.4**			**13.5**			**1.4**

Table A.3-41. Cold, Moist Forest Vegetation Type #1570.

#1570	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/VASC, VASC Dashiki									
subalpine fir	2	0.5	0.8	2.2%	15	*0.3*	0.1	NRCS	0.03
lodgepole	11	0.8	8.5	25.1%	30	*7.5*	0.1	NRCS	0.75
sapling subalpine fir	4	0.5	1.8	5.2%	4.5	*0.2*	0.1	NRCS	0.02
sapling whitebark	2	0.5	0.8	2.2%	4.5	*0.1*	0.1	BPJ	0.01
sapling lodgepole	15	1.0	14.5	42.9%	9	*3.9*	0.1	NRCS	0.39
sapling Doug fir	4	0.3	1.0	3.0%	12	*0.4*	0.1	NRCS	0.04
graminoid	15	0.4	6.6	19.4%	0.7	*0.1*	0.25	BPJ	0.03
			33.8			**12.5**			**1.3**
PIAL/CARO5, PICO Lasac									
lodgepole	11	1.0	10.6	46.0%	30	*13.8*	0.1	NRCS	1.38
whitebark pine	1	0.5	0.5	2.2%	15	*0.3*	0.1	INT-180	0.03
sapling subalpine fir	1	0.3	0.3	1.1%	4.5	*0.0*	0.1	NRCS	0.00
sapling whitebark	2	1.0	1.5	6.5%	4.5	*0.3*	0.1	BPJ	0.03
sapling lodgepole	3	1.0	2.7	11.7%	9	*1.1*	0.1	NRCS	0.11
graminoid	13	0.6	7.5	32.5%	0.7	*0.2*	0.25	BPJ	0.06
			23.0			**15.8**			**1.61**
		Average	**28.4**			**14.1**			**1.4**

Table A.3-42. Riparian Vegetation Type #2000.

#2000	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Graminoid cryaquolls									
Geyers willow	1	0.3	0.2	0.6%	6	*0.0*	0.25	Brunsfeld	0.01
Grass sp.	68	0.4	29.1	99.4%	0.7	*0.7*	0.25	FIES/BPJ	0.17
			29.2			**0.7**			**0.2**

Table A.3-43. Riparian Vegetation Type #2020.

#2020	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Graminoid Chickreek									
sapling lodgepole	1	0.3	0.1	0.5%	9	*0.0*	0.1	NRCS	0.00
bog birch	1	0.3	0.1	0.5%	3	*0.0*	0.5	INT-180	0.01
yellow willow	1	0.5	0.4	1.4%	6	*0.1*	0.25	Brunsfeld	0.02
wolfs willow	1	0.3	0.3	1.0%	1	*0.0*	0.5	Brunsfeld	0.01
Grass sp.	42	0.6	23.5	96.5%	0.7	*0.7*	0.25	FIES/BPJ	0.17
			24.4			**0.8**			**0.2**
Salix/Graminoid Tepete									
bog birch	20	0.7	13.2	14.5%	3	*0.4*	0.25	INT-180	0.11
Geyers willow	10	0.3	3.3	3.6%	6	*0.2*	0.25	Brunsfeld	0.05
Booths willow	2	0.3	0.7	0.7%	6	*0.0*	0.25	Brunsfeld	0.01
willow sp.	35	0.3	11.6	12.7%	6	*0.8*	0.25	Brunsfeld	0.19
coyote willow	1	0.7	0.3	0.4%	8	*0.0*	0.25	Brunsfeld	0.01
plainleaf willow	25	0.3	8.3	9.1%	4	*0.4*	0.5	Brunsfeld	0.18
wolfs willow	1	0.3	0.3	0.4%	1	*0.0*	0.5	Brunsfeld	0.00
Grass sp.	113	0.5	53.1	58.5%	0.7	*0.4*	0.25	FIES/BPJ	0.10
			90.7			**2.3**			**0.66**
		Average	**57.6**			**1.6**			**0.4**

Table A.3-44. Riparian Vegetation Type #2040.

#2040	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PICO Perfa									
lodgepole	9	0.6	5.4	12.8%	30	*3.9*	0.1	NRCS	0.39
sapling lodgepole	30	0.8	24.1	57.3%	9	*5.2*	0.1	NRCS	0.52
sapling limber	1	0.2	0.1	0.2%	7.6	*0.0*	0.1	NRCS	0.00
sapling aspen	4	0.4	1.7	4.0%	12	*0.5*	0.25	NRCS	0.12
twinberry	1	0.2	0.1	0.2%	2	*0.0*	0.5	Hitchcock	0.00
Utah honeysuckle	1	0.2	0.1	0.2%	2	*0.0*	0.5	INT-180	0.00
Bebbs willow	3	0.4	1.1	2.6%	4.6	*0.1*	0.5	Brunsfeld	0.06
scoulers willow	2	0.4	0.6	1.4%	15	*0.2*	0.25	Brunsfeld	0.05
common snowberry	1	0.2	0.1	0.2%	2	*0.0*	0.5	INT-180	0.00
grass	30	0.3	8.8	20.9%	0.7	*0.1*	0.25	BPJ	0.04
			42.0			**10.0**			**1.2**
ABLA/CACA4, CACA4 Bootjack									
lodgepole	9	0.7	5.9	11.7%	30	*3.5*	0.1	NRCS	0.35
sapling lodgepole	15	1.0	15.0	29.5%	9	*2.7*	0.1	NRCS	0.27
sapling aspen	1	0.3	0.3	0.6%	12	*0.1*	0.1	NRCS	0.01
twinberry	1	0.3	0.3	0.6%	2	*0.0*	0.5	Hitchcock	0.01
Bebbs willow	8	0.3	2.6	5.2%	4.6	*0.2*	0.5	Brunsfeld	0.12
coyote willow	1	0.3	0.3	0.6%	8	*0.1*	0.25	Brunsfeld	0.01
scoulers willow	1	0.3	0.2	0.3%	15	*0.0*	0.25	Brunsfeld	0.01
grass	51	0.5	26.1	51.3%	0.7	*0.4*	0.25	BPJ	0.09
			50.8			**7.0**			**0.87**
		Average	**46.4**			**8.5**			**1.0**

Table A.3-45. Riparian Vegetation Type #2604.

#2604	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PIEN/GATR3 Cryofluvents									
subalpine fir	1	0.2	0.2	0.4%	15	*0.1*	0.1	NRCS	0.01
RM juniper	8	0.2	1.6	3.5%	15	*0.5*	0.1	NRCS	0.05
Engelmann spruce	10	0.2	2.0	4.4%	37	*1.6*	0.1	NRCS	0.16
narrowleaf cottonwood	15	1.0	15.0	32.7%	18	*5.9*	0.25	NRCS	1.47
Doug fir	14	0.6	8.2	17.8%	61	*10.9*	0.1	NRCS	1.09
sapling RM juniper	3	0.6	1.5	3.3%	7.6	*0.2*	0.1	NRCS	0.02
sapling E. spruce	1	0.2	0.1	0.2%	9	*0.0*	0.1	NRCS	0.00
sapling nlf cottonwood	1	0.6	0.7	1.4%	9	*0.1*	0.25	BPJ	0.03
sapling Doug fir	1	0.2	0.2	0.4%	12	*0.1*	0.1	NRCS	0.01
RM maple	2	0.4	0.6	1.3%	4.6	*0.1*	0.5	NRCS	0.03
serviceberry	1	0.6	0.6	1.3%	5	*0.1*	0.5	Hitchcock	0.03
water birch	10	0.2	2.0	4.4%	15	*0.7*	0.25	NRCS	0.16
dogwood	3	1.0	3.4	7.4%	4	*0.3*	0.5	Hitchcock	0.15
hawthorn	1	0.4	0.2	0.4%	6.1	*0.0*	0.25	NRCS	0.01
silverberry	6	0.4	2.5	5.4%	4	*0.2*	0.5	Hitchcock	0.11
chokecherry	9	0.4	3.6	7.8%	7.6	*0.6*	0.5	NRCS	0.30
Ribes sp.	2	0.4	0.8	1.7%	1	*0.0*	0.5	FIES/BPJ	0.01
yellow willow	1	0.2	0.2	0.4%	6	*0.0*	0.25	Brunsfeld	0.01
common snowberry	3	0.8	2.6	5.6%	2	*0.1*	0.5	INT-180	0.06
			45.9			**21.5**			**3.70**

Table A.3-46. Riparian Vegetation Type #2606.

#2606	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Salix/Gram cryaquolls									
sapling aspen	2	0.1	0.3	0.6%	12	*0.1*	0.25	NRCS	0.02
sapling Doug fir	1	0.1	0.0	0.1%	12	*0.0*	0.1	NRCS	0.00
Mtn alder	4	0.1	0.5	1.2%	5	*0.1*	0.5	NRCS	0.03
water birch	0	0.1	0.0	0.0%	15	*0.0*	0.25	NRCS	0.00
dogwood	1	0.1	0.0	0.1%	4	*0.0*	0.5	Hitchcock	0.00
Ribes sp.	1	0.2	0.1	0.3%	1	*0.0*	0.5	Hitchcock	0.00
Bebbs willow	2	0.1	0.1	0.3%	4.6	*0.0*	0.5	Brunsfeld	0.01
Booths willow	23	0.7	17.1	38.3%	6	*2.3*	0.25	Brunsfeld	0.57
Drummonds willow	15	0.3	3.8	8.6%	4	*0.3*	0.5	Brunsfeld	0.17
coyote willow	5	0.1	0.7	1.5%	8	*0.1*	0.25	Brunsfeld	0.03
wolfs willow	1	0.1	0.1	0.1%	1	*0.0*	0.5	Brunsfeld	0.00
twinberry	1	0.3	0.2	0.4%	2	*0.0*	0.5	Hitchcock	0.00
mtn snowberry	1	0.1	0.1	0.1%	1.5	*0.0*	0.5	Hitchcock	0.00
grass	114	0.2	21.6	48.5%	0.7	*0.3*	0.25	BPJ	0.08
			44.6			**3.3**			**0.9**
Salix/Gram cryaquolls, poorly drained									
sapling aspen	1	0.2	0.3	0.3%	12	*0.0*	0.25	NRCS	0.01
sapling lodgepole	1	0.1	0.1	0.1%	9	*0.0*	0.1	NRCS	0.00
lodgepole	1	0.1	0.1	0.1%	30	*0.0*	0.1	NRCS	0.00
dogwood	1	0.1	0.1	0.1%	4	*0.0*	0.5	Hitchcock	0.00
Ribes sp.	2	0.2	0.3	0.4%	1	*0.0*	0.5	Hitchcock	0.00
Geyers willow	24	0.7	16.0	20.3%	6	*1.2*	0.25	Brunsfeld	0.30
Booths willow	25	0.4	11.0	13.9%	6	*0.8*	0.25	Brunsfeld	0.21
Drummonds willow	10	0.1	1.1	1.4%	4	*0.1*	0.5	Brunsfeld	0.03
coyote willow	10	0.2	2.2	2.8%	8	*0.2*	0.25	Brunsfeld	0.06
Lemmons willow	25	0.1	2.8	3.5%	3	*0.1*	0.5	Brunsfeld	0.05
twinberry	1	0.2	0.1	0.1%	2	*0.0*	0.5	Hitchcock	0.00
grass	215	0.2	45.1	56.9%	0.7	*0.4*	0.25	BPJ	0.10
			79.1			**2.9**			**0.77**
		Average	**61.9**			**3.1**			**0.8**

Table A.3-47. Riparian Vegetation Type #2608.

#2608	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
Salix/Gram cryaquolls, poorly drained									
sapling aspen	1	0.2	0.3	0.3%	12	*0.0*	0.25	NRCS	0.01
sapling lodgepole	1	0.1	0.1	0.1%	9	*0.0*	0.1	NRCS	0.00
lodgepole	1	0.1	0.1	0.1%	30	*0.0*	0.1	NRCS	0.00
dogwood	1	0.1	0.1	0.1%	4	*0.0*	0.5	Hitchcock	0.00
Ribes sp.	2	0.2	0.3	0.4%	1	*0.0*	0.5	Hitchcock	0.00
Geyers willow	24	0.7	16.0	20.3%	6	*1.2*	0.25	Brunsfeld	0.30
Booths willow	25	0.4	11.0	13.9%	6	*0.8*	0.25	Brunsfeld	0.21
Drummonds willow	10	0.1	1.1	1.4%	4	*0.1*	0.5	Brunsfeld	0.03
coyote willow	10	0.2	2.2	2.8%	8	*0.2*	0.25	Brunsfeld	0.06
Lemmons willow	25	0.1	2.8	3.5%	3	*0.1*	0.5	Brunsfeld	0.05
twinberry	1	0.2	0.1	0.1%	2	*0.0*	0.5	Hitchcock	0.00
grass	215	0.2	45.1	56.9%	0.7	*0.4*	0.25	BPJ	0.10
			79.1			**2.9**			**0.8**
ABLA/CACA4, CACA4 Bootjack									
lodgepole	9	0.7	5.9	11.7%	30	*3.5*	0.1	NRCS	0.35
sapling lodgepole	15	1.0	15.0	29.5%	9	*2.7*	0.1	NRCS	0.27
sapling aspen	1	0.3	0.3	0.6%	12	*0.1*	0.1	NRCS	0.01
twinberry	1	0.3	0.3	0.6%	2	*0.0*	0.5	Hitchcock	0.01
Bebbs willow	8	0.3	2.6	5.2%	4.6	*0.2*	0.5	Brunsfeld	0.12
coyote willow	1	0.3	0.3	0.6%	8	*0.1*	0.25	Brunsfeld	0.01
scoulers willow	1	0.3	0.2	0.3%	15	*0.0*	0.25	Brunsfeld	0.01
grass	51	0.5	26.1	51.3%	0.7	*0.4*	0.25	BPJ	0.09
			50.8			**7.0**			**0.87**
		Average	**65.0**			**4.9**			**0.8**

Table A.3-48. Riparian Vegetation Type #2609.

#2609	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PIEN/EQAR									
subalpine fir	3	0.5	1.7	6.5%	15	*1.0*	0.1	NRCS	0.10
Engelmann spruce	15	0.8	12.1	47.9%	37	*17.7*	0.1	NRCS	1.77
lodgepole	7	0.2	1.1	4.4%	30	*1.3*	0.1	NRCS	0.13
sapling subalpine fir	1	0.7	0.8	3.1%	4.5	*0.1*	0.1	NRCS	0.01
sapling E. spruce	3	0.7	2.0	7.8%	9	*0.7*	0.1	NRCS	0.07
mtn alder	3	0.3	1.1	4.2%	5	*0.2*	0.5	Hitchcock	0.10
serviceberry	3	0.3	0.9	3.5%	5	*0.2*	0.5	Hitchcock	0.09
dogwood	1	0.3	0.2	0.7%	4	*0.0*	0.5	Hitchcock	0.01
Utah honeysuckle	1	0.8	0.5	2.0%	2	*0.0*	0.5	INT-180	0.02
twinberry	6	0.2	1.0	3.8%	2	*0.1*	0.5	Hitchcock	0.04
chokecherry	1	0.2	0.1	0.3%	7.6	*0.0*	0.25	NRCS	0.01
Ribes sp.	2	0.5	0.8	3.2%	1	*0.0*	0.5	FIES/BPJ	0.02
Drummonds willow	6	0.3	1.8	7.2%	4	*0.3*	0.5	Brunsfeld	0.14
planeleaf willow	2	0.3	0.7	2.6%	4	*0.1*	0.5	Brunsfeld	0.05
buffaloberry	1	0.2	0.1	0.3%	3	*0.0*	0.5	FIES/BPJ	0.00
mtn ash	1	0.7	0.4	1.6%	4	*0.1*	0.5	UW Burke	0.03
mtn snowberry	1	0.3	0.2	0.9%	1.5	*0.0*	0.5	Hitchcock	0.01
			25.3			**21.9**			**2.6**
PIEN/GATR3									
subalpine fir	2	0.1	0.2	0.4%	15	*0.1*	0.1	NRCS	0.01
Engelmann spruce	17	1.0	17.1	44.6%	37	*16.5*	0.1	NRCS	1.65
Doug fir	13	0.1	1.3	3.4%	61	*2.1*	0.1	NRCS	0.21
sapling subalpine fir	3	0.3	0.8	2.0%	4.5	*0.1*	0.1	NRCS	0.01
sapling E. spruce	2	0.8	1.4	3.8%	9	*0.3*	0.1	NRCS	0.03
sapling Doug fir	1	0.1	0.1	0.1%	12	*0.0*	0.1	NRCS	0.00
serviceberry	1	0.4	0.2	0.5%	5	*0.0*	0.5	Hitchcock	0.01
dogwood	8	0.4	3.2	8.3%	4	*0.3*	0.5	Hitchcock	0.17
Utah honeysuckle	1	0.4	0.2	0.6%	2	*0.0*	0.5	INT-180	0.01
twinberry	3	0.2	0.5	1.3%	2	*0.0*	0.5	Hitchcock	0.01
Bebbs willow	17	0.3	5.1	13.4%	4.6	*0.6*	0.5	Brunsfeld	0.31
Ribes sp.	5	0.4	1.6	4.2%	1	*0.0*	0.5	FIES/BPJ	0.02
Drummonds willow	20	0.1	2.0	5.2%	4	*0.2*	0.5	Brunsfeld	0.10
Booths willow	25	0.1	2.5	6.5%	6	*0.4*	0.25	Brunsfeld	0.10
Geyers willow	8	0.2	1.6	4.2%	6	*0.3*	0.25	Brunsfeld	0.06
whiplash willow	1	0.1	0.1	0.1%	16	*0.0*	0.25	Brunsfeld	0.01
yellow willow	1	0.1	0.1	0.3%	6	*0.0*	0.25	Brunsfeld	0.00
buffaloberry	1	0.1	0.1	0.1%	3	*0.0*	0.5	FIES/BPJ	0.00
elderberry	0	0.1	0.0	0.0%	3	*0.0*	0.5	INT-180	0.00
mtn ash	1	0.2	0.1	0.3%	4	*0.0*	0.5	UW Burke	0.01
common snowberry	1	0.1	0.1	0.1%	2	*0.0*	0.5	INT-180	0.00
mtn snowberry	1	0.4	0.2	0.6%	1.5	*0.0*	0.5	Hitchcock	0.00
			38.4			**21.0**			**2.72**
		Average	**31.8**			**21.5**			**2.7**

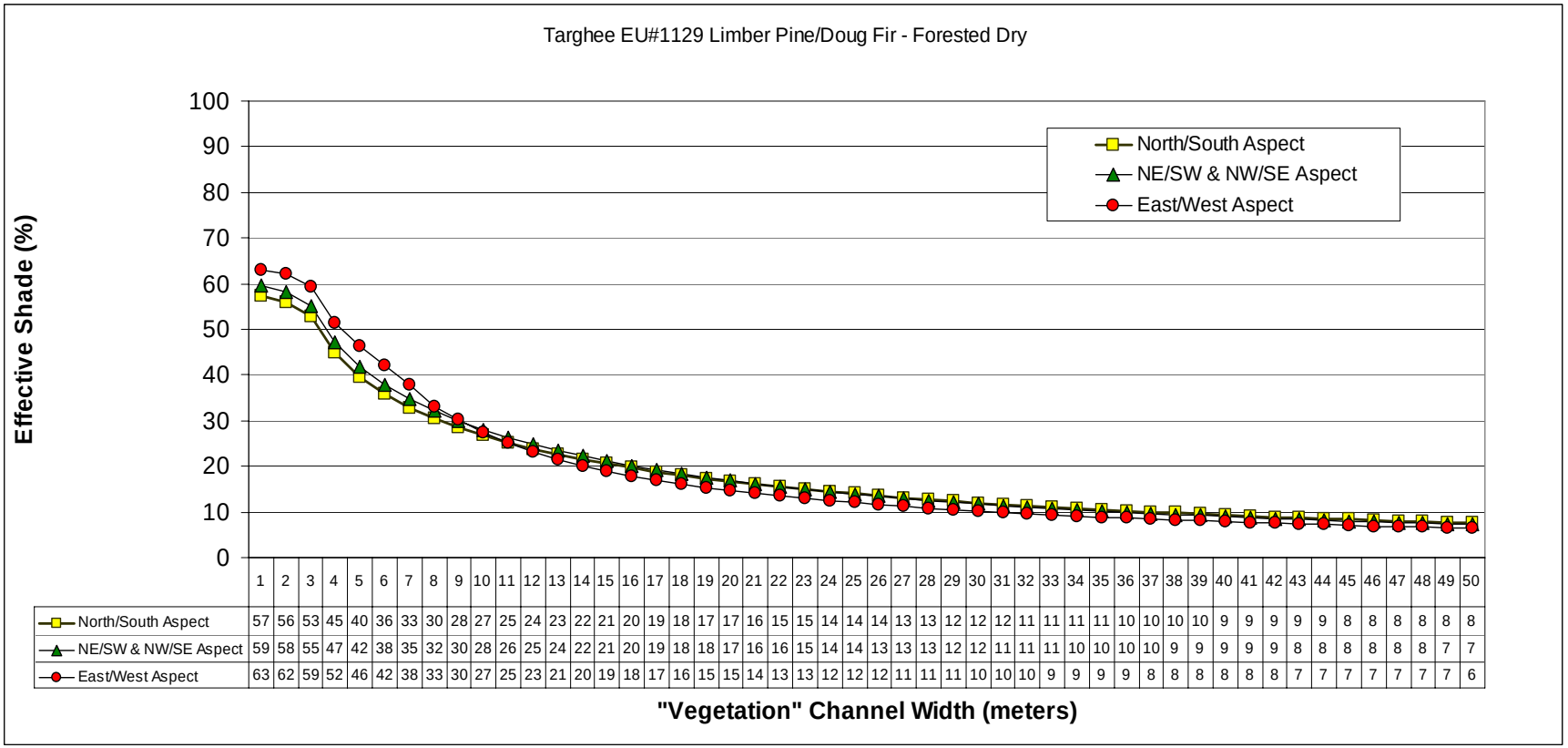
Table A.3-49. Douglas fir/Sagebrush Ecotone Vegetation Type #1760.

#1760	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PSME/ARTRV Fourme									
Limber pine sapling	2	0.5	1.0	2.1%	7.6	*0.2*	0.1	NRCS	0.02
Doug fir sapling	2	0.5	0.8	1.5%	12	*0.2*	0.1	NRCS	0.02
subalpine fir	1	0.5	0.3	0.5%	15	*0.1*	0.1	NRCS	0.01
Doug fir	10	0.5	4.8	9.8%	61	*6.0*	0.1	NRCS	0.60
mtn snowberry	12	1.0	11.5	23.7%	1.5	*0.4*	0.5	Hitchcock	0.18
serviceberry	1	1.0	0.7	1.4%	5	*0.1*	0.5	Hitchcock	0.04
mtn big sagebrush	6	1.0	6.2	12.8%	0.5	*0.1*	0.5	Hitchcock	0.03
utah honeysuckle	1	0.5	0.3	0.5%	2	*0.0*	0.5	INT-180	0.01
ribes sp	1	0.5	0.3	0.5%	1	*0.0*	0.5	BPJ	0.00
grass	40	0.6	22.9	47.2%	0.7	*0.3*	0.25	BPJ	0.08
			48.6			**7.2**			**1.0**
shrub portion									
rabbitbrush	5	0.3	1.3	2.6%	1.5	*0.0*	0.5	Hitchcock	0.02
potentilla	1	0.3	0.3	0.5%	0.5	*0.0*	0.5	INT-180	0.00
mtn big sagebrush	28	1.0	27.5	56.6%	0.5	*0.3*	0.5	Hitchcock	0.14
buffaloberry	1	0.3	0.1	0.3%	3	*0.0*	0.5	FEIS/BPJ	0.00
mtn snowberry	12	0.3	3.0	6.2%	1.5	*0.1*	0.5	Hitchcock	0.05
grass	55	0.4	22.9	47.1%	0.7	*0.3*	0.25	BPJ	0.08
			55.0			**0.8**			**0.3**
		Average	**51.8**			**4.0**			**0.6**

Species = plant species included in the development of a community's shade curve.
Ave CC = Average canopy cover for each species.
CC*Const = Average canopy cover for an individual species times its constancy value.
Relative Proportion = an individual species portion of the total cover times constancy value.
Height = mature height for each species determined from literature values or best professional judgment.
H*RP = height for an individual species times its relative proportion.
Overhang = branch overhang percent of height based on plant type and size; conifers = 10%, deciduous trees and tall shrubs (>5m) = 25%, low shrubs = 50%.
Source = literature source for each species mature height.
Wt Overhang = branch overhang distance for each species determined from a percentage of its height.

Total = the overall weighted canopy cover is the sum of the CC*Const column, the overall weighted height is the sum of the H*RP column, the overall weighted overhang is the sum of the Wt Overhang column.

Figure A.3-21. Dry Forest Vegetation Type #1129.



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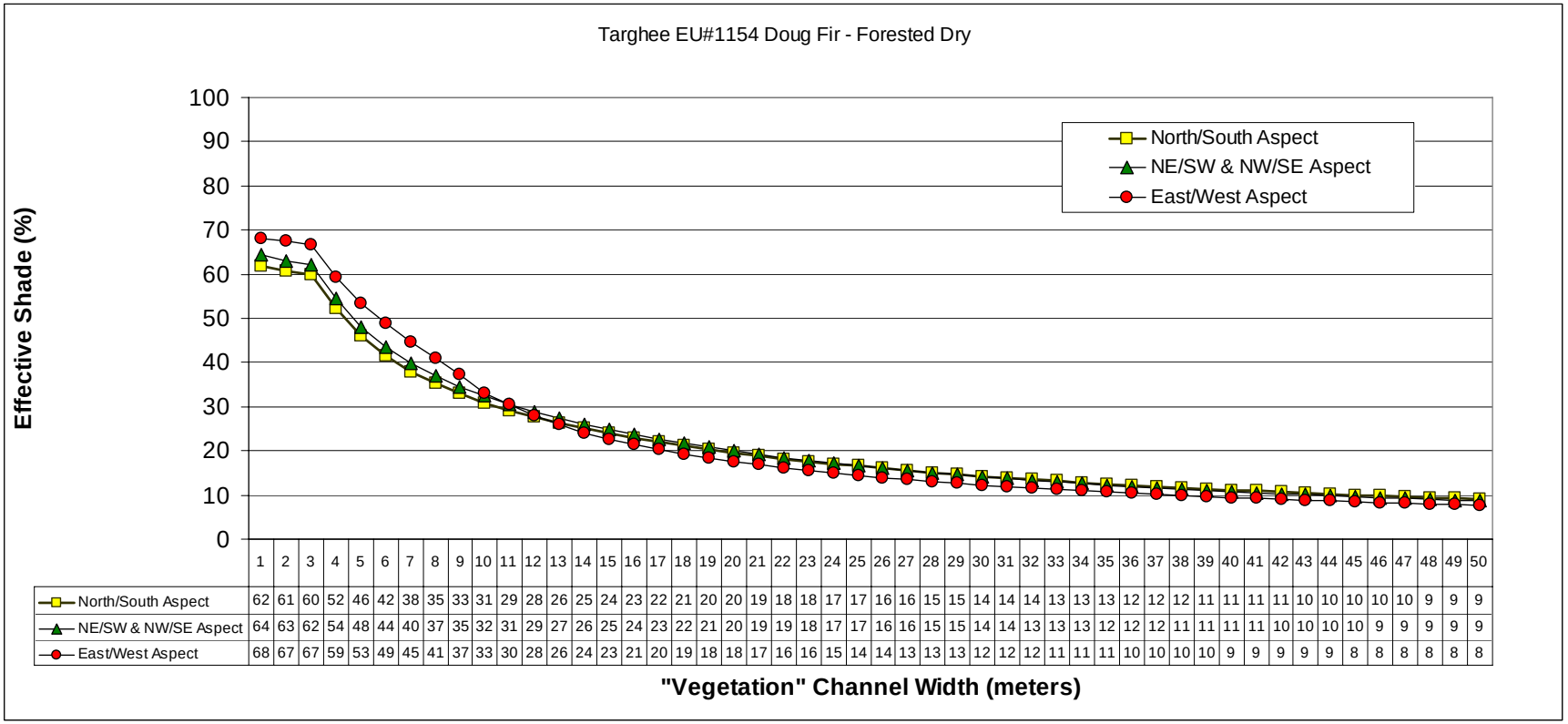
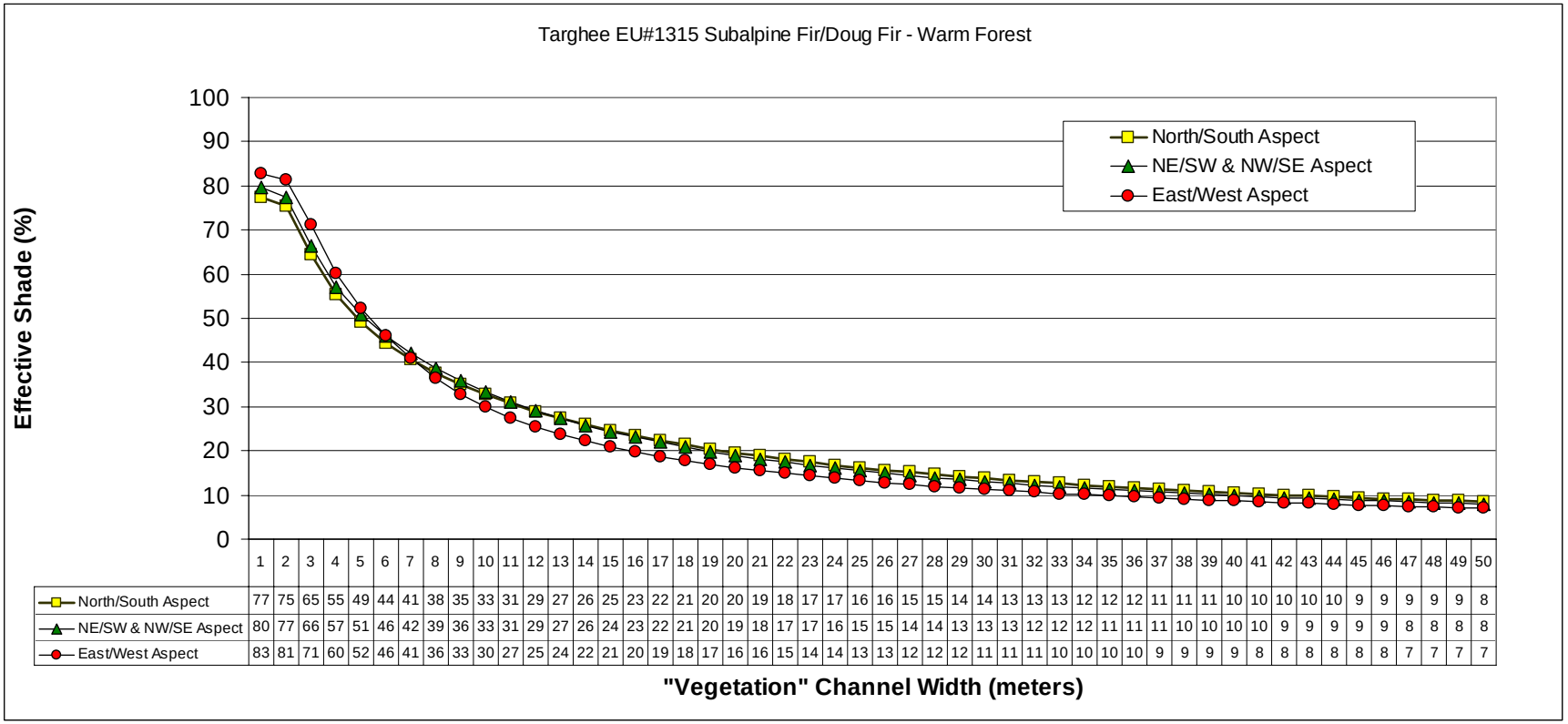
North/South Aspect	57	56	53	45	40	36	33	30	28	27	25	24	23	22	21	20	19	18	17	17	16	15	15	14	14	14	13	13	12	12	12	11	11	11	11	10	10	10	10	9	9	9	9	9	8	8	8	8	8	8
NE/SW & NW/SE Aspect	59	58	55	47	42	38	35	32	30	28	26	25	24	22	21	20	19	18	18	17	16	16	15	14	14	13	13	13	12	12	11	11	11	10	10	10	10	9	9	9	9	9	8	8	8	8	8	8	7	7
East/West Aspect	63	62	59	52	46	42	38	33	30	27	25	23	21	20	19	18	17	16	15	15	14	13	13	12	12	12	11	11	11	10	10	10	9	9	9	9	8	8	8	8	8	8	7	7	7	7	7	7	7	6

Figure A.3-22. Dry Forest Vegetation Type #1154.



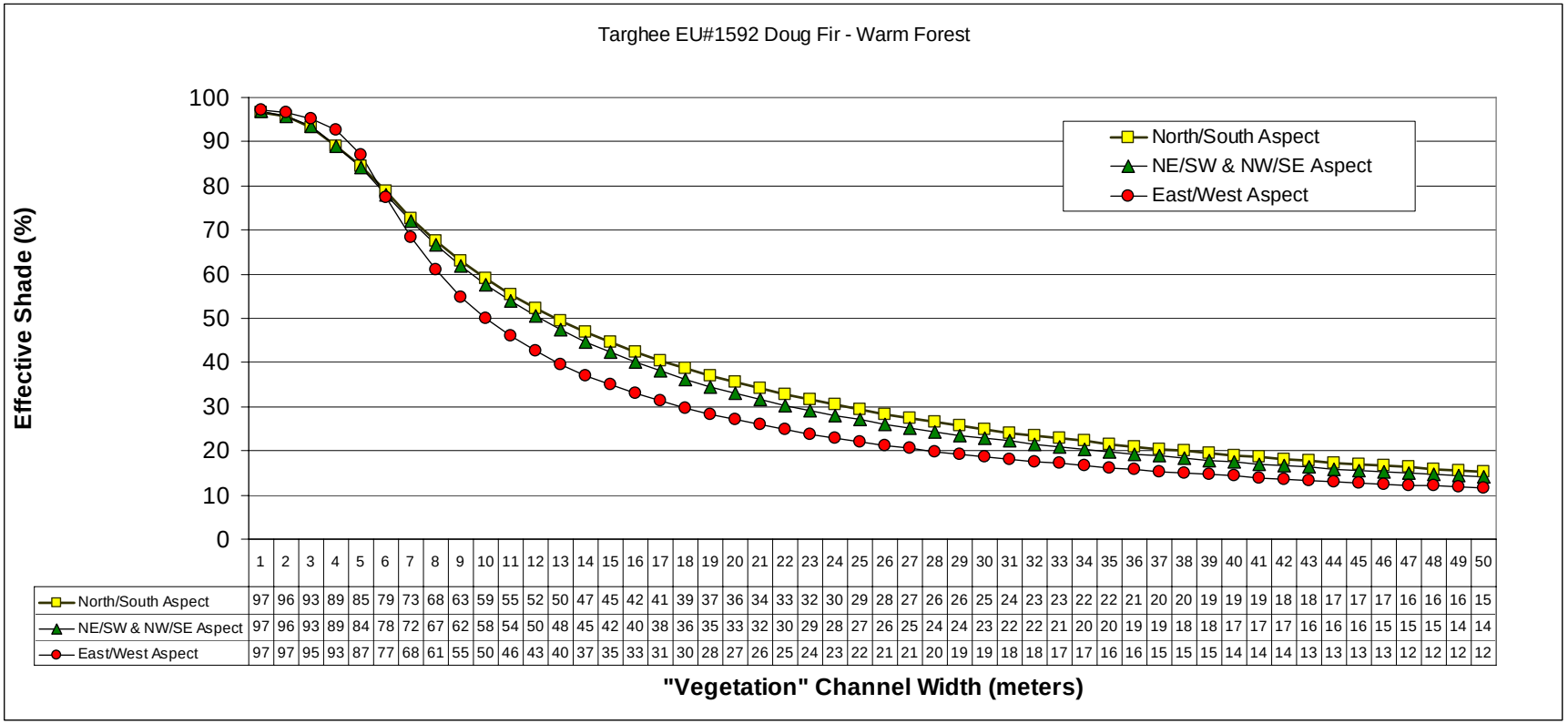
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	62	61	60	52	46	42	38	35	33	31	29	28	26	25	24	23	22	21	20	20	19	18	18	17	17	16	16	15	15	14	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10	10	10	9	9	9
NE/SW & NW/SE Aspect	64	63	62	54	48	44	40	37	35	32	31	29	27	26	25	24	23	22	21	20	19	19	18	17	17	16	16	15	15	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10	10	9	9	9	9	9
East/West Aspect	68	67	67	59	53	49	45	41	37	33	30	28	26	24	23	21	20	19	18	18	17	16	16	15	14	14	13	13	13	12	12	12	11	11	11	10	10	10	10	9	9	9	9	8	8	8	8	8	8	8

Figure A.3-23. Warm Forest Vegetation Type #1315.



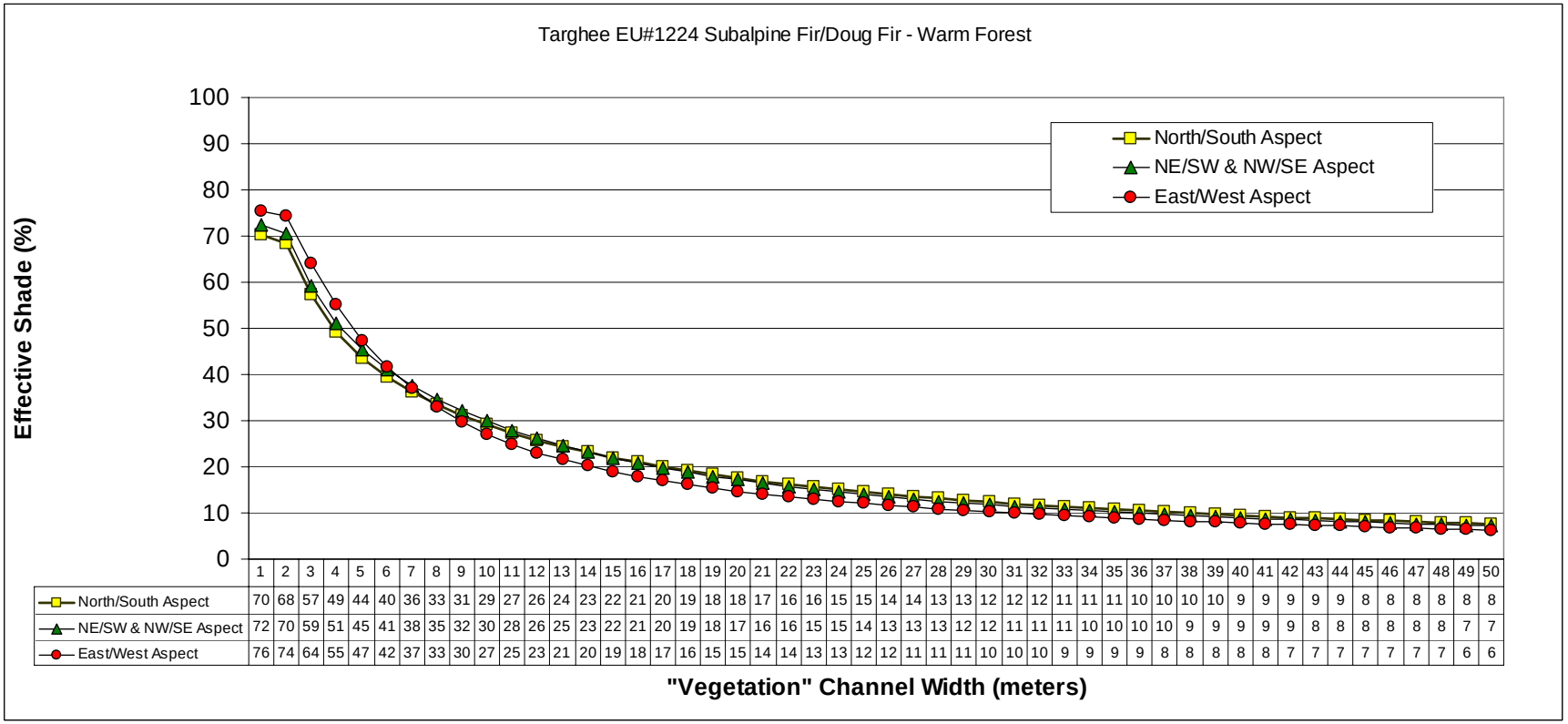
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	77	75	65	55	49	44	41	38	35	33	31	29	27	26	25	23	22	21	20	20	19	18	17	17	16	16	15	15	14	14	13	13	13	12	12	12	11	11	11	10	10	10	10	10	9	9	9	9	9	8
NE/SW & NW/SE Aspect	80	77	66	57	51	46	42	39	36	33	31	29	27	26	24	23	22	21	20	19	18	17	17	16	15	15	14	14	13	13	13	12	12	12	11	11	11	10	10	10	10	9	9	9	9	9	8	8	8	8
East/West Aspect	83	81	71	60	52	46	41	36	33	30	27	25	24	22	21	20	19	18	17	16	16	15	14	14	13	13	12	12	12	11	11	11	10	10	10	10	9	9	9	9	8	8	8	8	8	8	7	7	7	7

Figure A.3-24. Warm Forest Vegetation Type #1592.



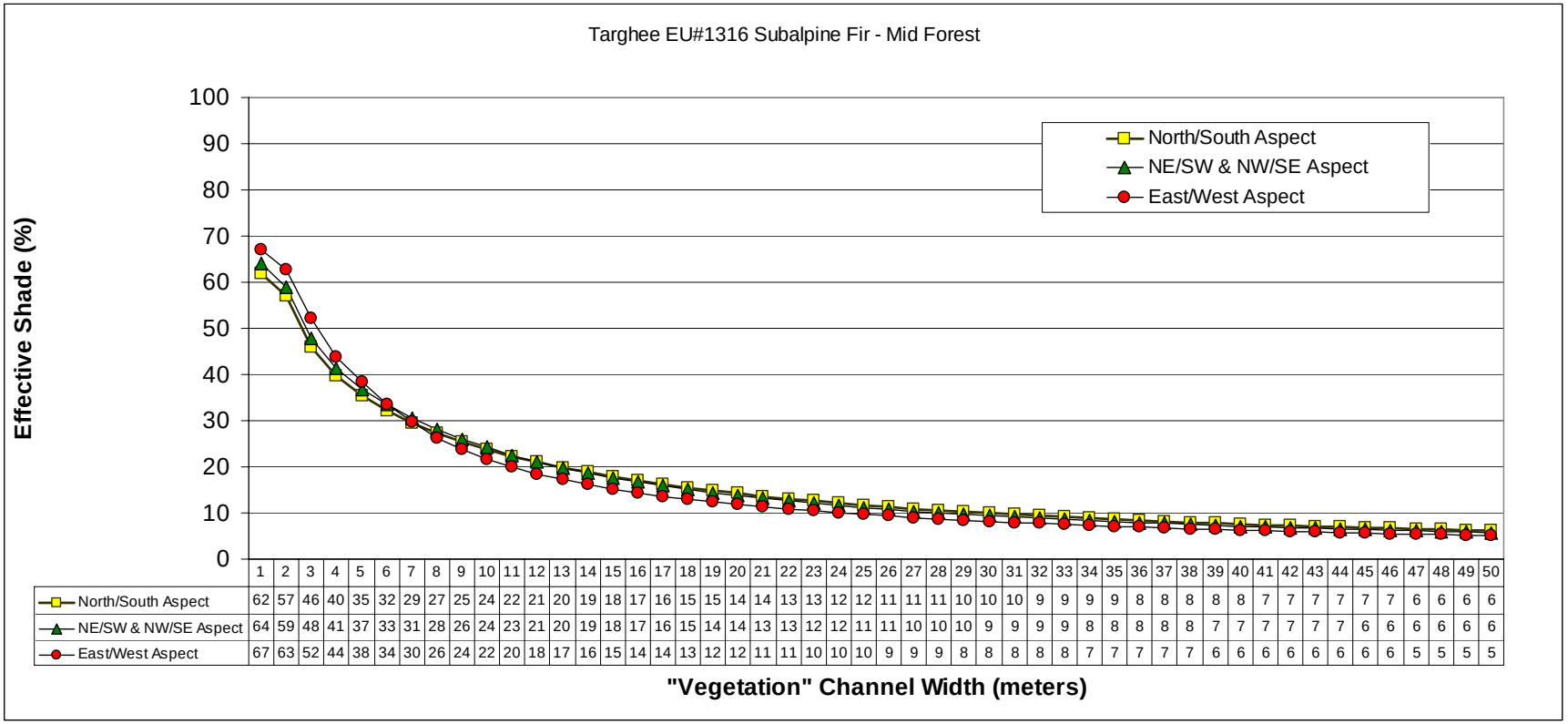
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	97	96	93	89	85	79	73	68	63	59	55	52	50	47	45	42	41	39	37	36	34	33	32	30	29	28	27	26	26	25	24	23	23	22	22	21	20	20	19	19	19	18	18	17	17	17	16	16	16	15
NE/SW & NW/SE Aspect	97	96	93	89	84	78	72	67	62	58	54	50	48	45	42	40	38	36	35	33	32	30	29	28	27	26	25	24	24	23	22	22	21	20	20	19	19	18	18	17	17	17	16	16	16	15	15	15	14	14
East/West Aspect	97	97	95	93	87	77	68	61	55	50	46	43	40	37	35	33	31	30	28	27	26	25	24	23	22	21	21	20	19	19	18	18	17	17	16	16	15	15	15	14	14	14	13	13	13	13	12	12	12	12

Figure A.3-25. Warm Forest Vegetation Type #1224.



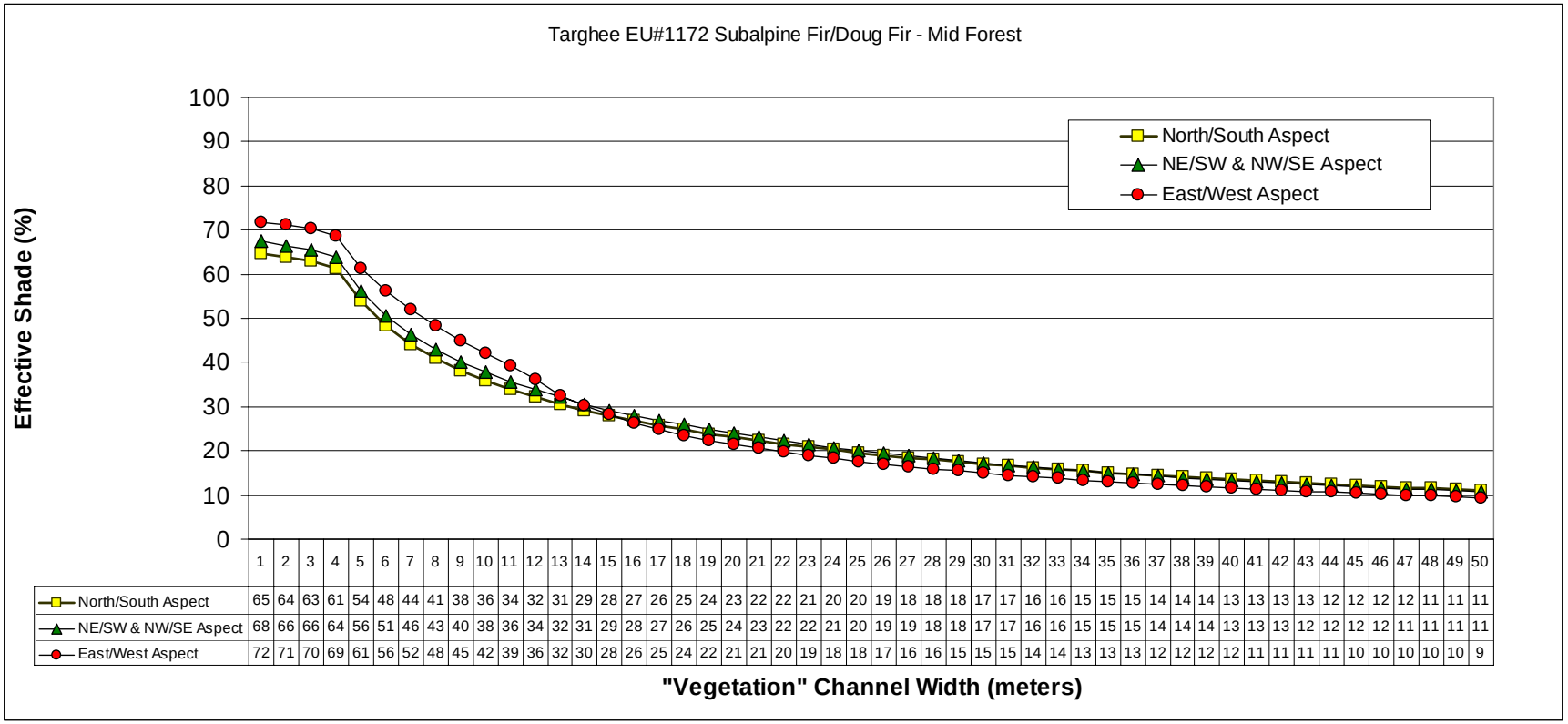
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	70	68	57	49	44	40	36	33	31	29	27	26	24	23	22	21	20	19	18	18	17	16	16	15	15	14	14	13	13	12	12	12	11	11	11	10	10	10	10	9	9	9	9	9	8	8	8	8	8	8
NE/SW & NW/SE Aspect	72	70	59	51	45	41	38	35	32	30	28	26	25	23	22	21	20	19	18	17	16	16	15	15	14	13	13	13	12	12	11	11	11	10	10	10	10	9	9	9	9	9	8	8	8	8	8	8	7	7
East/West Aspect	76	74	64	55	47	42	37	33	30	27	25	23	21	20	19	18	17	16	15	15	14	14	13	13	12	12	11	11	11	10	10	10	9	9	9	9	8	8	8	8	8	7	7	7	7	7	7	7	6	6

Figure A.3-26. Mid Forest Vegetation Type #1316.



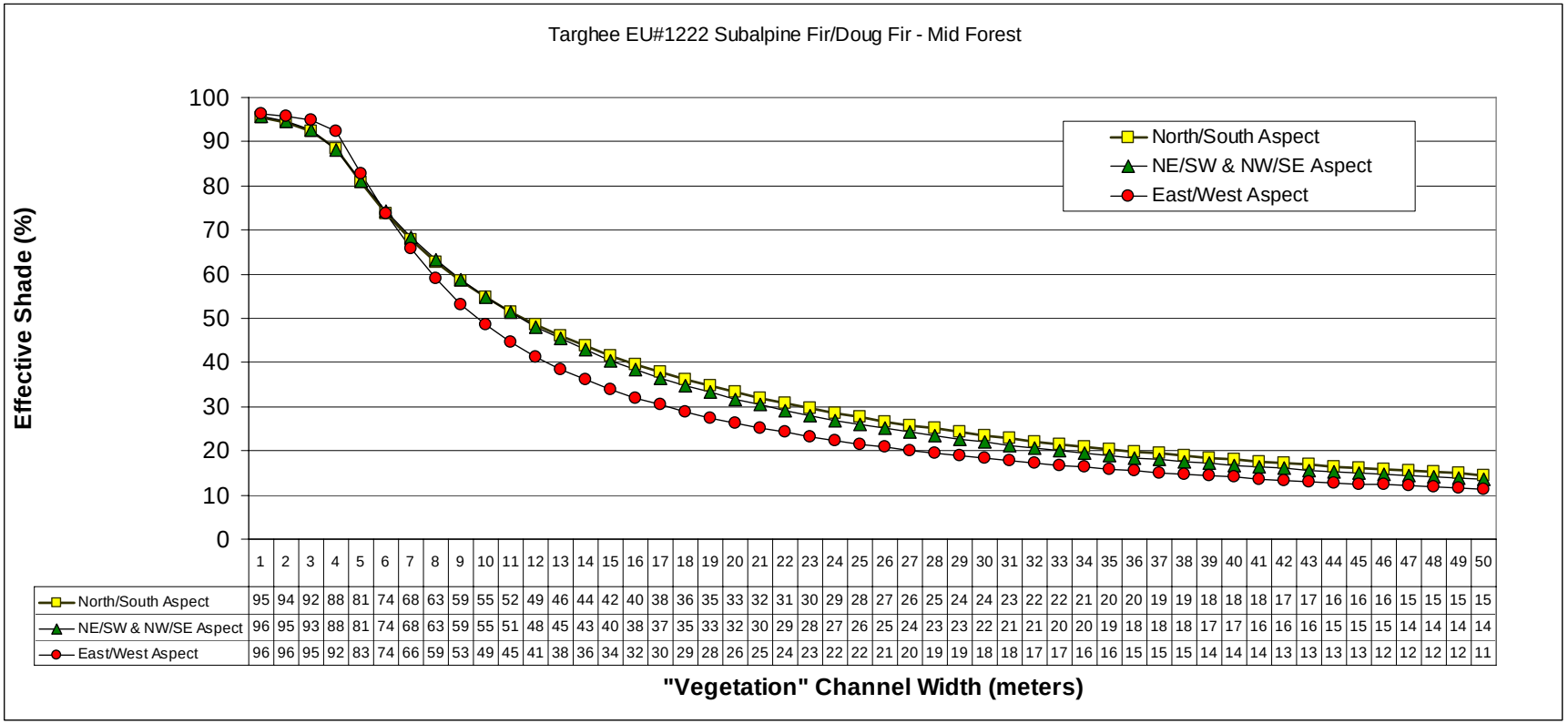
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	62	57	46	40	35	32	29	27	25	24	22	21	20	19	18	17	16	15	15	14	14	13	13	12	12	11	11	11	10	10	10	9	9	9	9	8	8	8	8	8	7	7	7	7	7	7	6	6	6	6
NE/SW & NW/SE Aspect	64	59	48	41	37	33	31	28	26	24	23	21	20	19	18	17	16	15	14	14	13	13	12	12	11	11	10	10	10	9	9	9	9	8	8	8	8	8	7	7	7	7	7	7	6	6	6	6	6	6
East/West Aspect	67	63	52	44	38	34	30	26	24	22	20	18	17	16	15	14	14	13	12	12	11	11	10	10	10	9	9	9	8	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6	6	5	5	5	5

Figure A.3-27. Mid Forest Vegetation Type #1172.



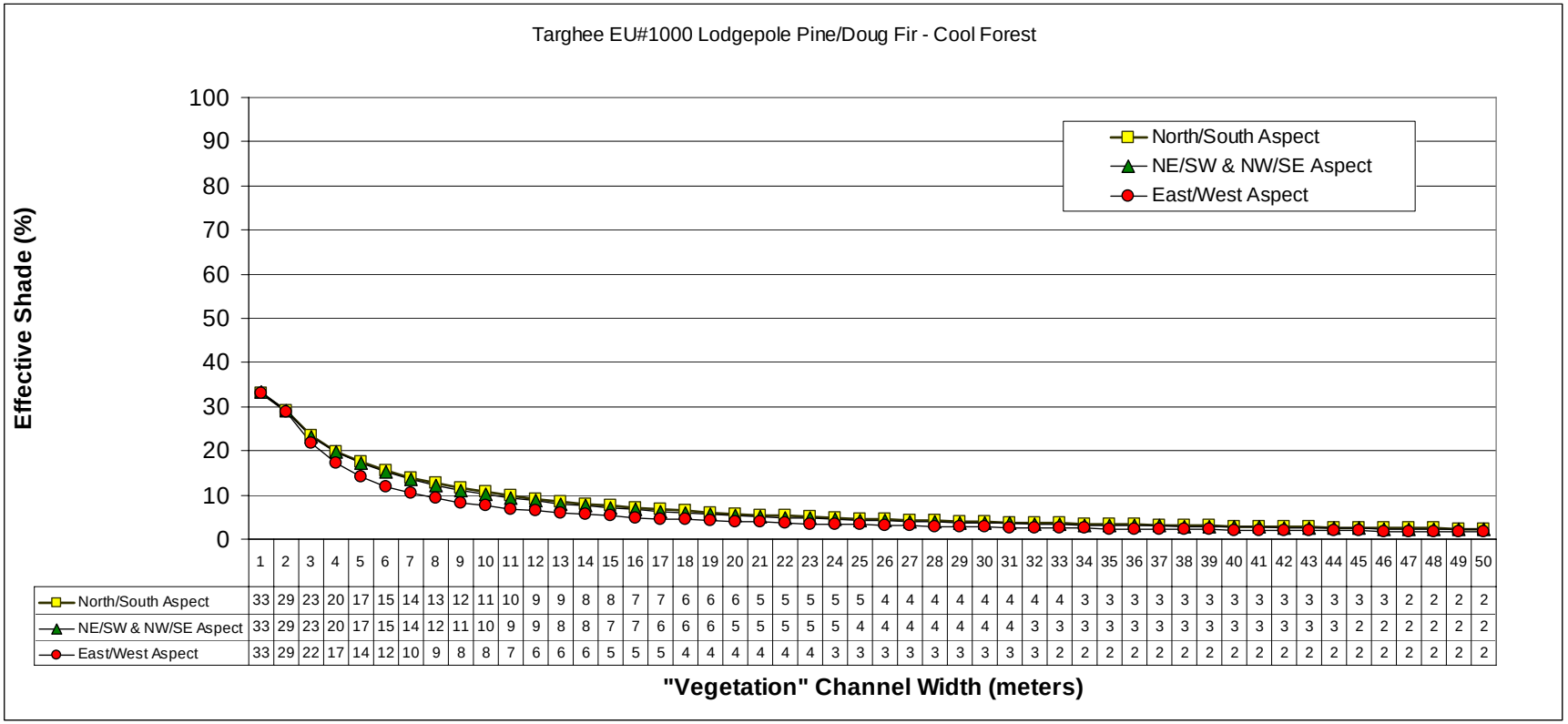
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	65	64	63	61	54	48	44	41	38	36	34	32	31	29	28	27	26	25	24	23	22	22	21	20	20	19	18	18	18	17	17	16	16	15	15	15	14	14	14	13	13	13	13	12	12	12	12	11	11	11
NE/SW & NW/SE Aspect	68	66	66	64	56	51	46	43	40	38	36	34	32	31	29	28	27	26	25	24	23	22	22	21	20	19	19	18	18	17	17	16	16	15	15	15	14	14	14	13	13	13	12	12	12	12	11	11	11	11
East/West Aspect	72	71	70	69	61	56	52	48	45	42	39	36	32	30	28	26	25	24	22	21	21	20	19	18	18	17	16	16	15	15	15	14	14	13	13	13	12	12	12	12	11	11	11	11	10	10	10	10	10	9

Figure A.3-28. Mid Forest Vegetation Type #1222.



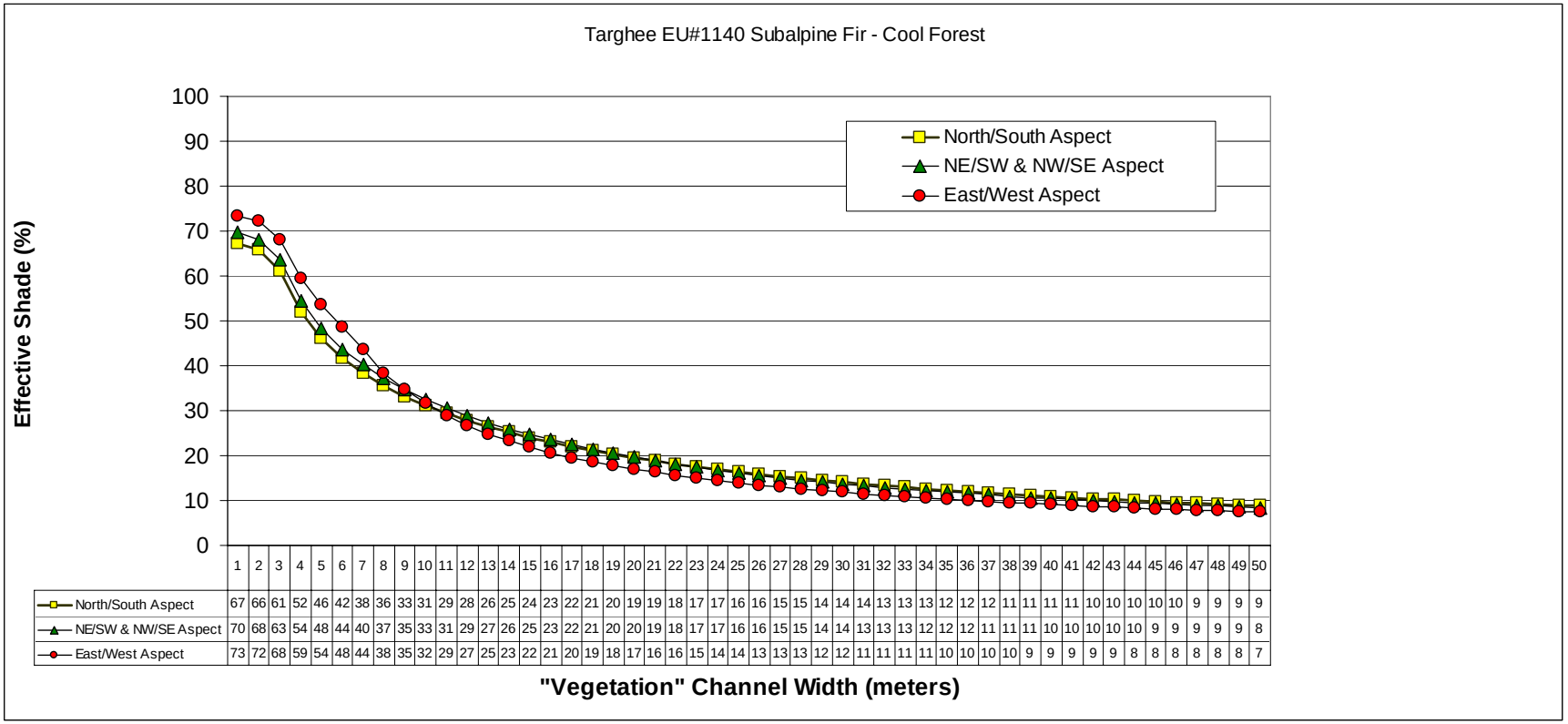
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	95	94	92	88	81	74	68	63	59	55	52	49	46	44	42	40	38	36	35	33	32	31	30	29	28	27	26	25	24	24	23	22	22	21	20	20	19	19	18	18	18	17	17	16	16	16	15	15	15	15
NE/SW & NW/SE Aspect	96	95	93	88	81	74	68	63	59	55	51	48	45	43	40	38	37	35	33	32	30	29	28	27	26	25	24	23	23	22	21	21	20	20	19	18	18	18	17	17	16	16	16	15	15	15	14	14	14	14
East/West Aspect	96	96	95	92	83	74	66	59	53	49	45	41	38	36	34	32	30	29	28	26	25	24	23	22	22	21	20	19	19	18	18	17	17	16	16	15	15	15	14	14	14	13	13	13	13	12	12	12	12	11

Figuree A.3-29. Cool Forest Vegetation Type #1000.



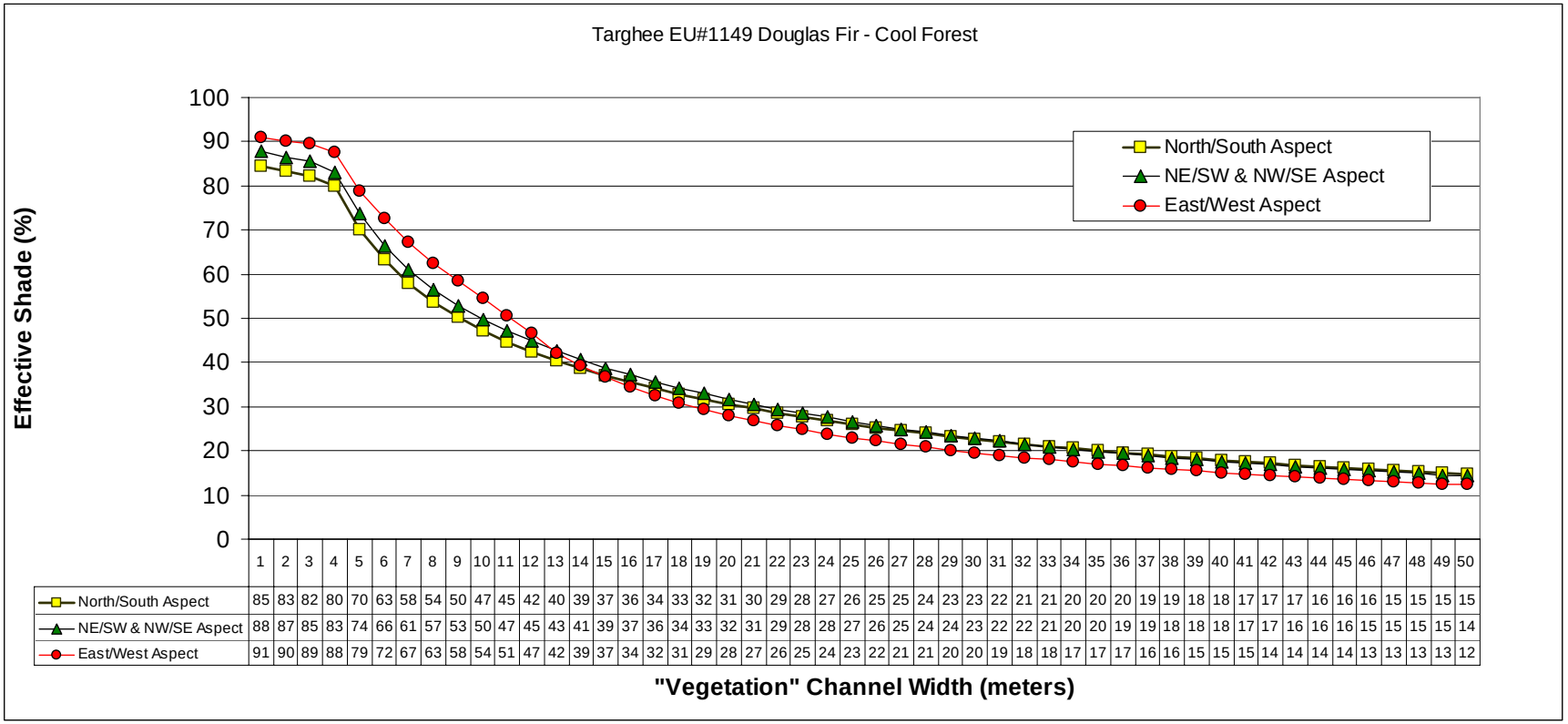
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	33	29	23	20	17	15	14	13	12	11	10	9	9	8	8	7	7	6	6	6	5	5	5	5	5	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2
NE/SW & NW/SE Aspect	33	29	23	20	17	15	14	12	11	10	9	9	8	8	7	7	6	6	6	5	5	5	5	5	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2
East/West Aspect	33	29	22	17	14	12	10	9	8	8	7	6	6	6	5	5	5	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Figure A.3-30. Cool Forest Vegetation Type #1140.



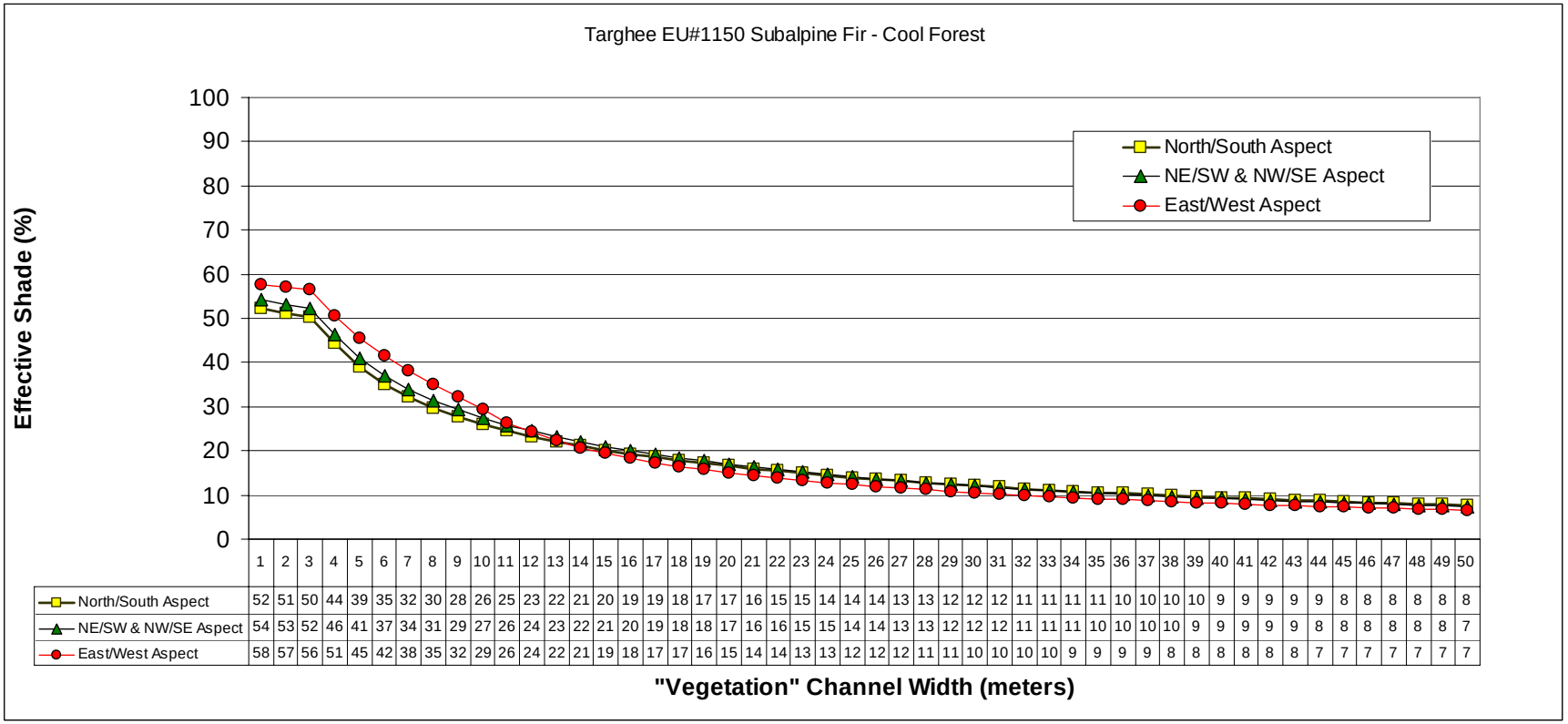
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	67	66	61	52	46	42	38	36	33	31	29	28	26	25	24	23	22	21	20	19	19	18	17	17	16	16	15	15	14	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10	10	10	9	9	9	9
NE/SW & NW/SE Aspect	70	68	63	54	48	44	40	37	35	33	31	29	27	26	25	23	22	21	20	20	19	18	17	17	16	16	15	15	14	14	13	13	13	12	12	12	11	11	11	10	10	10	10	10	9	9	9	9	9	8
East/West Aspect	73	72	68	59	54	48	44	38	35	32	29	27	25	23	22	21	20	19	18	17	16	16	15	14	14	13	13	13	12	12	11	11	11	11	10	10	10	10	9	9	9	9	9	8	8	8	8	8	8	7

Figure A.3-31. Cool Forest Vegetation Type #1149.



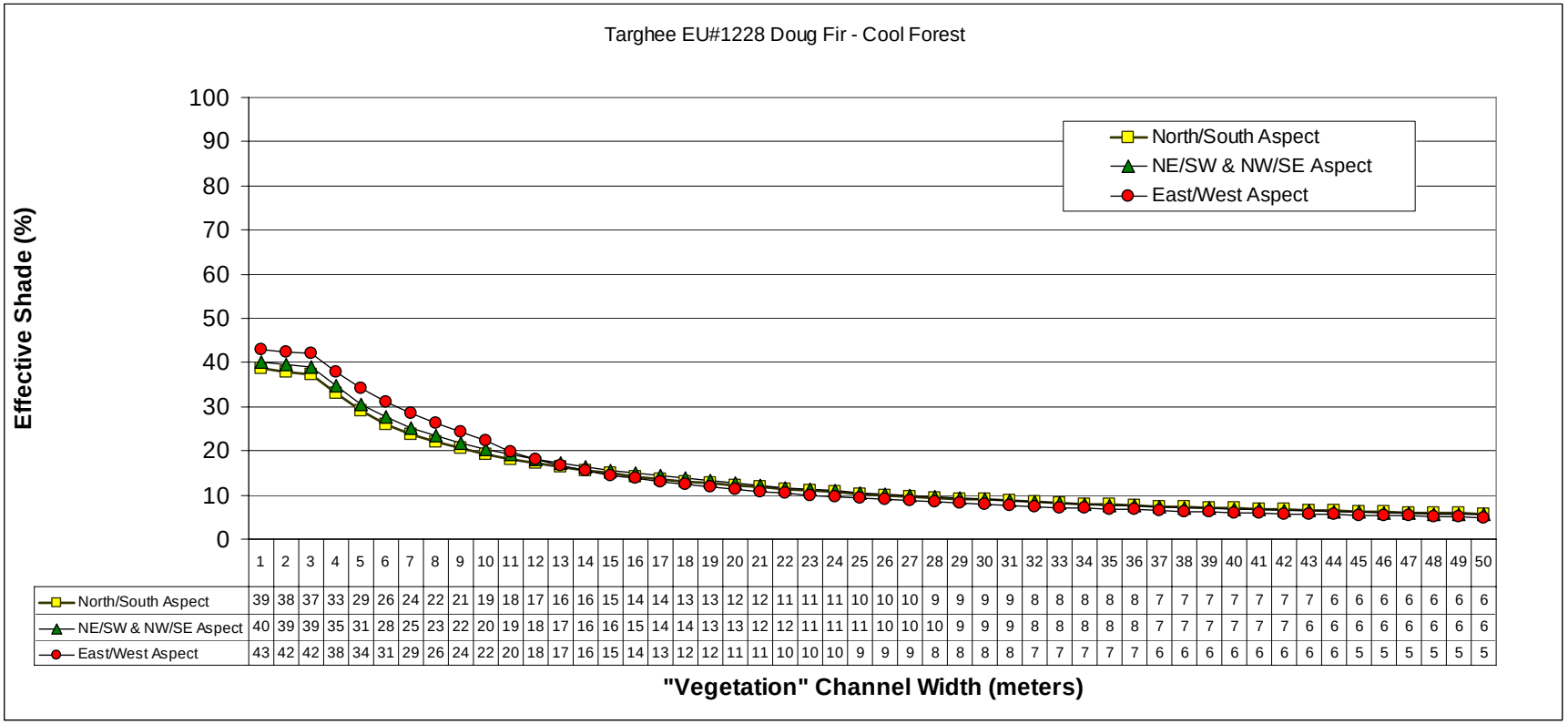
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	85	83	82	80	70	63	58	54	50	47	45	42	40	39	37	36	34	33	32	31	30	29	28	27	26	25	25	24	23	23	22	21	21	20	20	20	19	19	18	18	17	17	17	16	16	16	15	15	15	15
NE/SW & NW/SE Aspect	88	87	85	83	74	66	61	57	53	50	47	45	43	41	39	37	36	34	33	32	31	29	28	28	27	26	25	24	24	23	22	22	21	20	20	19	19	18	18	18	17	17	16	16	16	15	15	15	15	14
East/West Aspect	91	90	89	88	79	72	67	63	58	54	51	47	42	39	37	34	32	31	29	28	27	26	25	24	23	22	21	21	20	20	19	18	18	17	17	17	16	16	15	15	15	14	14	14	14	13	13	13	13	12

Figure A.3-32. Cool Forest Vegetation Type #1150.



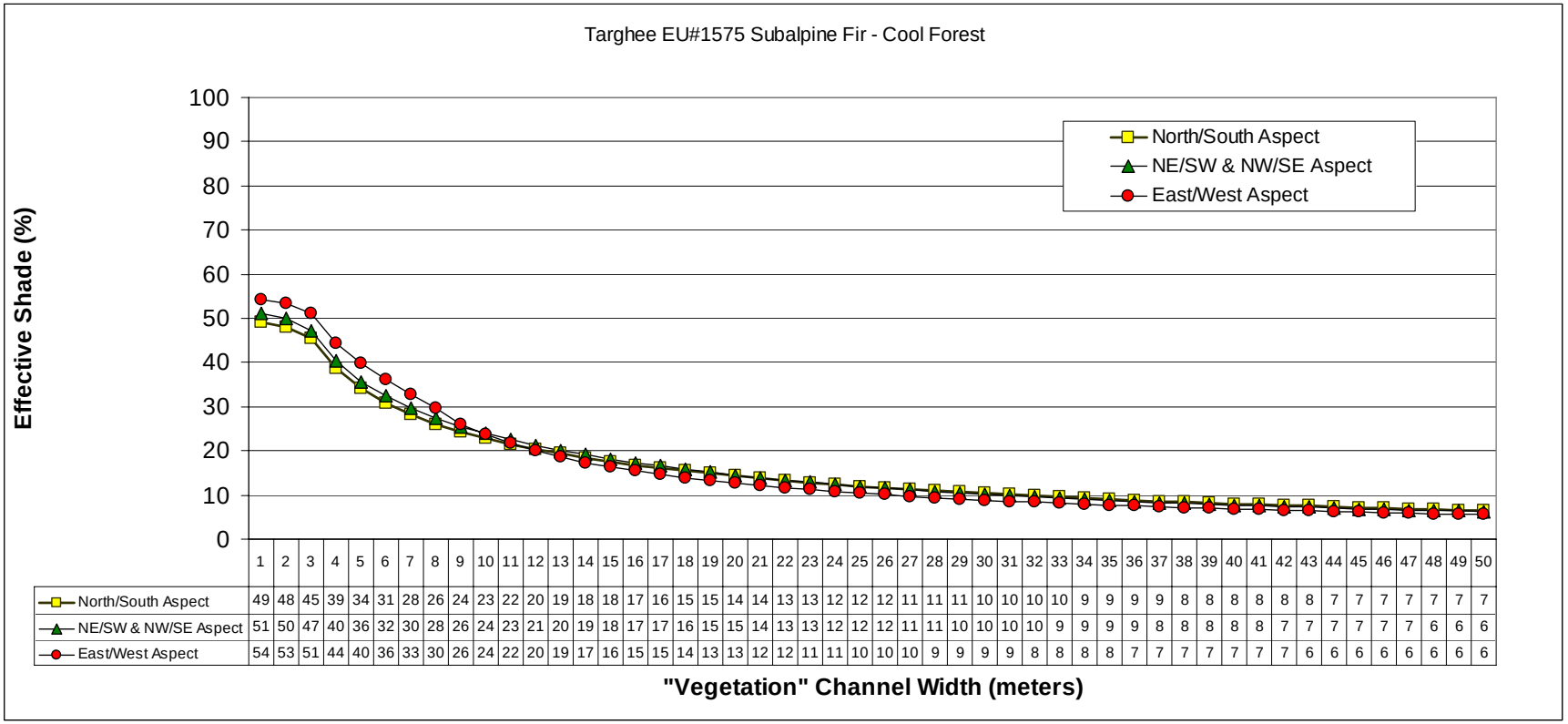
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	52	51	50	44	39	35	32	30	28	26	25	23	22	21	20	19	19	18	17	17	16	15	15	14	14	14	13	13	12	12	12	11	11	11	11	10	10	10	10	9	9	9	9	9	8	8	8	8	8	8
NE/SW & NW/SE Aspect	54	53	52	46	41	37	34	31	29	27	26	24	23	22	21	20	19	18	18	17	16	16	15	15	14	14	13	13	12	12	12	11	11	11	10	10	10	10	9	9	9	9	9	8	8	8	8	8	8	7
East/West Aspect	58	57	56	51	45	42	38	35	32	29	26	24	22	21	19	18	17	17	16	15	14	14	13	13	12	12	12	11	11	10	10	10	10	9	9	9	9	8	8	8	8	8	8	7	7	7	7	7	7	7

Figure A.3-33. Cool Forest Vegetation Type #1228.



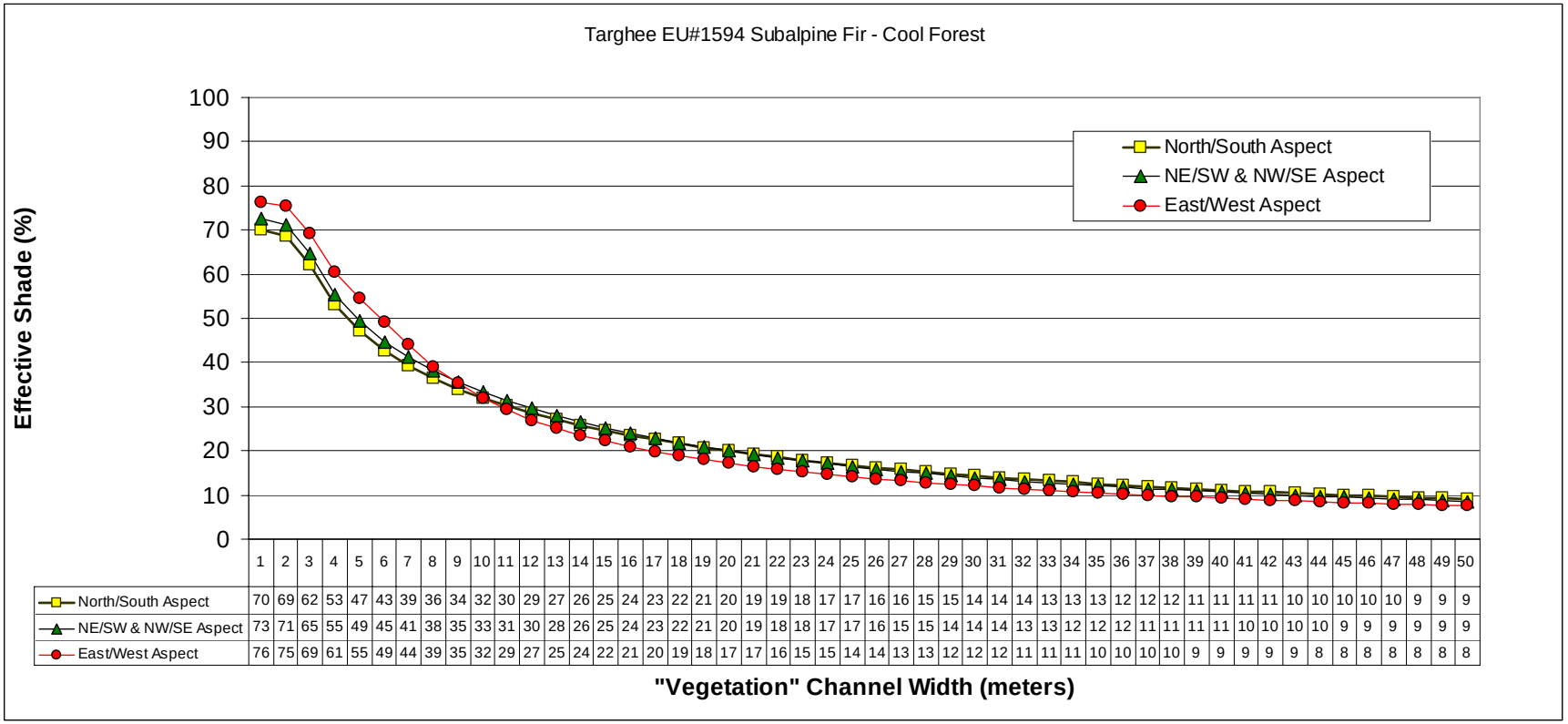
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	39	38	37	33	29	26	24	22	21	19	18	17	16	16	15	14	14	13	13	12	12	11	11	11	10	10	10	9	9	9	9	8	8	8	8	8	7	7	7	7	7	7	7	6	6	6	6	6	6	6
NE/SW & NW/SE Aspect	40	39	39	35	31	28	25	23	22	20	19	18	17	16	16	15	14	14	13	13	12	12	11	11	11	10	10	10	9	9	9	8	8	8	8	8	7	7	7	7	7	7	6	6	6	6	6	6	6	6
East/West Aspect	43	42	42	38	34	31	29	26	24	22	20	18	17	16	15	14	13	12	12	11	11	10	10	10	9	9	9	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6	6	5	5	5	5	5	5

Figure A.3-34. Cool Forest Vegetation Type #1575.



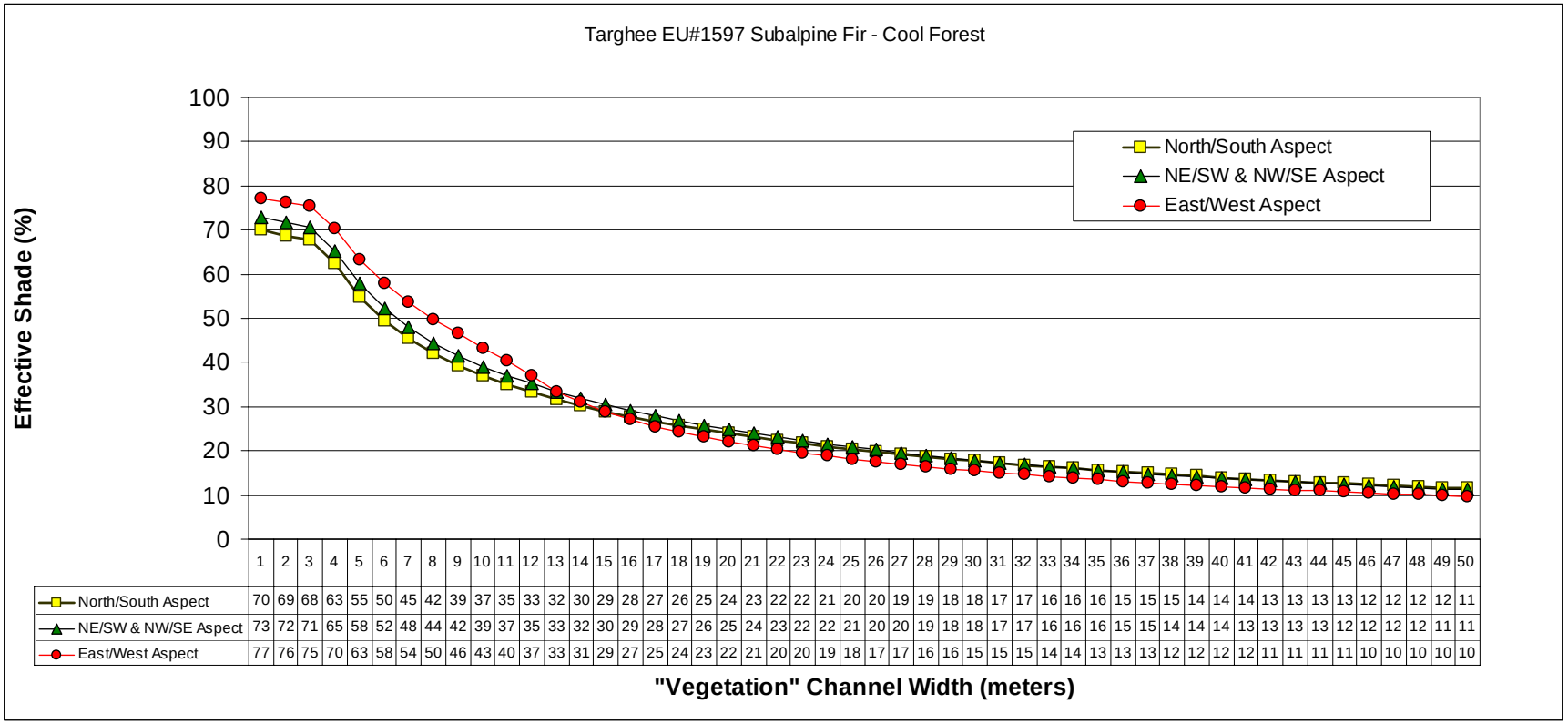
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	49	48	45	39	34	31	28	26	24	23	22	20	19	18	18	17	16	15	15	14	14	13	13	12	12	12	11	11	11	10	10	10	10	9	9	9	9	8	8	8	8	8	8	7	7	7	7	7	7	7
NE/SW & NW/SE Aspect	51	50	47	40	36	32	30	28	26	24	23	21	20	19	18	17	17	16	15	15	14	13	13	12	12	12	11	11	10	10	10	10	9	9	9	9	8	8	8	8	8	7	7	7	7	7	7	6	6	6
East/West Aspect	54	53	51	44	40	36	33	30	26	24	22	20	19	17	16	15	15	14	13	13	12	12	11	11	10	10	10	9	9	9	9	8	8	8	8	7	7	7	7	7	7	7	6	6	6	6	6	6	6	6

Figure A.3-35. Cool Forest Vegetation Type #1594.



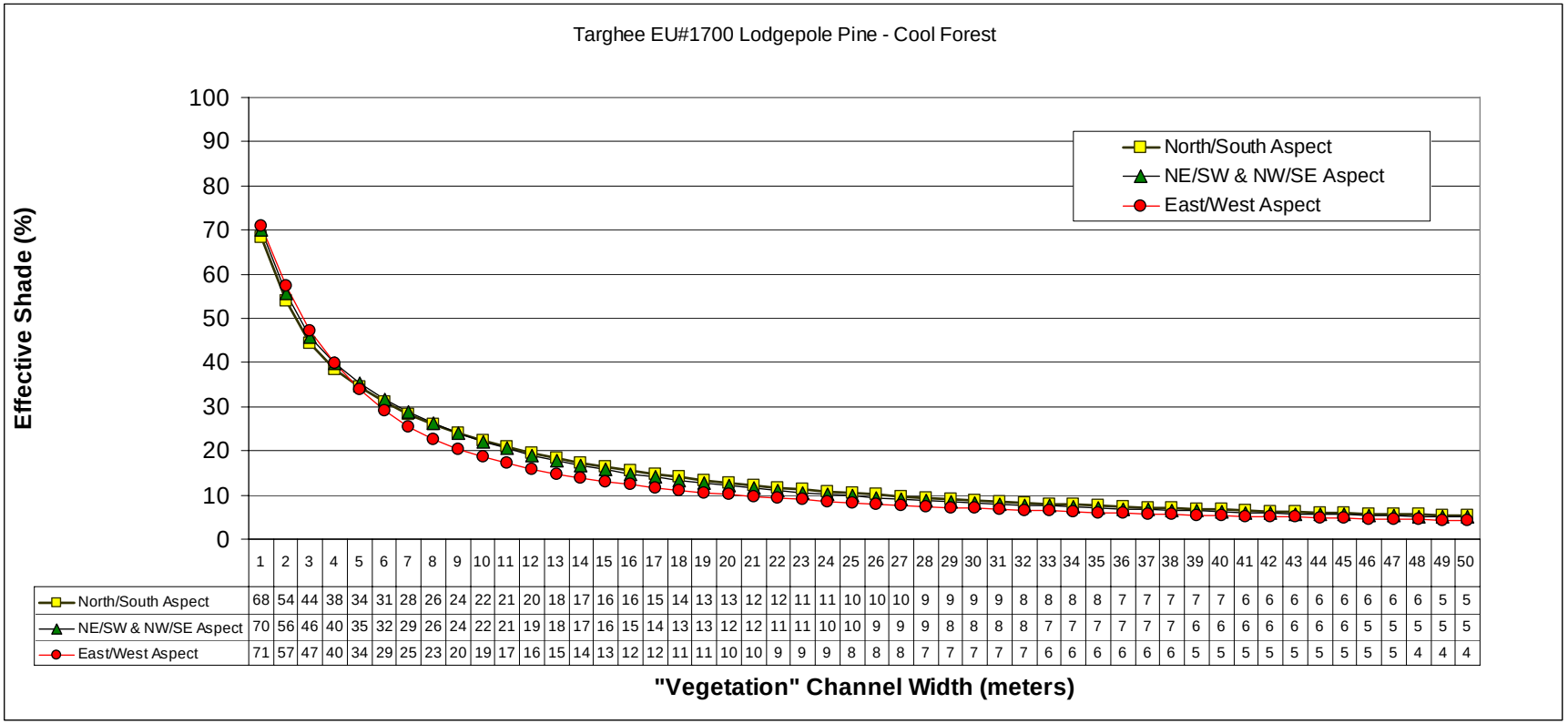
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	70	69	62	53	47	43	39	36	34	32	30	29	27	26	25	24	23	22	21	20	19	19	18	17	17	16	16	15	15	14	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10	10	10	9	9	9
NE/SW & NW/SE Aspect	73	71	65	55	49	45	41	38	35	33	31	30	28	26	25	24	23	22	21	20	19	18	18	17	17	16	15	15	14	14	14	13	13	12	12	12	11	11	11	11	10	10	10	10	9	9	9	9	9	9
East/West Aspect	76	75	69	61	55	49	44	39	35	32	29	27	25	24	22	21	20	19	18	17	17	16	15	15	14	14	13	13	12	12	12	11	11	11	10	10	10	10	9	9	9	9	9	8	8	8	8	8	8	8

Figure A.3-36. Cool Forest Vegetation Type #1597.



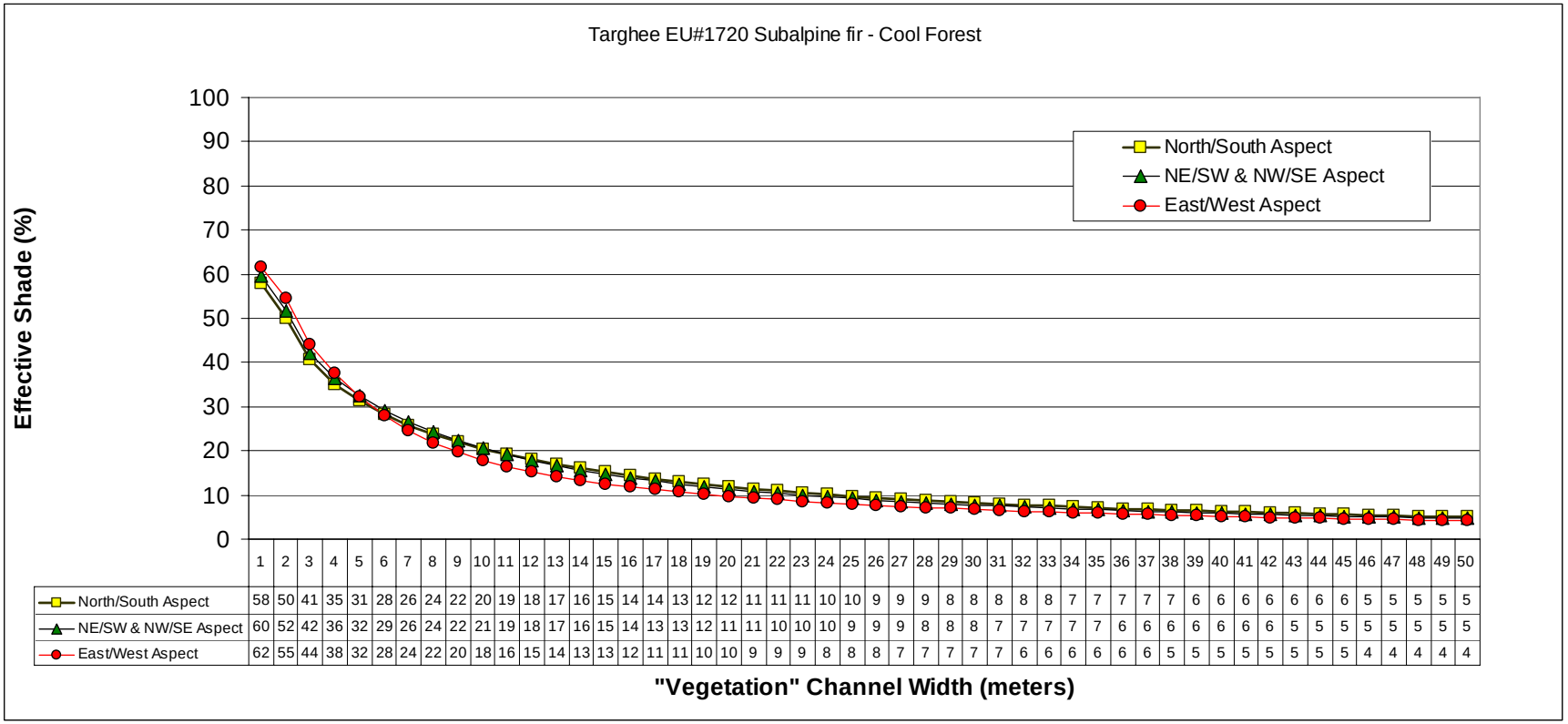
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	70	69	68	63	55	50	45	42	39	37	35	33	32	30	29	28	27	26	25	24	23	22	22	21	20	20	19	19	18	18	17	17	16	16	16	15	15	15	14	14	14	13	13	13	13	12	12	12	12	11
NE/SW & NW/SE Aspect	73	72	71	65	58	52	48	44	42	39	37	35	33	32	30	29	28	27	26	25	24	23	22	22	21	20	20	19	18	18	17	17	16	16	16	15	15	14	14	14	13	13	13	13	12	12	12	12	11	11
East/West Aspect	77	76	75	70	63	58	54	50	46	43	40	37	33	31	29	27	25	24	23	22	21	20	20	19	18	17	17	16	16	15	15	15	14	14	13	13	13	12	12	12	12	11	11	11	11	10	10	10	10	10

Figure A.3-37. Cool Forest Vegetation Type #1700.



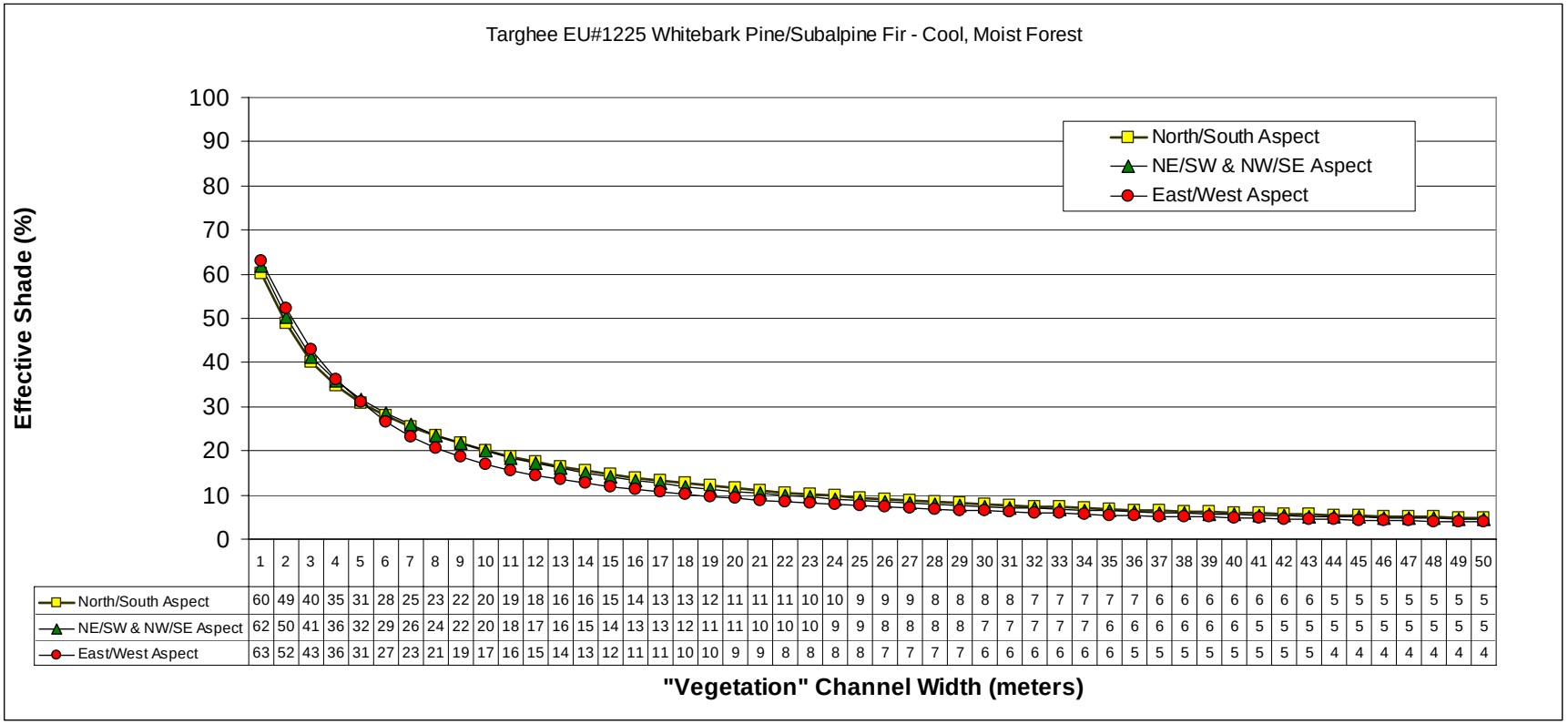
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	68	54	44	38	34	31	28	26	24	22	21	20	18	17	16	16	15	14	13	13	12	12	11	11	10	10	10	9	9	9	9	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6	6	5	5
NE/SW & NW/SE Aspect	70	56	46	40	35	32	29	26	24	22	21	19	18	17	16	15	14	13	13	12	12	11	11	10	10	9	9	9	8	8	8	8	7	7	7	7	7	7	6	6	6	6	6	6	6	5	5	5	5	5
East/West Aspect	71	57	47	40	34	29	25	23	20	19	17	16	15	14	13	12	12	11	11	10	10	9	9	9	8	8	8	7	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5	4	4	4

Figure A.3-38. Cool Forest Vegetation Type #1720.



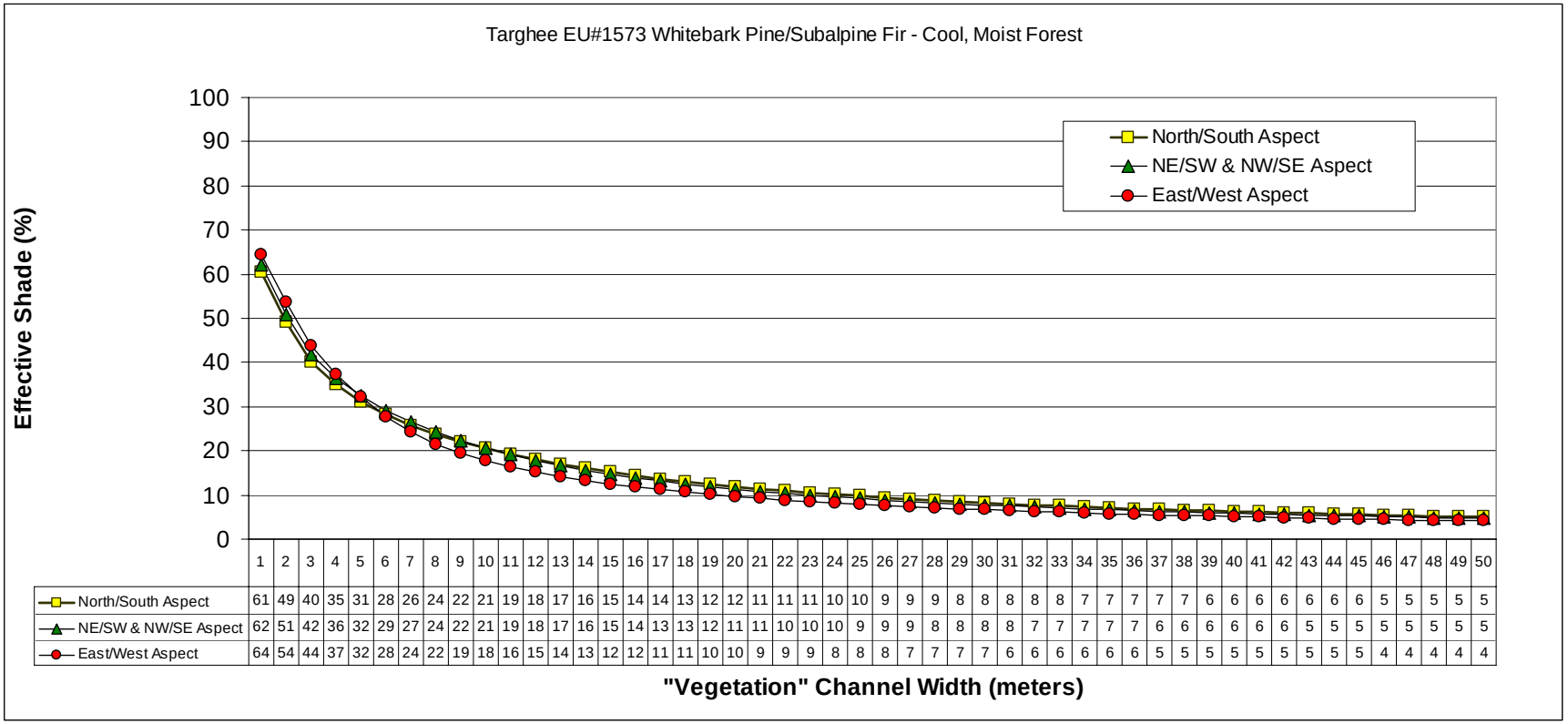
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	58	50	41	35	31	28	26	24	22	20	19	18	17	16	15	14	14	13	12	12	11	11	11	10	10	9	9	9	8	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6	5	5	5	5	5
NE/SW & NW/SE Aspect	60	52	42	36	32	29	26	24	22	21	19	18	17	16	15	14	13	13	12	11	11	10	10	10	9	9	9	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6	5	5	5	5	5	5	5	5
East/West Aspect	62	55	44	38	32	28	24	22	20	18	16	15	14	13	13	12	11	11	10	10	9	9	9	8	8	8	7	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	4	4	4	4	4

Figure A.3-39. Cold, Moist Forest Vegetation Type #1225.



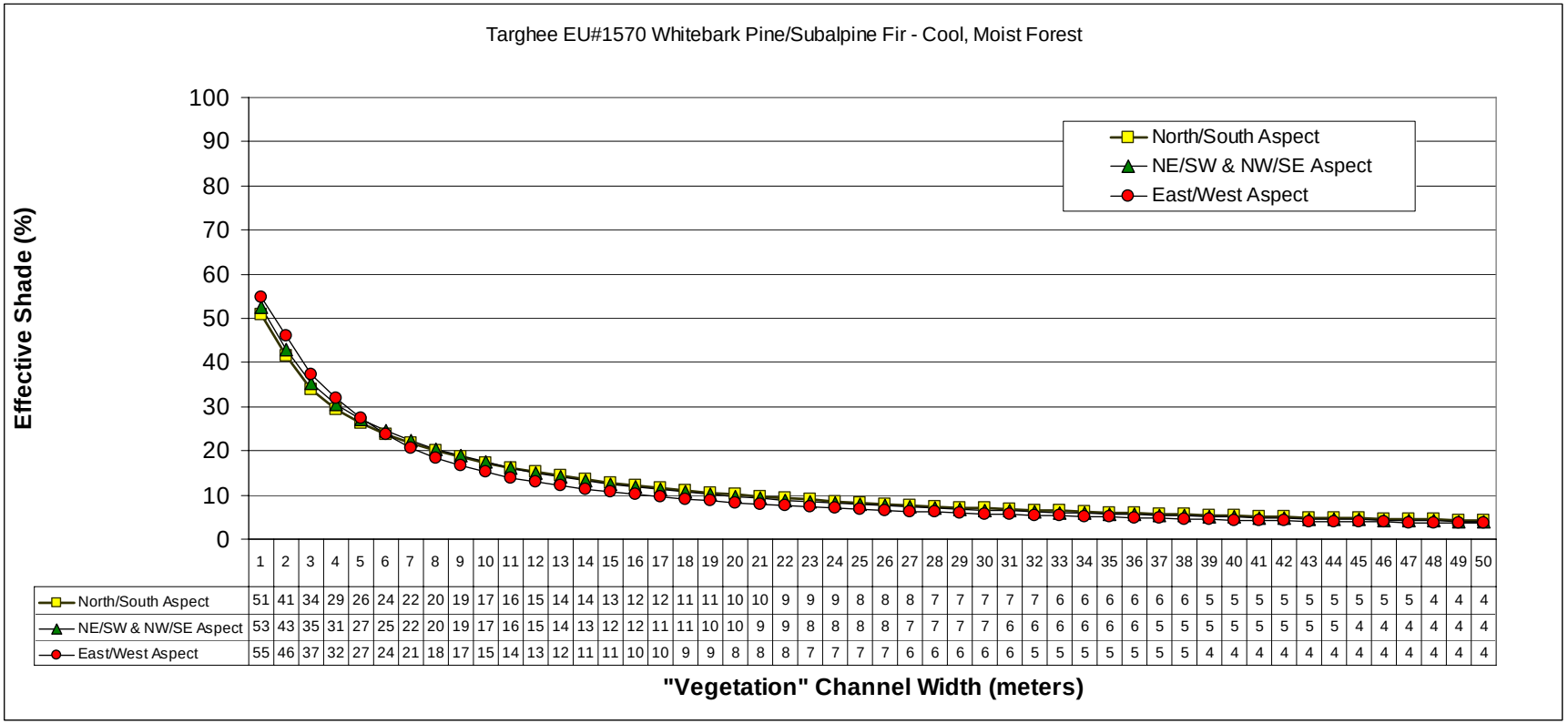
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	60	49	40	35	31	28	25	23	22	20	19	18	16	16	15	14	13	13	12	11	11	11	10	10	9	9	9	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6	5	5	5	5	5	5	5
NE/SW & NW/SE Aspect	62	50	41	36	32	29	26	24	22	20	18	17	16	15	14	13	13	12	11	11	10	10	10	9	9	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5	5
East/West Aspect	63	52	43	36	31	27	23	21	19	17	16	15	14	13	12	11	11	10	10	9	9	8	8	8	8	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	4	4	4	4	4	4	4

Figure A.3-40. Cold, Moist Forest Vegetation Type #1573.



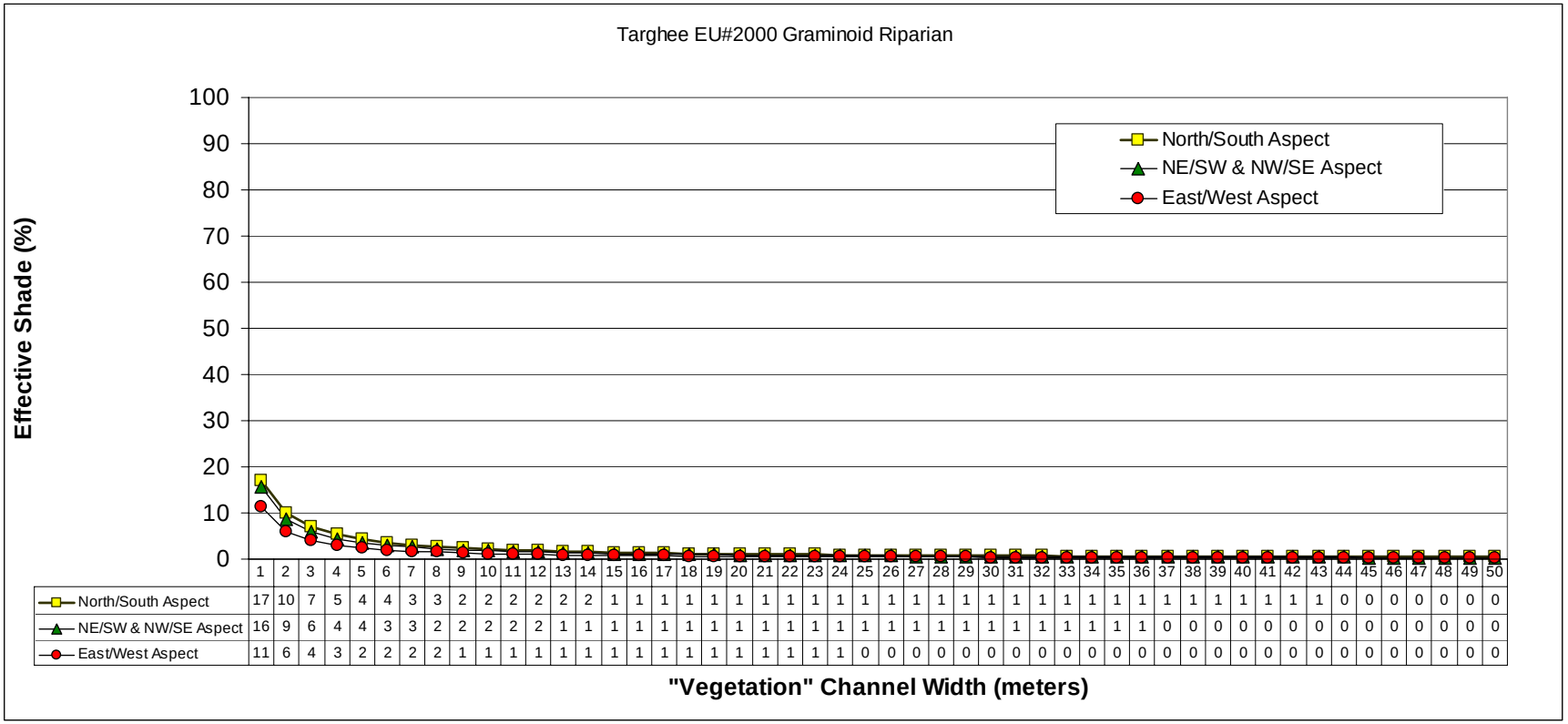
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	61	49	40	35	31	28	26	24	22	21	19	18	17	16	15	14	14	13	12	12	11	11	11	10	10	9	9	9	8	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6	5	5	5	5	5
NE/SW & NW/SE Aspect	62	51	42	36	32	29	27	24	22	21	19	18	17	16	15	14	13	13	12	11	11	10	10	10	9	9	9	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5
East/West Aspect	64	54	44	37	32	28	24	22	19	18	16	15	14	13	12	12	11	11	10	10	9	9	9	8	8	8	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5	4	4	4	4	4

Figure A.3-41. Cold, Moist Forest Vegetation Type #1570.



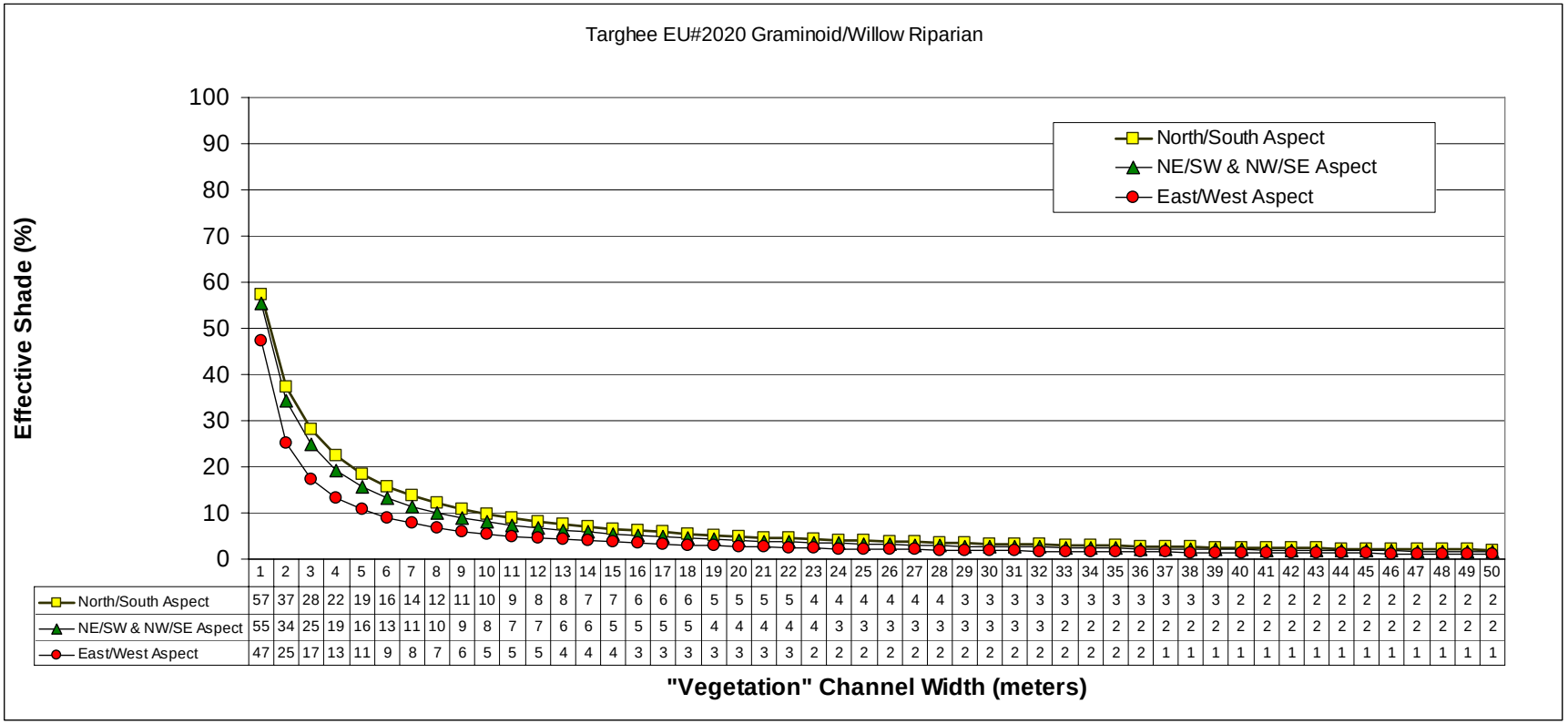
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	51	41	34	29	26	24	22	20	19	17	16	15	14	14	13	12	12	11	11	10	10	9	9	9	8	8	8	7	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5	4	4	4
NE/SW & NW/SE Aspect	53	43	35	31	27	25	22	20	19	17	16	15	14	13	12	12	11	11	10	10	9	9	8	8	8	8	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	4	4	4	4	4	4
East/West Aspect	55	46	37	32	27	24	21	18	17	15	14	13	12	11	11	10	10	9	9	8	8	8	7	7	7	7	6	6	6	6	6	5	5	5	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4	4

Figure A.3-42. Riparian Vegetation Type #2000.



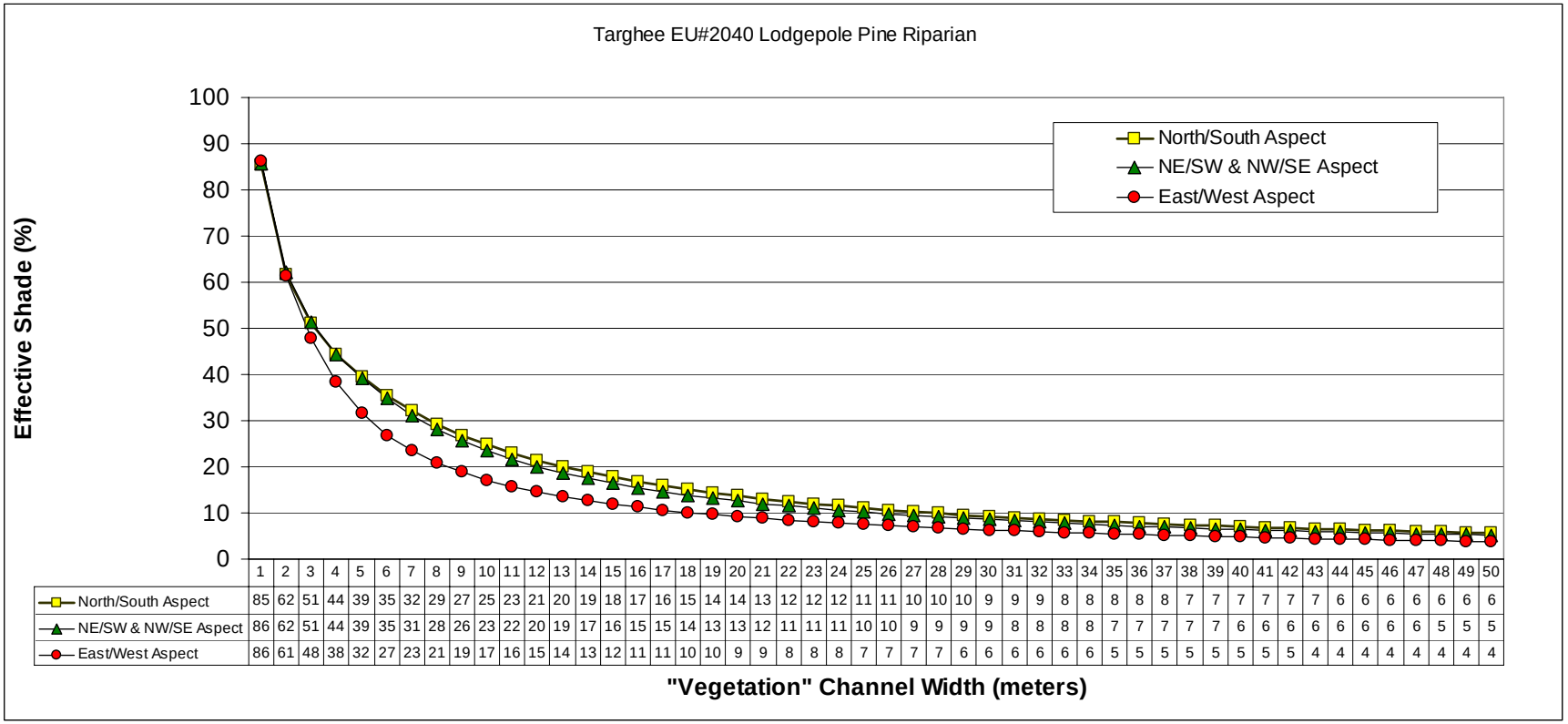
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	17	10	7	5	4	4	3	3	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
NE/SW & NW/SE Aspect	16	9	6	4	4	3	3	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
East/West Aspect	11	6	4	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A.3-43. Riparian Vegetation Type #2020.



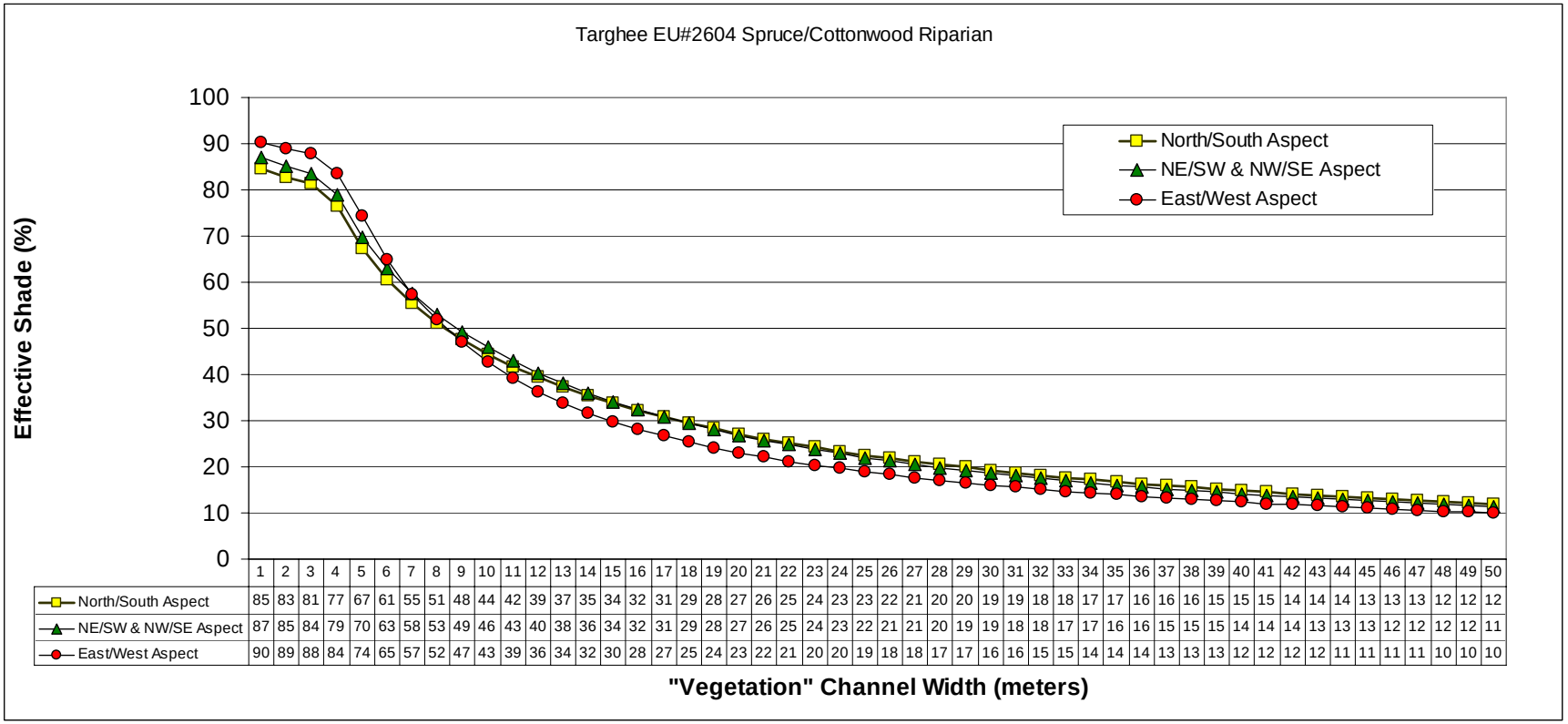
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	57	37	28	22	19	16	14	12	11	10	9	8	8	7	7	6	6	6	5	5	5	5	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2
NE/SW & NW/SE Aspect	55	34	25	19	16	13	11	10	9	8	7	7	6	6	5	5	5	5	4	4	4	4	4	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
East/West Aspect	47	25	17	13	11	9	8	7	6	5	5	5	4	4	4	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Figure A.3-44. Riparian Vegetation Type #2040.



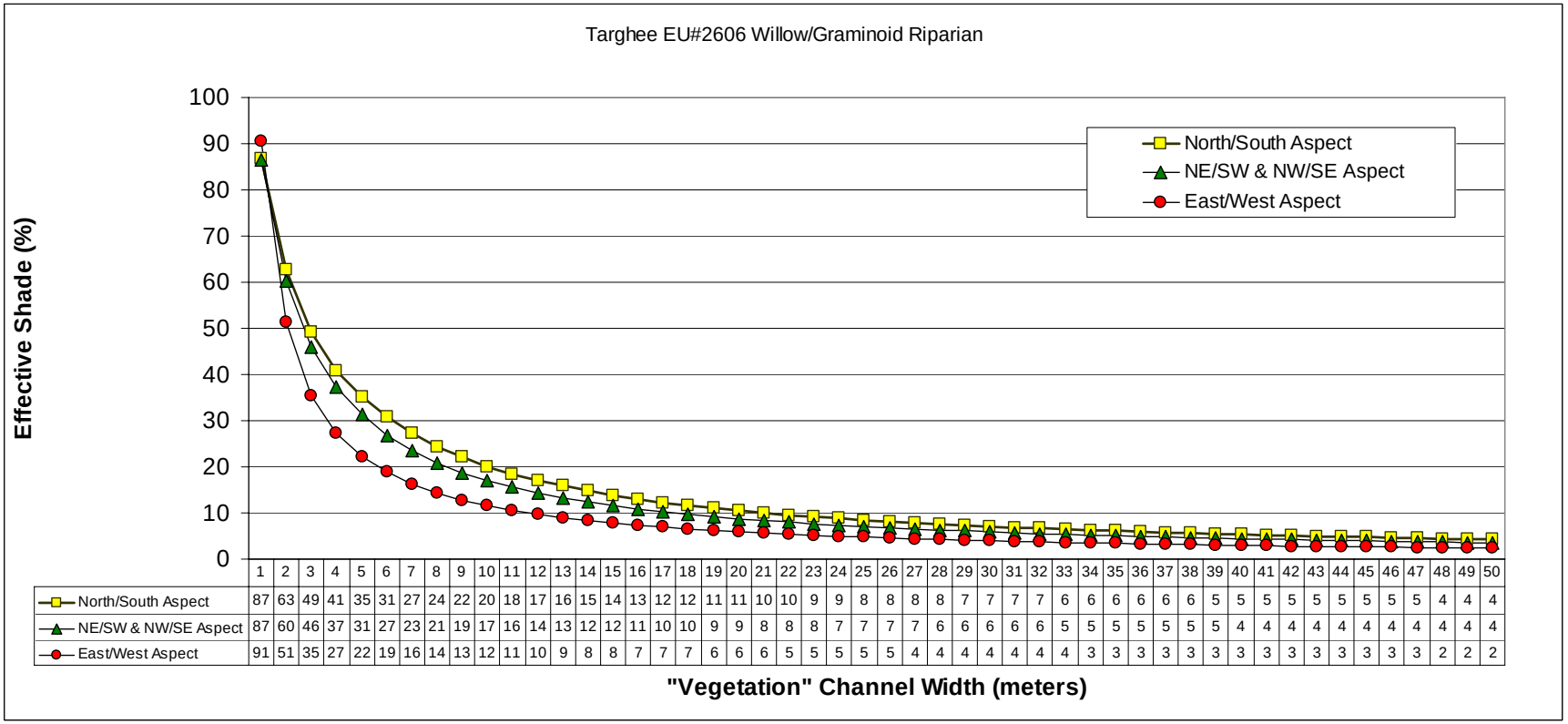
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	85	62	51	44	39	35	32	29	27	25	23	21	20	19	18	17	16	15	14	14	13	12	12	12	11	11	10	10	10	9	9	9	8	8	8	8	8	7	7	7	7	7	7	6	6	6	6	6	6	6
NE/SW & NW/SE Aspect	86	62	51	44	39	35	31	28	26	23	22	20	19	17	16	15	15	14	13	13	12	11	11	11	10	10	9	9	9	9	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6	6	5	5	5
East/West Aspect	86	61	48	38	32	27	23	21	19	17	16	15	14	13	12	11	11	10	10	9	9	8	8	8	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	4	4	4	4	4	4	4	4

Figure A.3-45. Riparian Vegetation Type #2604.



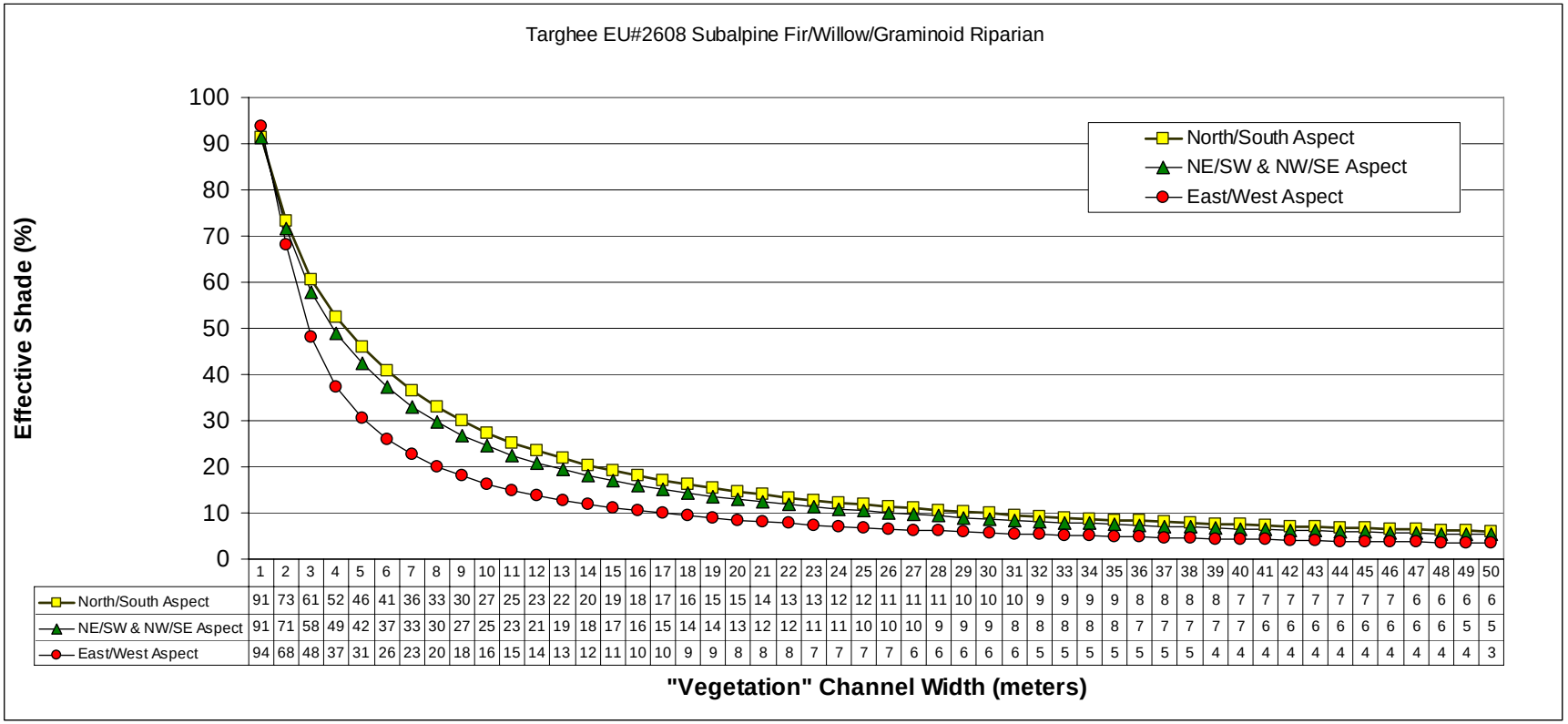
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	85	83	81	77	67	61	55	51	48	44	42	39	37	35	34	32	31	29	28	27	26	25	24	23	23	22	21	20	20	19	19	18	18	17	17	16	16	16	15	15	15	14	14	14	13	13	13	12	12	12
NE/SW & NW/SE Aspect	87	85	84	79	70	63	58	53	49	46	43	40	38	36	34	32	31	29	28	27	26	25	24	23	22	21	21	20	19	19	18	18	17	17	16	16	15	15	15	14	14	14	13	13	13	12	12	12	12	11
East/West Aspect	90	89	88	84	74	65	57	52	47	43	39	36	34	32	30	28	27	25	24	23	22	21	20	20	19	18	18	17	17	16	16	15	15	14	14	14	13	13	13	12	12	12	12	11	11	11	11	10	10	10

Figure A.3-46. Riparian Vegetation Type #2606.



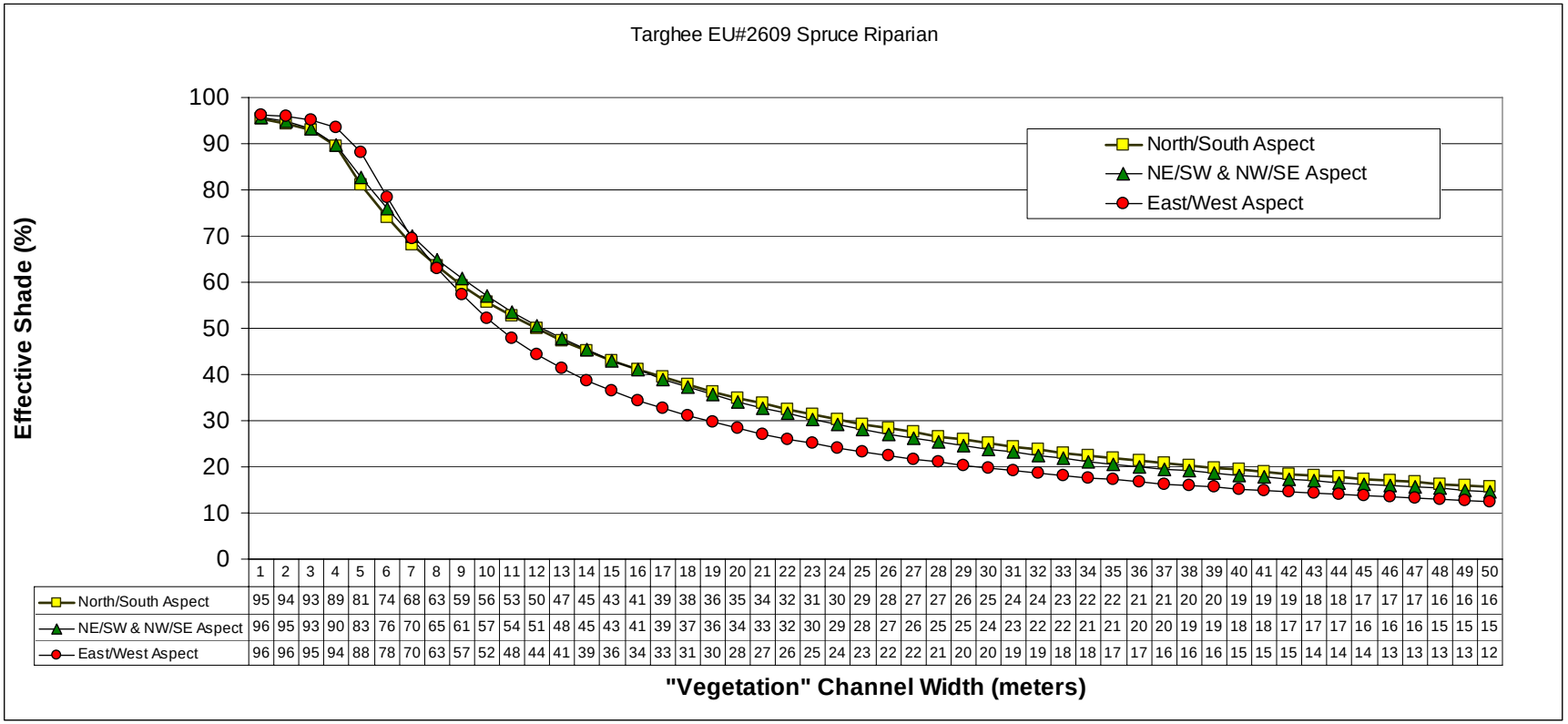
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	87	63	49	41	35	31	27	24	22	20	18	17	16	15	14	13	12	12	11	11	10	10	9	9	8	8	8	8	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5	4	4	4
NE/SW & NW/SE Aspect	87	60	46	37	31	27	23	21	19	17	16	14	13	12	12	11	10	10	9	9	8	8	8	7	7	7	7	6	6	6	6	6	5	5	5	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4
East/West Aspect	91	51	35	27	22	19	16	14	13	12	11	10	9	8	8	7	7	7	6	6	6	5	5	5	5	5	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2

Figure A.3-47. Riparian Vegetation Type #2608.



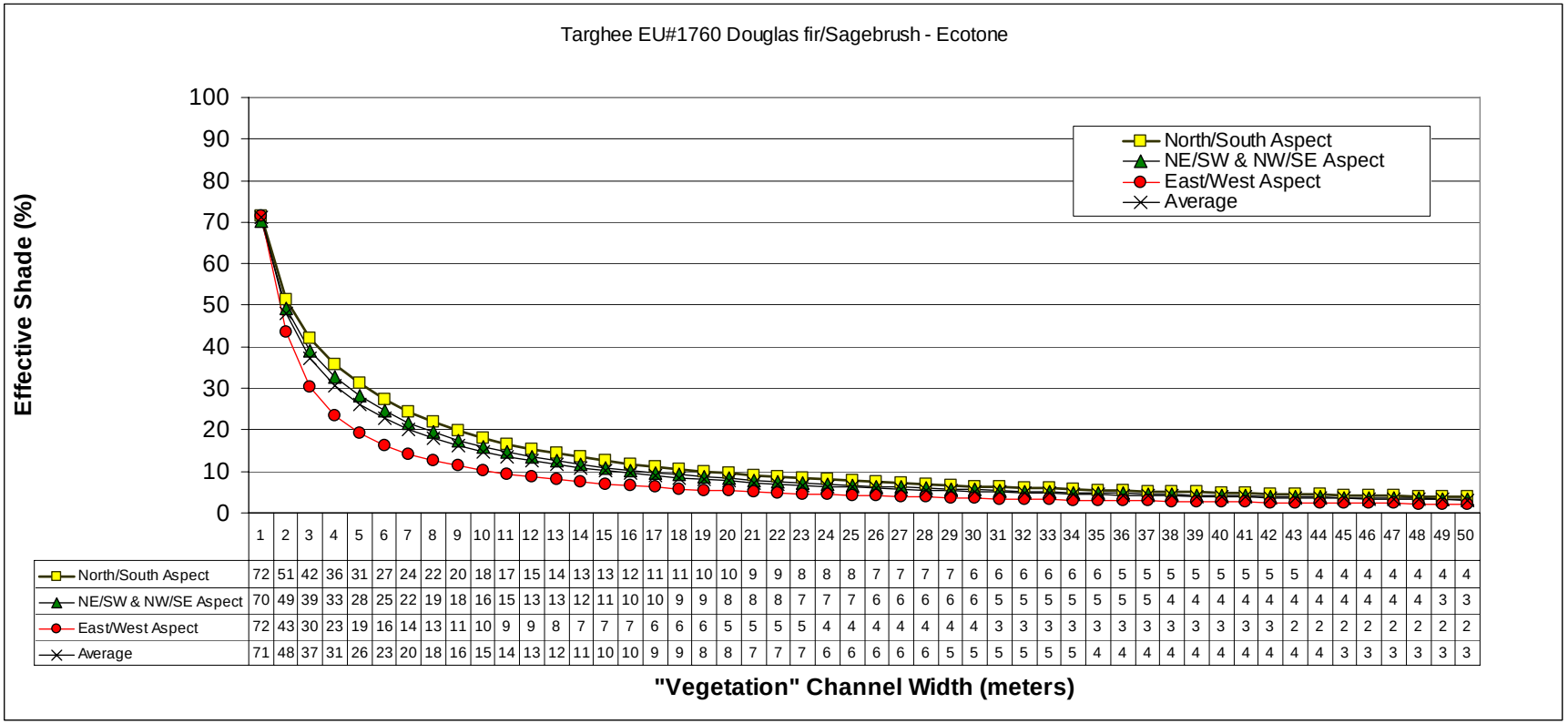
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	91	73	61	52	46	41	36	33	30	27	25	23	22	20	19	18	17	16	15	15	14	13	13	12	12	11	11	11	10	10	10	9	9	9	9	8	8	8	8	7	7	7	7	7	7	7	6	6	6	6
NE/SW & NW/SE Aspect	91	71	58	49	42	37	33	30	27	25	23	21	19	18	17	16	15	14	14	13	12	12	11	11	10	10	10	9	9	9	8	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6	6	5	5
East/West Aspect	94	68	48	37	31	26	23	20	18	16	15	14	13	12	11	10	10	9	9	8	8	8	7	7	7	7	6	6	6	6	6	5	5	5	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4	3

Figure A.3-48. Riparian Vegetation Type #2609.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	95	94	93	89	81	74	68	63	59	56	53	50	47	45	43	41	39	38	36	35	34	32	31	30	29	28	27	27	26	25	24	24	23	22	22	21	21	20	20	19	19	19	18	18	17	17	17	16	16	16
NE/SW & NW/SE Aspect	96	95	93	90	83	76	70	65	61	57	54	51	48	45	43	41	39	37	36	34	33	32	30	29	28	27	26	25	25	24	23	22	22	21	21	20	20	19	19	18	18	17	17	17	16	16	16	15	15	15
East/West Aspect	96	96	95	94	88	78	70	63	57	52	48	44	41	39	36	34	33	31	30	28	27	26	25	24	23	22	22	21	20	20	19	19	18	18	17	17	16	16	16	15	15	15	14	14	14	13	13	13	13	12

Figure A.3-49.Douglas fir/Sagebrush Ecotone Vegetation Type #1760.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	72	51	42	36	31	27	24	22	20	18	17	15	14	13	13	12	11	11	10	10	9	9	8	8	8	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	5	4	4	4	4	4	4	4
NE/SW & NW/SE Aspect	70	49	39	33	28	25	22	19	18	16	15	13	13	12	11	10	10	9	9	8	8	8	7	7	7	6	6	6	6	6	5	5	5	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4	3	3
East/West Aspect	72	43	30	23	19	16	14	13	11	10	9	9	8	7	7	7	6	6	6	5	5	5	5	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2
Average	71	48	37	31	26	23	20	18	16	15	14	13	12	11	10	10	9	9	8	8	7	7	7	6	6	6	6	6	5	5	5	5	5	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3

Salmon-Challis National Forest Vegetation (PVT) Types

Table A.3-49. Limber Pine Vegetation Type Matched with PIFL/FEID H.T. of Steele et al. (1981).

Limber Pine	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PIFL/FEID									
Limber pine	23	1.0	23.0	23.1%	20	*4.6*	0.1	NRCS	0.46
Doug fir	25	1.0	25.0	25.1%	45	*11.3*	0.1	INT-180	1.13
mtn mahogany	1	0.4	0.4	0.4%	7.6	*0.0*	0.1	NRCS	0.00
Ribes sp	3	0.8	2.3	2.3%	1	*0.0*	0.5	FEIS/BPJ	0.01
Buffaloberry	1	0.4	0.4	0.4%	3	*0.0*	0.5	FEIS/BPJ	0.01
mtn snowberry	1	1.0	1.0	1.0%	1.5	*0.0*	0.5	Hitchcock	0.01
grass sp.	72	0.7	47.5	47.8%	0.7	*0.3*	0.25	BPJ	0.08
			99.5			**16.3**			**1.7**

Table A.3-50. Ponderosa Pine Vegetation Type Matched with PIPO/FEID H.T. of Steele et al. (1981).

Ponderosa Pine	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PIPO/FEID									
ponderosa pine	35	1.0	35.0	53.3%	43	*22.9*	0.1	INT-180	2.29
aspen	1	0.2	0.2	0.2%	20	*0.0*	0.25	NRCS	0.01
RM maple	1	0.2	0.2	0.2%	9	*0.0*	0.25	NRCS	0.01
serviceberry	1	0.7	0.7	1.0%	5	*0.0*	0.5	Hitchcock	0.02
ninebark	1	0.2	0.2	0.2%	2	*0.0*	0.5	INT-180	0.00
chokecherry	3	0.2	0.5	0.7%	7.6	*0.1*	0.25	NRCS	0.01
Ribes sp	1	0.8	0.8	1.1%	1	*0.0*	0.5	FEIS/BPJ	0.01
common snowberry	1	0.4	0.4	0.5%	1.5	*0.0*	0.5	Hitchcock	0.00
grass sp.	55	0.5	28.1	42.7%	0.7	*0.3*	0.25	BPJ	0.07
			65.7			**23.4**			**2.4**

Table A.3-51. Douglas Fir/Grassland Vegetation Type Matched with PSME/CARU/FEID H.T. of Steele et al. (1981).

Doug Fir/Grassland	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PSME/CARU/FEID									
Doug fir	20	1.0	20.0	29.6%	45	*13.3*	0.1	INT-180	1.33
Ribes sp	1	0.6	0.6	0.8%	1	*0.0*	0.5	FEIS/BPJ	0.00
mtn snowberry	1	0.6	0.6	0.8%	1.5	*0.0*	0.5	Hitchcock	0.01
grass sp.	51	0.9	46.4	68.7%	0.7	*0.5*	0.25	BPJ	0.12
			67.5			**13.8**			**1.5**

Table A.3-52. Douglas Fir/Limber Pine Vegetation Type Matched with PSME/ARCO/ASMI H.T. of Steele et al. (1981).

Doug fir/Limber Pine	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PSME/ARCO/ASMI									
Engelmann spruce	1	0.3	0.3	0.4%	37	*0.1*	0.1	INT-180	0.01
Limber pine	10	0.8	7.5	10.5%	20	*2.1*	0.1	NRCS	0.21
Doug fir	50	1.0	50.0	70.1%	45	*31.6*	0.1	INT-180	3.16
mtn mahogany	1	0.3	0.3	0.4%	7.6	*0.0*	0.1	NRCS	0.00
menziesia	1	0.3	0.3	0.4%	2	*0.0*	0.5	INT-180	0.00
chokecherry	3	0.3	0.8	1.1%	7.6	*0.1*	0.25	NRCS	0.02
Ribes sp	2	0.5	1.0	1.4%	1	*0.0*	0.5	FEIS/BPJ	0.01
buffaloberry	1	0.5	0.5	0.7%	3	*0.0*	0.5	FEIS/BPJ	0.01
mtn snowberry	1	0.8	0.8	1.1%	1.5	*0.0*	0.5	Hitchcock	0.01
grass sp.	17	0.6	10.0	14.1%	0.7	*0.1*	0.25	BPJ	0.02
			71.3			**34.1**			**3.5**

Table A.3-53. Douglas Fir/Lodgepole Pine-Steep Vegetation Type Matched with PSME/CAGE/CAGE H.T. of Steele et al. (1981).

Doug fir/Lodgepole Steep	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PSME/CAGE/CAGE									
subalpine fir	1	0.3	0.3	0.3%	15	*0.0*	0.1	NRCS	0.00
Limber pine	1	0.2	0.2	0.2%	20	*0.0*	0.1	NRCS	0.00
whitebark pine	8	0.2	1.2	1.5%	15	*0.2*	0.1	NRCS	0.02
lodgepole	16	0.4	5.6	6.8%	30	*2.1*	0.1	NRCS	0.21
aspen	1	0.2	0.2	0.2%	20	*0.0*	0.25	NRCS	0.01
Doug fir	48	1.0	48.0	58.7%	45	*26.4*	0.1	NRCS	2.64
RM maple	4	0.4	1.4	1.7%	9	*0.2*	0.25	NRCS	0.04
serviceberry	1	0.2	0.2	0.2%	5	*0.0*	0.5	Hitchcock	0.00
Utah honeysuckle	1	0.2	0.2	0.2%	2	*0.0*	0.5	INT-180	0.00
chokecherry	2	0.2	0.3	0.4%	7.6	*0.0*	0.25	NRCS	0.01
Ribes sp	15	0.3	3.8	4.6%	1	*0.0*	0.5	FEIS/BPJ	0.02
scoulers willow	1	0.4	0.4	0.4%	15	*0.1*	0.25	Brunsfeld	0.02
mtn snowberry	2	1.0	1.9	2.3%	1.5	*0.0*	0.5	Hitchcock	0.02
grass sp.	43	0.4	18.5	22.6%	0.7	*0.2*	0.25	BPJ	0.04
			81.8			**29.3**			**3.0**

Table A.3-54. Douglas Fir/Lodgepole Pine-Gentle Vegetation Type Matched with PSME/CARU/CARU H.T. of Steele et al. (1981).

Doug fir/Lodgepole Gentle	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PSME/CARU/CARU									
subalpine fir	1	0.3	0.3	0.2%	15	*0.0*	0.1	NRCS	0.00
Engelmann spruce	1	0.1	0.1	0.0%	37	*0.0*	0.1	INT-180	0.00
whitebark pine	3	0.1	0.2	0.1%	15	*0.0*	0.1	NRCS	0.00
lodgepole	20	0.6	11.0	10.1%	30	*3.0*	0.1	NRCS	0.30
aspen	9	0.5	4.1	3.7%	20	*0.7*	0.25	NRCS	0.19
Doug fir	47	1.0	47.0	43.2%	45	*19.4*	0.1	INT-180	1.94
RM maple	2	0.2	0.3	0.3%	9	*0.0*	0.25	NRCS	0.01
serviceberry	1	0.2	0.2	0.1%	5	*0.0*	0.5	Hitchcock	0.00
ceanothus	25	0.3	6.3	5.7%	3	*0.2*	0.5	INT-180	0.09
Utah honeysuckle	1	0.1	0.1	0.0%	2	*0.0*	0.5	INT-180	0.00
Ribes sp	6	0.2	1.1	1.0%	1	*0.0*	0.5	FEIS/BPJ	0.00
scoulers willow	3	0.3	0.8	0.7%	15	*0.1*	0.25	Brunsfeld	0.03
mtn snowberry	4	1.0	3.8	3.5%	1.5	*0.1*	0.5	Hitchcock	0.03
grass sp.	77	0.4	33.9	31.2%	0.7	*0.2*	0.25	BPJ	0.05
			108.8			**23.9**			**2.6**

Table A.3-55. Dry Douglas Fir with Ponderosa Pine Vegetation Type Matched with PSME/AGSP/PIPO H.T. of Steele et al. (1981).

Dry Doug fir w/Ppine	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PSME/AGSP/PIPO									
lodgepole	2	0.4	0.7	0.9%	30	*0.3*	0.1	NRCS	0.03
ponderosa pine	22	1.0	22.0	27.2%	43	*11.7*	0.1	INT-180	1.17
Limber pine	1	0.3	0.3	0.3%	20	*0.1*	0.1	NRCS	0.01
Doug fir	17	1.0	17.0	21.0%	45	*9.5*	0.1	INT-180	0.95
serviceberry	1	0.8	0.8	0.9%	5	*0.0*	0.5	Hitchcock	0.02
mtn mahogany	1	0.3	0.3	0.3%	7.6	*0.0*	0.1	NRCS	0.00
chokecherry	1	0.3	0.3	0.3%	7.6	*0.0*	0.25	NRCS	0.01
Ribes sp	2	0.4	0.8	1.0%	1	*0.0*	0.5	FEIS/BPJ	0.00
mtn snowberry	1	0.3	0.3	0.3%	1.5	*0.0*	0.5	Hitchcock	0.00
grass sp.	69	0.6	38.6	47.8%	0.7	*0.3*	0.25	BPJ	0.08
			80.9			**21.9**			**2.3**

Table A.3-56. Dry Douglas Fir without Ponderosa Pine Vegetation Type Matched with PSME/FEID/FEID H.T. of Steele et al. (1981).

Dry Doug fir w/out Ppine	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
PSME/FEID/FEID									
lodgepole	3	0.2	0.5	0.8%	30	*0.2*	0.1	NRCS	0.02
Doug fir	34	1.0	34.0	59.6%	45	*26.8*	0.1	INT-180	2.68
common juniper	1	0.3	0.3	0.4%	3	*0.0*	0.5	NRCS	0.01
Ribes sp	4	0.4	1.6	2.8%	1	*0.0*	0.5	FEIS/BPJ	0.01
mtn snowberry	1	0.6	0.6	1.0%	1.5	*0.0*	0.5	Hitchcock	0.01
grass sp.	46	0.4	20.2	35.5%	0.7	*0.2*	0.25	BPJ	0.06
			57.1			**27.3**			**2.8**

Table A.3-57. Grand Fir Vegetation Type Matched with ABGR/VAGL H.T. of Steele et al. (1981).

Grand fir	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Sourcce	Wt Overhang
ABGR/VAGL									
lodgepole	15	0.8	11.3	8.1%	30	*2.4*	0.1	NRCS	0.24
Doug fir	31	0.8	23.3	16.8%	45	*7.6*	0.1	INT-180	0.76
Grand fir	44	1.0	44.0	31.8%	61	*19.4*	0.1	NRCS	1.94
subalpine fir	16	0.7	10.4	7.5%	15	*1.1*	0.1	NRCS	0.11
larch	15	0.4	5.3	3.8%	61	*2.3*	0.1	NRCS	0.23
Engelmann spruce	20	0.8	15.0	10.8%	37	*4.0*	0.1	INT-180	0.40
ponderosa pine	7	0.4	2.5	1.8%	43	*0.8*	0.1	INT-180	0.08
aspen	1	0.2	0.2	0.1%	20	*0.0*	0.25	NRCS	0.01
RM maple	2	0.3	0.5	0.4%	9	*0.0*	0.25	NRCS	0.01
sitka alder	15	0.3	3.8	2.7%	3	*0.1*	0.5	INT-180	0.04
serviceberry	2	0.9	1.7	1.2%	5	*0.1*	0.5	Hitchcock	0.03
ceanothus	3	0.2	0.5	0.3%	3	*0.0*	0.5	INT-180	0.00
Utah honeysuckle	9	1.0	9.0	6.5%	2	*0.1*	0.5	INT-180	0.07
Ribes sp	3	0.3	0.9	0.7%	1	*0.0*	0.5	FEIS/BPJ	0.00
scoulers willow	4	0.6	2.2	1.6%	15	*0.2*	0.25	Brunsfeld	0.06
buffaloberry	1	0.4	0.4	0.3%	3	*0.0*	0.5	FEIS/BPJ	0.00
mtn ash	2	0.7	1.3	0.9%	4	*0.0*	0.5	INT-180	0.02
mtn snowberry	1	0.3	0.3	0.2%	1.5	*0.0*	0.5	Hitchcock	0.00
grass sp.	12	0.5	6.2	4.5%	0.7	*0.0*	0.25	BPJ	0.01
			138.4			**38.3**			**4.0**

Table A.3-58. Subalpine Fir-Moist Vegetation Type Matched with ABLA/STAM/LICA H.T. of Steele et al. (1981).

subalpine fir moist	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/STAM/LICA									
lodgepole	8	0.6	4.4	6.3%	30	*1.9*	0.1	NRCS	0.19
Doug fir	1	0.2	0.2	0.2%	45	*0.1*	0.1	INT-180	0.01
Grand fir	15	0.2	2.3	3.2%	61	*2.0*	0.1	INT-180/BPJ	0.20
subalpine fir	23	1.0	23.0	33.1%	15	*5.0*	0.1	NRCS	0.50
larch	1	0.2	0.2	0.2%	61	*0.1*	0.1	NRCS	0.01
Engelmann spruce	32	1.0	32.0	46.0%	37	*17.0*	0.1	INT-180	1.70
RM maple	1	0.3	0.3	0.4%	9	*0.0*	0.25	NRCS	0.01
sitka alder	3	0.3	0.8	1.1%	3	*0.0*	0.5	INT-180	0.02
Ribes sp	1	0.6	0.6	0.8%	1	*0.0*	0.5	FEIS/BPJ	0.00
mtn ash	1	0.5	0.5	0.6%	4	*0.0*	0.5	INT-180	0.01
common snowberry	1	0.3	0.3	0.4%	1.5	*0.0*	0.5	Hitchcock	0.00
grass sp.	14	0.4	5.3	7.7%	0.7	*0.1*	0.25	BPJ	0.01
			69.5			**26.3**			**2.7**

Table A.3-59. Subalpine Fir-Dry/Gentle Vegetation Type Matched with ABLA/SPBE H.T. of Steele et al. (1981).

subalpine fir/dry/gentle	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/SPBE									
lodgepole	10	1.0	9.5	9.3%	30	*2.8*	0.1	NRCS	0.28
Doug fir	50	1.0	47.5	46.5%	45	*20.9*	0.1	INT-180	2.09
ponderosa pine	3	0.2	0.5	0.4%	43	*0.2*	0.1	INT-180	0.02
subalpine fir	23	1.0	23.0	22.5%	15	*3.4*	0.1	NRCS	0.34
Engelmann spruce	1	0.2	0.2	0.1%	37	*0.1*	0.1	INT-180	0.01
RM maple	2	0.4	0.7	0.7%	9	*0.1*	0.25	NRCS	0.02
serviceberry	4	0.8	3.0	2.9%	5	*0.1*	0.5	Hitchcock	0.07
ceanothus	3	0.2	0.5	0.4%	3	*0.0*	0.5	INT-180	0.01
Utah honeysuckle	2	0.5	0.9	0.9%	2	*0.0*	0.5	INT-180	0.01
Ribes sp	1	0.5	0.5	0.4%	1	*0.0*	0.5	FEIS/BPJ	0.00
scoulers willow	2	0.4	0.7	0.7%	15	*0.1*	0.25	Brunsfeld	0.03
buffaloberry	2	0.5	0.9	0.9%	3	*0.0*	0.5	FEIS/BPJ	0.01
mtn ash	1	0.7	0.7	0.6%	4	*0.0*	0.5	INT-180	0.01
mtn snowberry	5	0.5	2.3	2.2%	1.5	*0.0*	0.5	Hitchcock	0.02
grass sp.	28	0.4	11.5	11.2%	0.7	*0.1*	0.25	BPJ	0.02
			102.1			**27.9**			**2.9**

Table A.3-60. Subalpine Fir-Dry/Steep Vegetation Type Matched with ABLA/CAGE/CAGE H.T. of Steele et al. (1981).

subalpine fir/dry/steep	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/CAGE/CAGE									
lodgepole	23	1.0	21.9	23.5%	30	*7.1*	0.1	NRCS	0.71
Doug fir	14	0.4	4.9	5.3%	45	*2.4*	0.1	INT-180	0.24
subalpine fir	37	1.0	37.0	39.9%	15	*6.0*	0.1	NRCS	0.60
Engelmann spruce	4	0.4	1.4	1.5%	37	*0.6*	0.1	INT-180	0.06
whitebark pine	6	0.5	2.7	2.9%	15	*0.4*	0.1	NRCS	0.04
limber pine	16	0.2	2.4	2.6%	20	*0.5*	0.1	NRCS	0.05
aspen	37	0.1	1.9	2.0%	20	*0.4*	0.25	NRCS	0.10
RM maple	1	0.1	0.1	0.1%	9	*0.0*	0.25	NRCS	0.00
common juniper	2	0.2	0.3	0.3%	3	*0.0*	0.5	NRCS	0.00
Utah honeysuckle	1	0.3	0.3	0.3%	2	*0.0*	0.5	INT-180	0.00
chokecherry	1	0.1	0.1	0.1%	7.6	*0.0*	0.25	NRCS	0.00
Ribes sp	3	0.4	1.1	1.1%	1	*0.0*	0.5	FEIS/BPJ	0.01
common snowberry	1	0.1	0.1	0.1%	1.5	*0.0*	0.5	Hitchcock	0.00
mtn ash	2	0.2	0.3	0.3%	4	*0.0*	0.5	INT-180	0.01
mtn snowberry	2	0.4	0.7	0.8%	1.5	*0.0*	0.5	Hitchcock	0.01
grass sp.	62	0.3	18.0	19.4%	0.7	*0.1*	0.25	BPJ	0.03
			92.8			**17.5**			**1.9**

Table A.3-61. Subalpine Fir with Lodgepole Pine Vegetation Type Matched with ABLA/VACA H.T. of Steele et al. (1981).

subalpine fir/lodgepole	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/VACA									
lodgepole	58	1.0	58.0	54.7%	30	*16.4*	0.1	NRCS	1.64
Doug fir	8	0.4	2.8	2.6%	45	*1.2*	0.1	INT-180	0.12
grand fir	1	0.2	0.2	0.1%	61	*0.1*	0.1	INT-180/BPJ	0.01
subalpine fir	12	1.0	11.4	10.7%	15	*1.6*	0.1	NRCS	0.16
Engelmann spruce	7	0.6	3.9	3.6%	37	*1.3*	0.1	INT-180	0.13
whitebark pine	2	0.3	0.5	0.5%	15	*0.1*	0.1	NRCS	0.01
limber pine	1	0.2	0.2	0.1%	20	*0.0*	0.1	NRCS	0.00
aspen	1	0.2	0.2	0.1%	20	*0.0*	0.25	NRCS	0.01
serviceberry	1	0.3	0.3	0.2%	5	*0.0*	0.5	Hitchcock	0.01
sweetberry honeyskle	1	0.3	0.3	0.2%	2	*0.0*	0.5	Burke	0.00
Utah honeysuckle	4	0.5	1.8	1.7%	2	*0.0*	0.5	INT-180	0.02
Ribes sp	3	0.2	0.5	0.4%	1	*0.0*	0.5	FEIS/BPJ	0.00
scoulers willow	15	0.2	2.3	2.1%	15	*0.3*	0.25	Brunsfeld	0.08
buffaloberry	2	0.5	0.9	0.8%	3	*0.0*	0.5	FEIS/BPJ	0.01
mtn ash	1	0.2	0.2	0.1%	4	*0.0*	0.5	INT-180	0.00
grass sp.	48	0.5	23.0	21.7%	0.7	*0.2*	0.25	BPJ	0.04
			106.1			**21.3**			**2.2**

Table A.3-62. Subalpine Fir with Whitebark Pine Vegetation Type Matched with ABLA/VASC/PIAL H.T. of Steele et al. (1981).

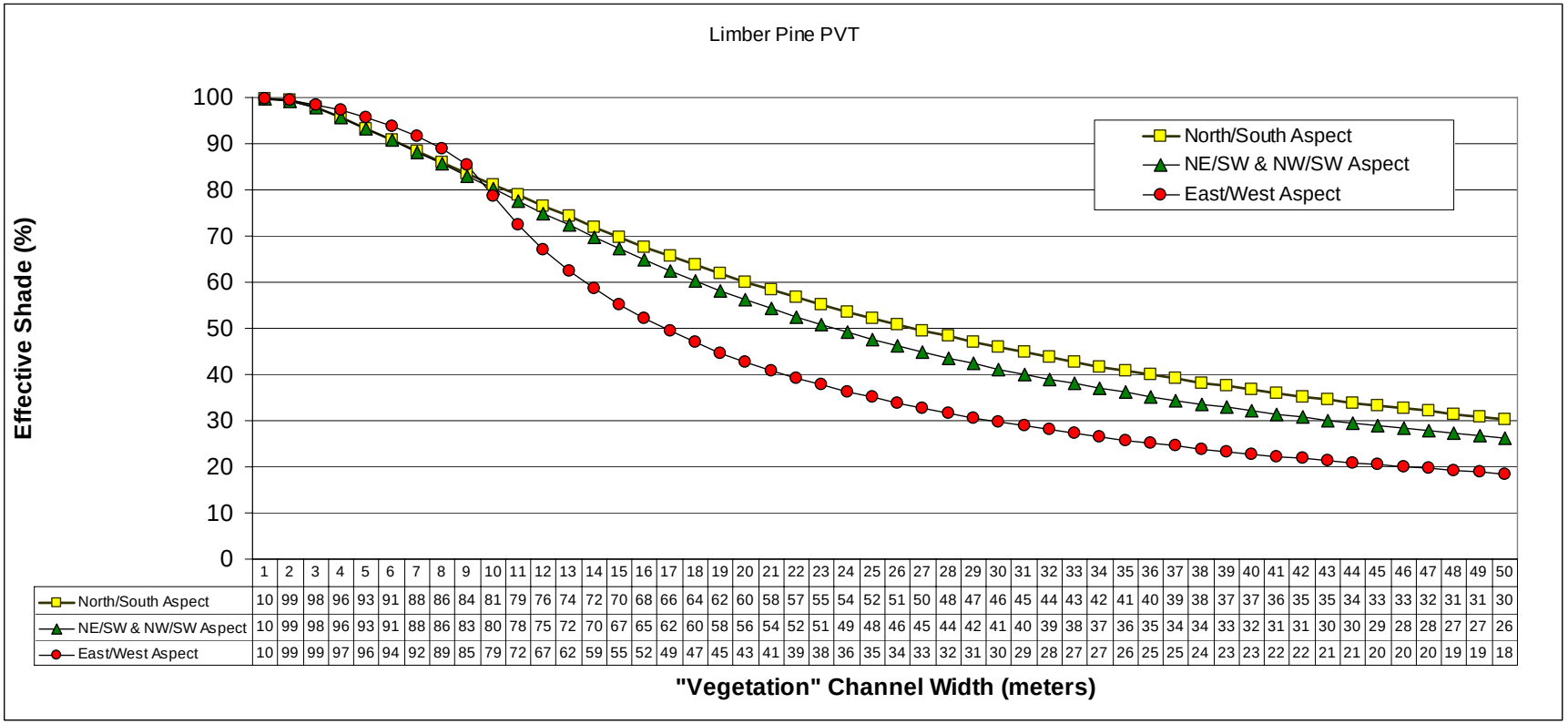
subalpine fir/whitebark	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/VASC/PIAL									
lodgepole	11	1.0	11.0	11.3%	30	*3.4*	0.1	NRCS	0.34
subalpine fir	34	1.0	34.0	35.1%	15	*5.3*	0.1	NRCS	0.53
Engelmann spruce	3	0.4	1.1	1.1%	37	*0.4*	0.1	INT-180	0.04
whitebark pine	46	1.0	46.0	47.4%	15	*7.1*	0.1	NRCS	0.71
common juniper	3	0.4	1.1	1.1%	3	*0.0*	0.5	NRCS	0.02
Labrador tea	3	0.4	1.1	1.1%	2	*0.0*	0.5	INT-180	0.01
grass sp.	5	0.6	2.9	2.9%	0.7	*0.0*	0.25	BPJ	0.01
			97.0			**16.2**			**1.6**

Table A.3-63. Subalpine Fir with Douglas Fir Vegetation Type Matched with ABLA/VAGL H.T. of Steele et al. (1981).

subalpine fir/Doug fir	Ave CC	Constancy	CC*Const	Relative Proportion	Height	H*RP	Overhang	Source	Wt Overhang
ABLA/VAGL									
lodgepole	4	0.6	2.2	2.1%	30	*0.6*	0.1	NRCS	0.06
Doug fir	28	1.0	26.6	25.6%	45	*11.5*	0.1	INT-180	1.15
subalpine fir	32	1.0	32.0	30.8%	15	*4.6*	0.1	NRCS	0.46
Engelmann spruce	17	0.7	11.1	10.6%	37	*3.9*	0.1	INT-180	0.39
whitebark pine	1	0.2	0.2	0.1%	15	*0.0*	0.1	NRCS	0.00
ponderosa pine	8	0.3	2.0	1.9%	43	*0.8*	0.1	NRCS	0.08
aspen	3	0.2	0.5	0.4%	20	*0.1*	0.25	NRCS	0.02
RM maple	1	0.6	0.6	0.5%	9	*0.0*	0.25	NRCS	0.01
serviceberry	2	0.5	0.9	0.9%	5	*0.0*	0.5	Hitchcock	0.02
Utah honeysuckle	15	1.0	15.0	14.4%	2	*0.3*	0.5	INT-180	0.14
Ribes sp	2	0.4	0.7	0.7%	1	*0.0*	0.5	FEIS/BPJ	0.00
scoulers willow	2	0.3	0.5	0.5%	15	*0.1*	0.25	Brunsfeld	0.02
mtn snowberry	3	0.2	0.5	0.4%	1.5	*0.0*	0.5	Hitchcock	0.00
buffaloberry	1	0.3	0.3	0.2%	3	*0.0*	0.5	FEIS/BPJ	0.00
mtn ash	2	0.7	1.3	1.3%	4	*0.1*	0.5	INT-180	0.03
common snowberry	1	0.2	0.2	0.1%	1.5	*0.0*	0.5	Hitchcock	0.00
grass sp.	23	0.4	9.7	9.3%	0.7	*0.1*	0.25	BPJ	0.02
			103.9			**22.2**			**2.4**

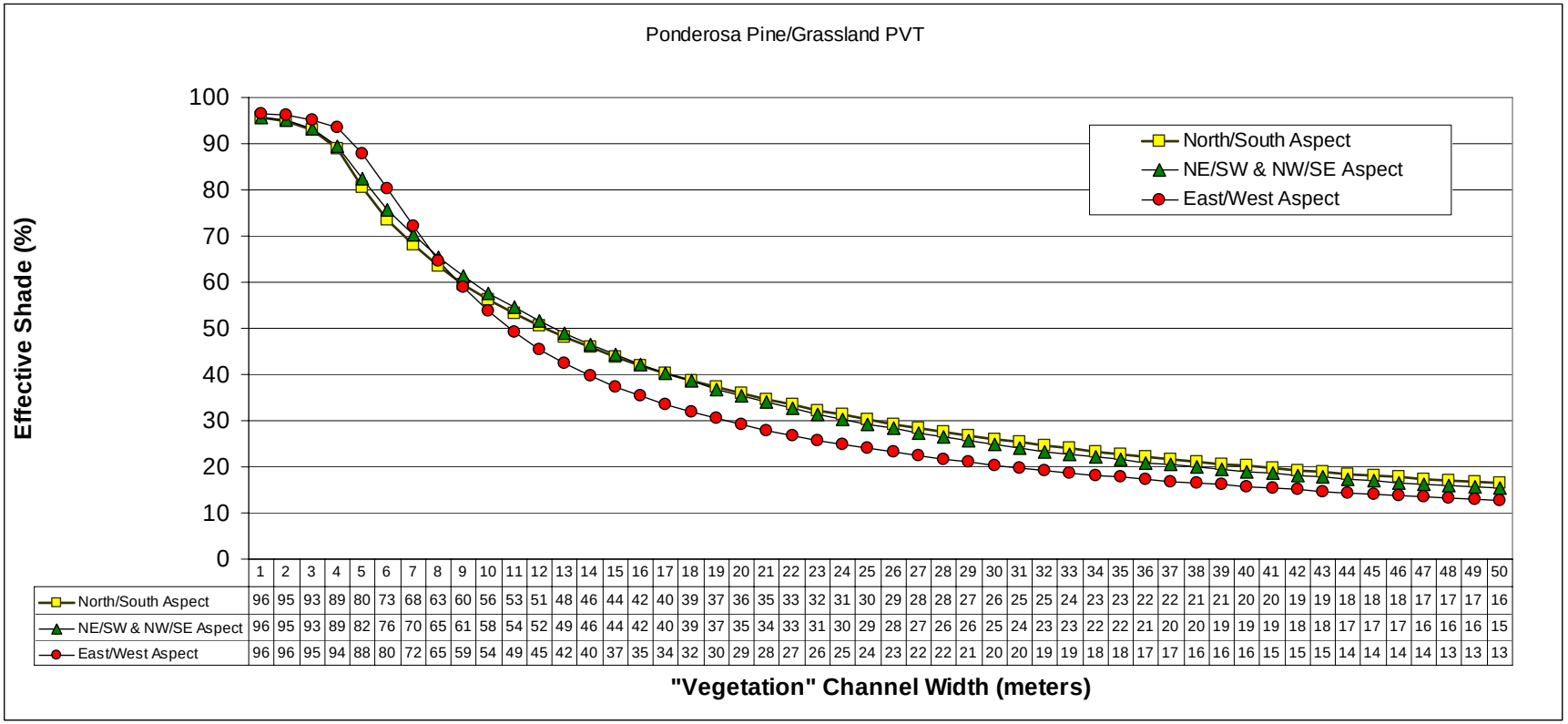
Species = plant species included in the development of a community's shade curve.
Ave CC = Average canopy cover for each species.
CC*Const = Average canopy cover for an individual species times its constancy value.
Relative Proportion = an individual species portion of the total cover times constancy value.
Height = mature height for each species determined from literature values or best professional judgment.
H*RP = height for an individual species times its relative proportion.
Overhang = branch overhang percent of height based on plant type and size; conifers = 10%, deciduous trees and tall shrubs (>5m) = 25%, low shrubs = 50%.
Source = literature source for each species mature height.
Wt Overhang = branch overhang distance for each species determined from a percentage of its height.
Total = the overall weighted canopy cover is the sum of the CC*Const column, the overall weighted height is the sum of the H*RP column, the overall weighted overhang is the sum of the Wt Overhang column.

Figure A.3-49. Limber Pine Vegetation Type.



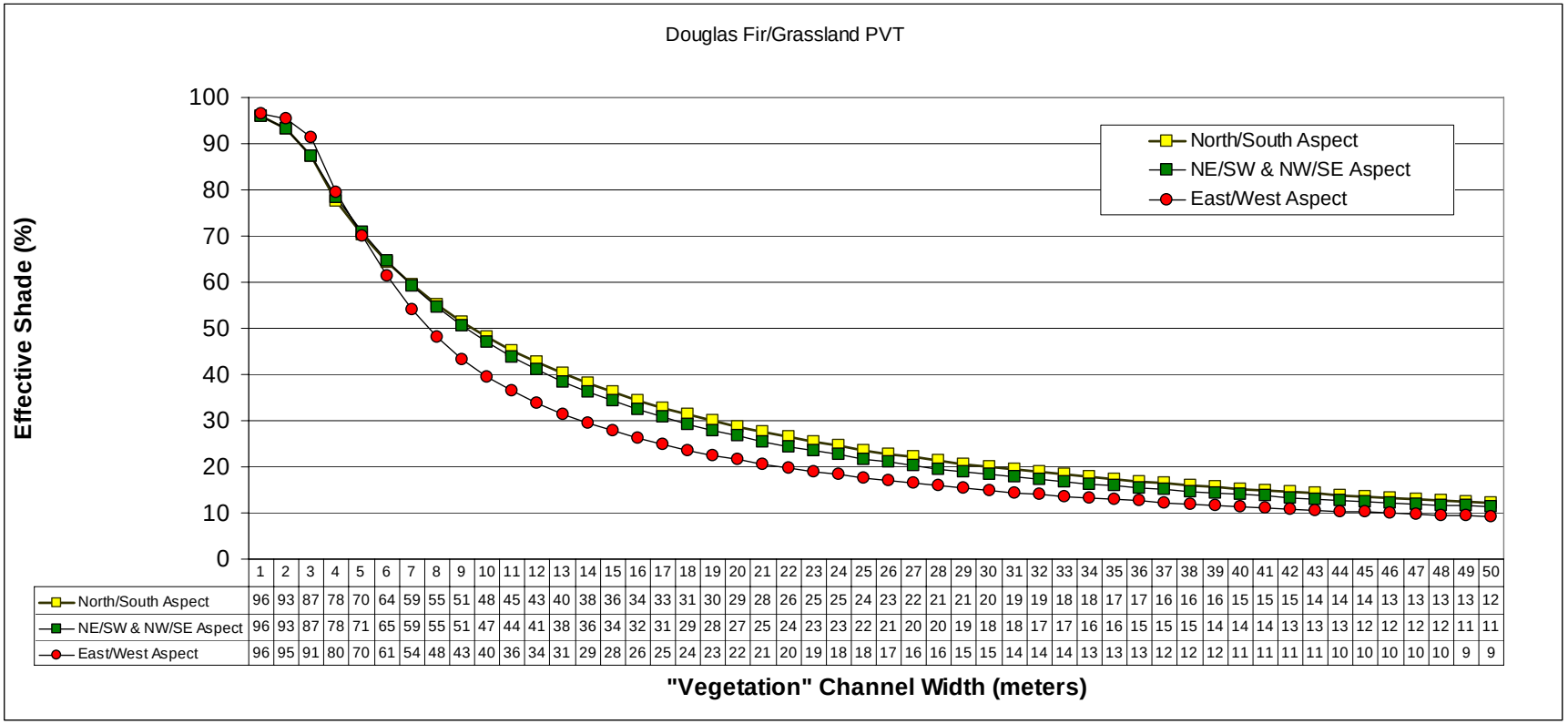
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	10	99	98	96	93	91	88	86	84	81	79	76	74	72	70	68	66	64	62	60	58	57	55	54	52	51	50	48	47	46	45	44	43	42	41	40	39	38	37	37	36	35	35	34	33	33	32	31	31	30
NE/SW & NW/SW Aspect	10	99	98	96	93	91	88	86	83	80	78	75	72	70	67	65	62	60	58	56	54	52	51	49	48	46	45	44	42	41	40	39	38	37	36	35	34	34	33	32	31	31	30	30	29	28	28	27	27	26
East/West Aspect	10	99	99	97	96	94	92	89	85	79	72	67	62	59	55	52	49	47	45	43	41	39	38	36	35	34	33	32	31	30	29	28	27	27	26	25	25	24	23	23	22	22	21	21	20	20	20	19	19	18

Figure A.3-50. Ponderosa Pine Vegetation Type.



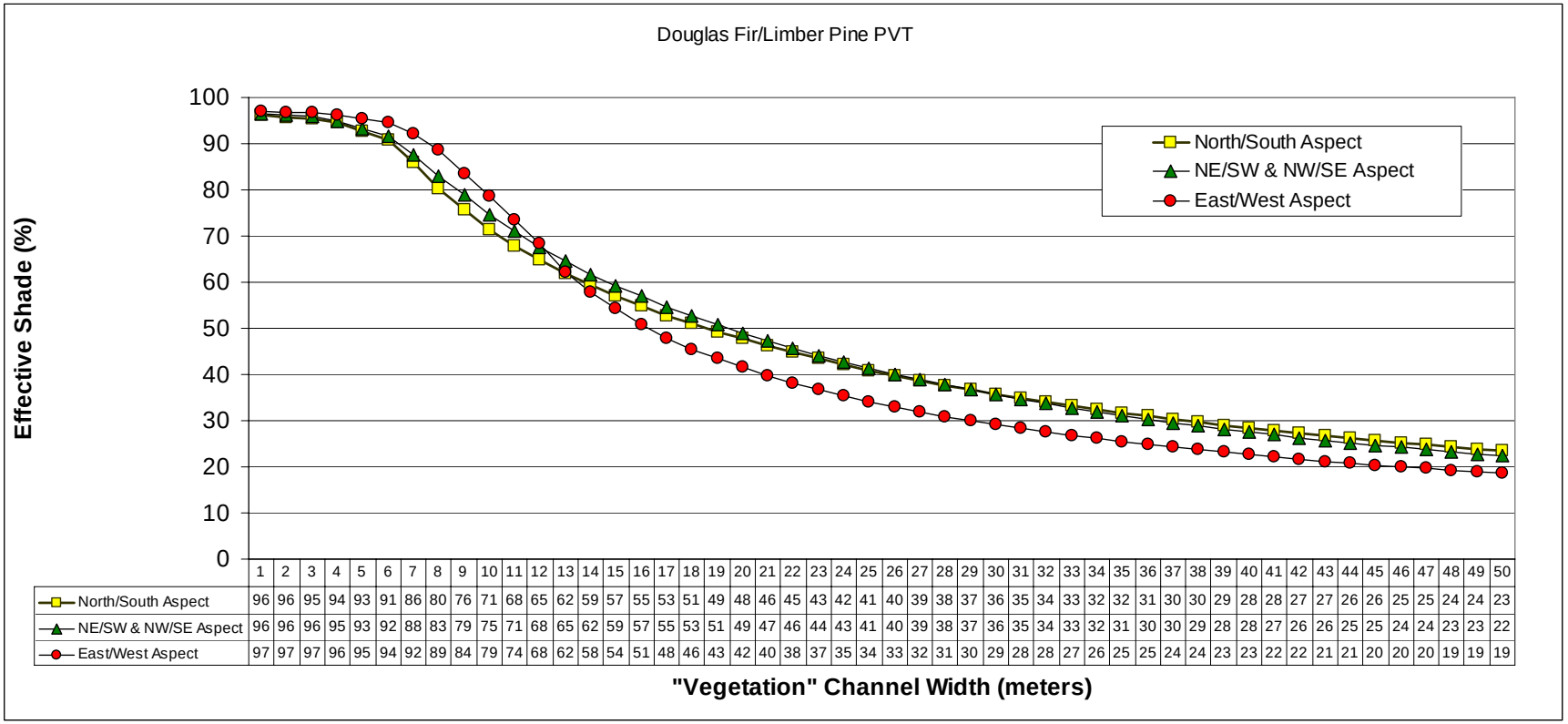
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	96	95	93	89	80	73	68	63	60	56	53	51	48	46	44	42	40	39	37	36	35	33	32	31	30	29	28	28	27	26	25	25	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17	17	16
NE/SW & NW/SE Aspect	96	95	93	89	82	76	70	65	61	58	54	52	49	46	44	42	40	39	37	35	34	33	31	30	29	28	27	26	26	25	24	23	23	22	22	21	20	20	19	19	19	18	18	17	17	17	16	16	16	15
East/West Aspect	96	96	95	94	88	80	72	65	59	54	49	45	42	40	37	35	34	32	30	29	28	27	26	25	24	23	22	22	21	20	20	19	19	18	18	17	17	16	16	16	15	15	15	14	14	14	14	13	13	13

Figure A.3-51. Douglas Fir/Grassland Vegetation Type.



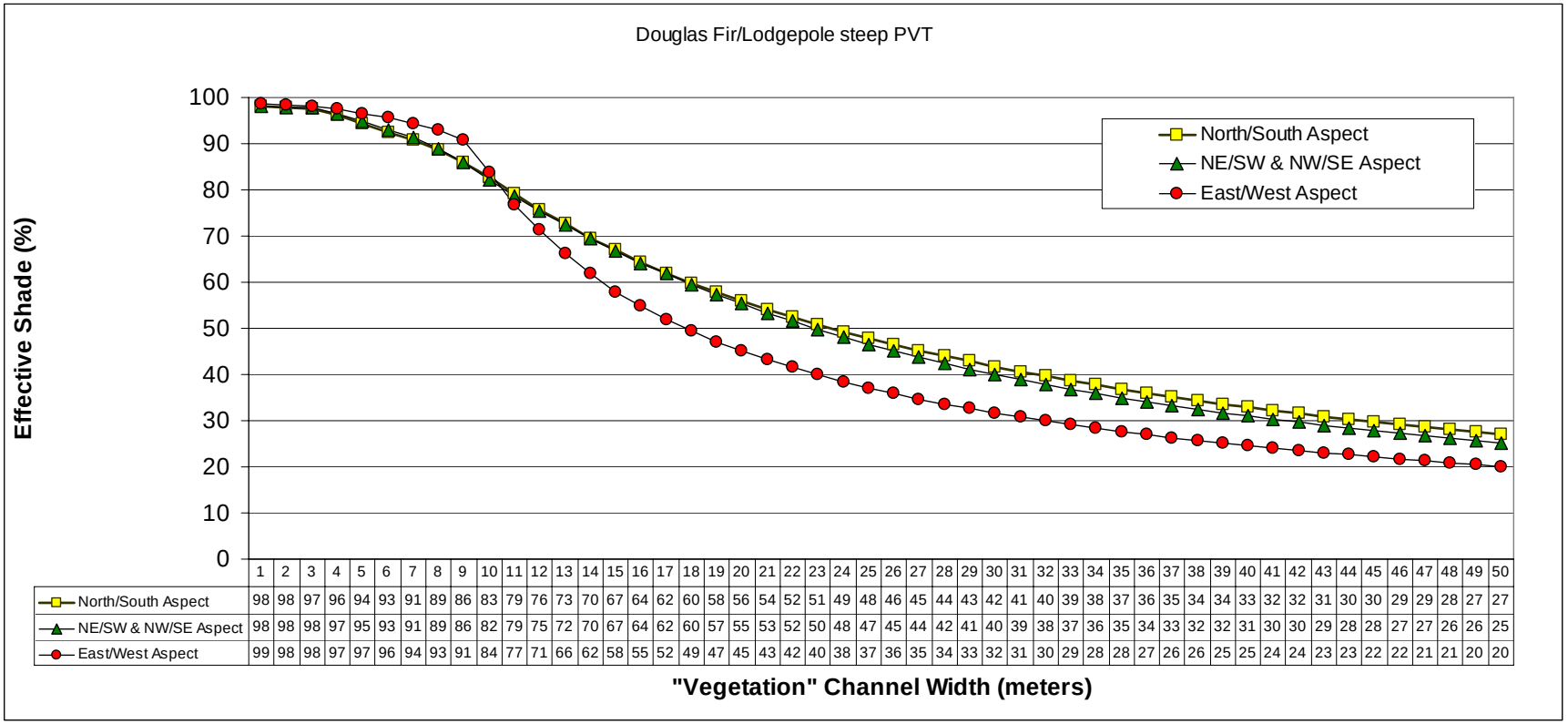
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	96	93	87	78	70	64	59	55	51	48	45	43	40	38	36	34	33	31	30	29	28	26	25	25	24	23	22	21	21	20	19	19	18	18	17	17	16	16	16	15	15	15	14	14	14	13	13	13	13	12
NE/SW & NW/SE Aspect	96	93	87	78	71	65	59	55	51	47	44	41	38	36	34	32	31	29	28	27	25	24	23	23	22	21	20	20	19	18	18	17	17	16	16	15	15	15	14	14	14	13	13	13	12	12	12	12	11	11
East/West Aspect	96	95	91	80	70	61	54	48	43	40	36	34	31	29	28	26	25	24	23	22	21	20	19	18	18	17	16	16	15	15	14	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10	10	10	9	9

Figure A.3-52. Douglas Fir/Limber Pine Vegetation Type.



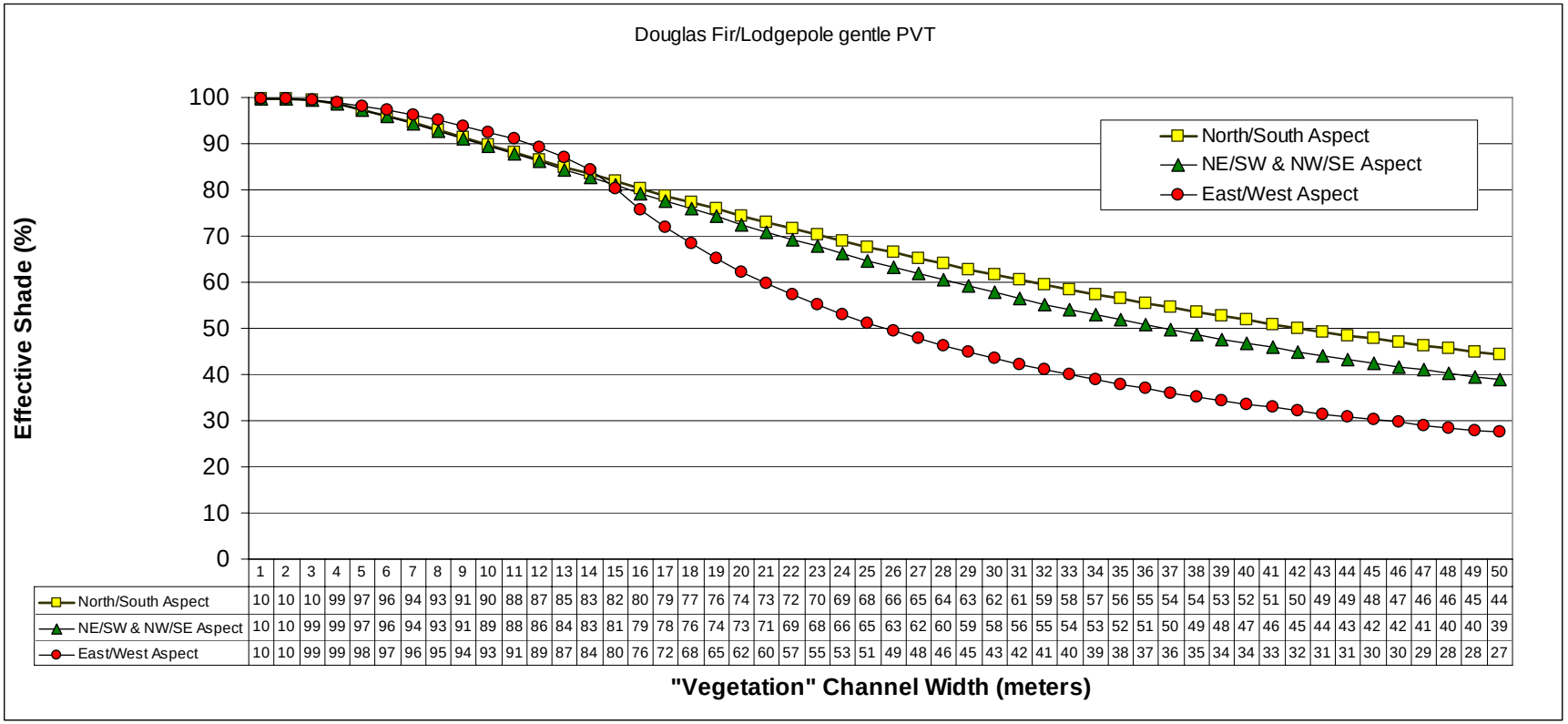
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	96	96	95	94	93	91	86	80	76	71	68	65	62	59	57	55	53	51	49	48	46	45	43	42	41	40	39	38	37	36	35	34	33	32	32	31	30	30	29	28	28	27	27	26	26	25	25	24	24	23
NE/SW & NW/SE Aspect	96	96	96	95	93	92	88	83	79	75	71	68	65	62	59	57	55	53	51	49	47	46	44	43	41	40	39	38	37	36	35	34	33	32	31	30	30	29	28	28	27	26	26	25	25	24	24	23	23	22
East/West Aspect	97	97	97	96	95	94	92	89	84	79	74	68	62	58	54	51	48	46	43	42	40	38	37	35	34	33	32	31	30	29	28	28	27	26	25	25	24	24	23	23	22	22	21	21	20	20	20	19	19	19

Figure A.3-53. Douglas Fir/Lodgepole Pine-Steep Vegetation Type.



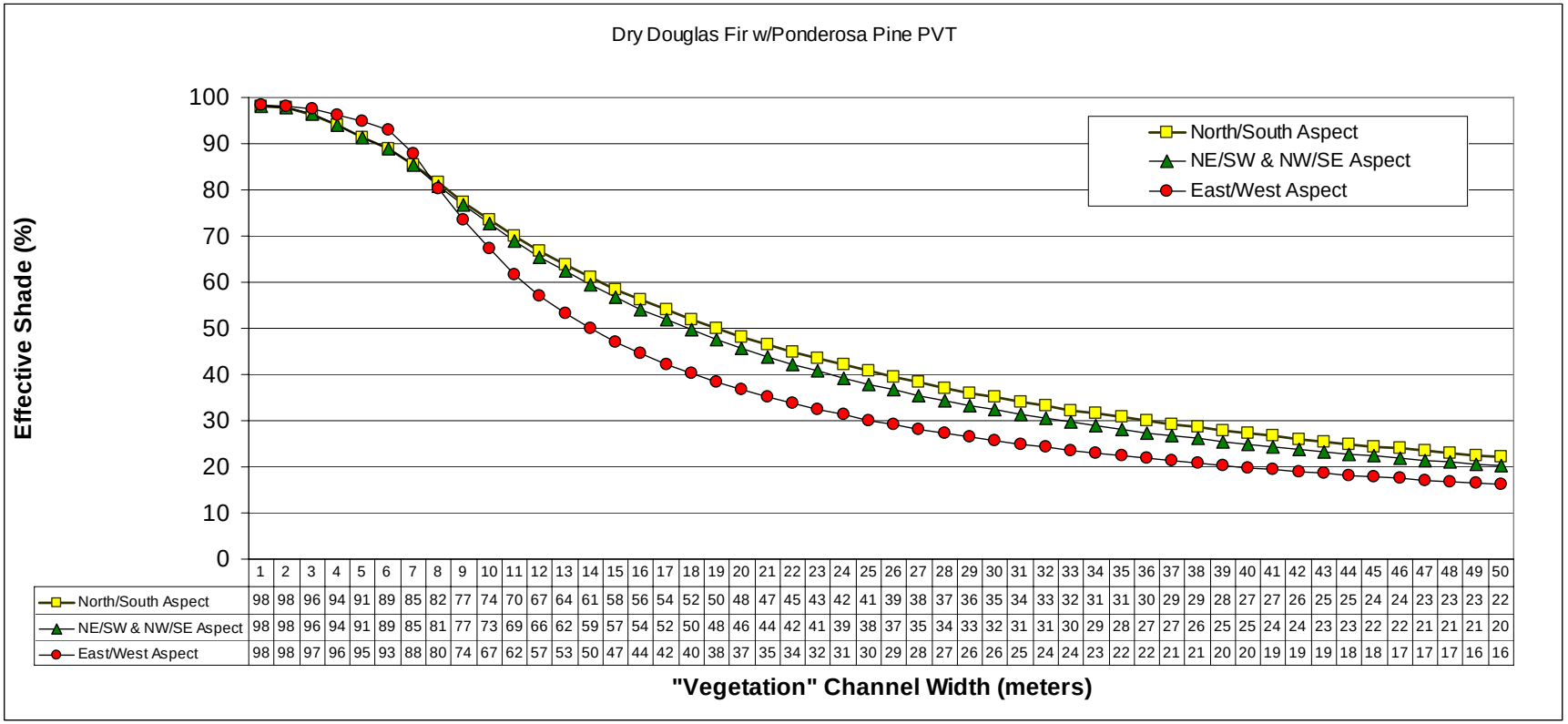
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	98	98	97	96	94	93	91	89	86	83	79	76	73	70	67	64	62	60	58	56	54	52	51	49	48	46	45	44	43	42	41	40	39	38	37	36	35	34	34	33	32	32	31	30	30	29	29	28	27	27
NE/SW & NW/SE Aspect	98	98	98	97	95	93	91	89	86	82	79	75	72	70	67	64	62	60	57	55	53	52	50	48	47	45	44	42	41	40	39	38	37	36	35	34	33	32	32	31	30	30	29	28	28	27	27	26	26	25
East/West Aspect	99	98	98	97	97	96	94	93	91	84	77	71	66	62	58	55	52	49	47	45	43	42	40	38	37	36	35	34	33	32	31	30	29	28	28	27	26	26	25	25	24	24	23	23	22	22	21	21	20	20

Figure A.3-54. Douglas Fir/Lodgepole Pine-Gentle Vegetation Type.



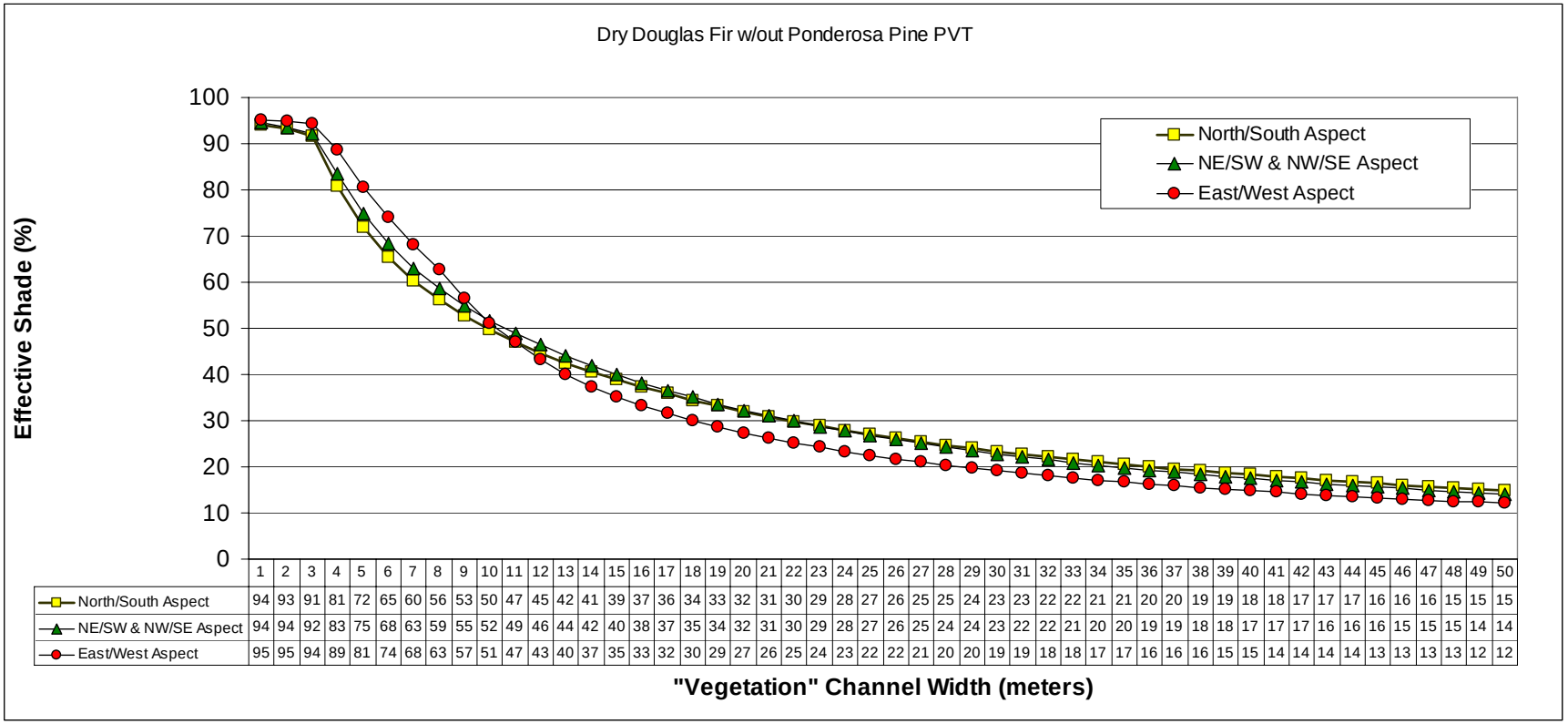
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	10	10	10	99	97	96	94	93	91	90	88	87	85	83	82	80	79	77	76	74	73	72	70	69	68	66	65	64	63	62	61	59	58	57	56	55	54	54	53	52	51	50	49	49	48	47	46	46	45	44
NE/SW & NW/SE Aspect	10	10	99	99	97	96	94	93	91	89	88	86	84	83	81	79	78	76	74	73	71	69	68	66	65	63	62	60	59	58	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	42	41	40	40	39
East/West Aspect	10	10	99	99	98	97	96	95	94	93	91	89	87	84	80	76	72	68	65	62	60	57	55	53	51	49	48	46	45	43	42	41	40	39	38	37	36	35	34	34	33	32	31	31	30	30	29	28	28	27

Figure A.3-55. Dry Douglas Fir with Ponderosa Pine Vegetation Type.



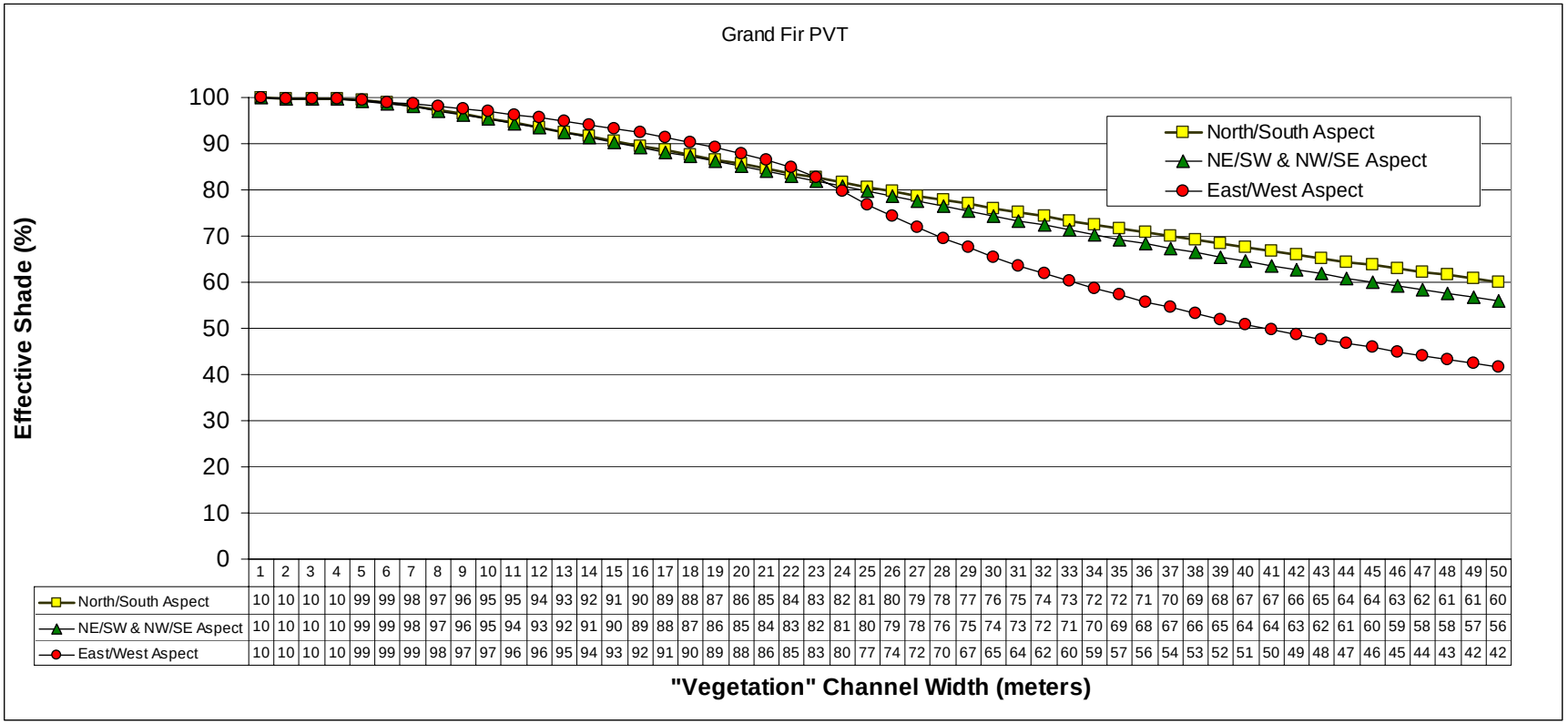
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	98	98	96	94	91	89	85	82	77	74	70	67	64	61	58	56	54	52	50	48	47	45	43	42	41	39	38	37	36	35	34	33	32	31	31	30	29	29	28	27	27	26	25	25	24	24	23	23	23	22
NE/SW & NW/SE Aspect	98	98	96	94	91	89	85	81	77	73	69	66	62	59	57	54	52	50	48	46	44	42	41	39	38	37	35	34	33	32	31	31	30	29	28	27	27	26	25	25	24	24	23	23	22	22	21	21	21	20
East/West Aspect	98	98	97	96	95	93	88	80	74	67	62	57	53	50	47	44	42	40	38	37	35	34	32	31	30	29	28	27	26	26	25	24	24	23	22	22	21	21	20	20	19	19	19	18	18	17	17	17	16	16

Figure A.3-56. Dry Douglas Fir without Ponderosa Pine Vegetation Type.



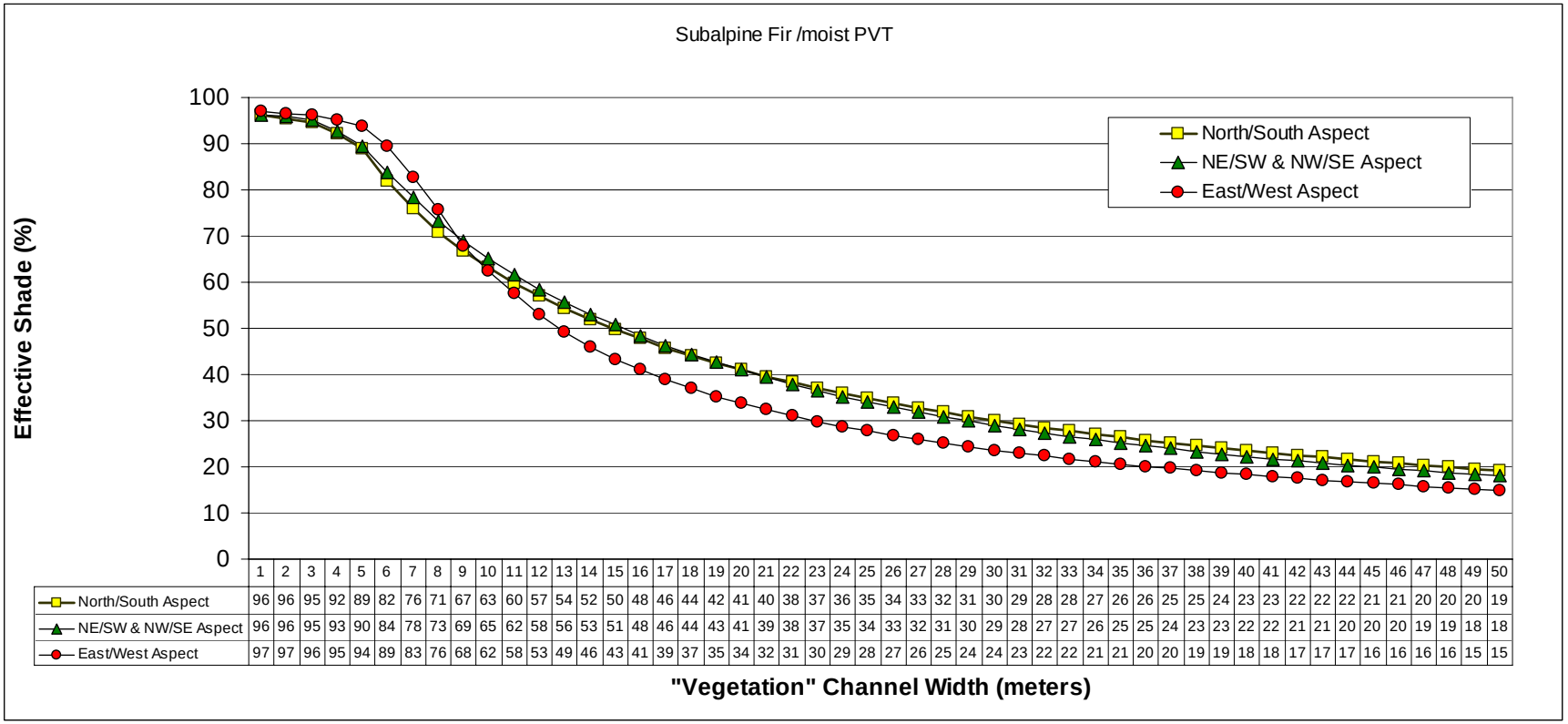
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	94	93	91	81	72	65	60	56	53	50	47	45	42	41	39	37	36	34	33	32	31	30	29	28	27	26	25	25	24	23	23	22	22	21	21	20	20	19	19	18	18	17	17	17	16	16	16	15	15	15
NE/SW & NW/SE Aspect	94	94	92	83	75	68	63	59	55	52	49	46	44	42	40	38	37	35	34	32	31	30	29	28	27	26	25	24	24	23	22	22	21	20	20	19	19	18	18	17	17	17	16	16	16	15	15	15	14	14
East/West Aspect	95	95	94	89	81	74	68	63	57	51	47	43	40	37	35	33	32	30	29	27	26	25	24	23	22	22	21	20	20	19	19	18	18	17	17	16	16	16	15	15	14	14	14	14	13	13	13	13	12	12

Figure A.3-57. Grand Fir Vegetation Type.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	10	10	10	10	99	99	98	97	96	95	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	72	71	70	69	68	67	67	66	65	64	64	63	62	61	61	60
NE/SW & NW/SE Aspect	10	10	10	10	99	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	76	75	74	73	72	71	70	69	68	67	66	65	64	64	63	62	61	60	59	58	58	57	56
East/West Aspect	10	10	10	10	99	99	99	98	97	97	96	96	95	94	93	92	91	90	89	88	86	85	83	80	77	74	72	70	67	65	64	62	60	59	57	56	54	53	52	51	50	49	48	47	46	45	44	43	42	42

Figure A.3-58. Subalpine Fir-Moist Vegetation Type.



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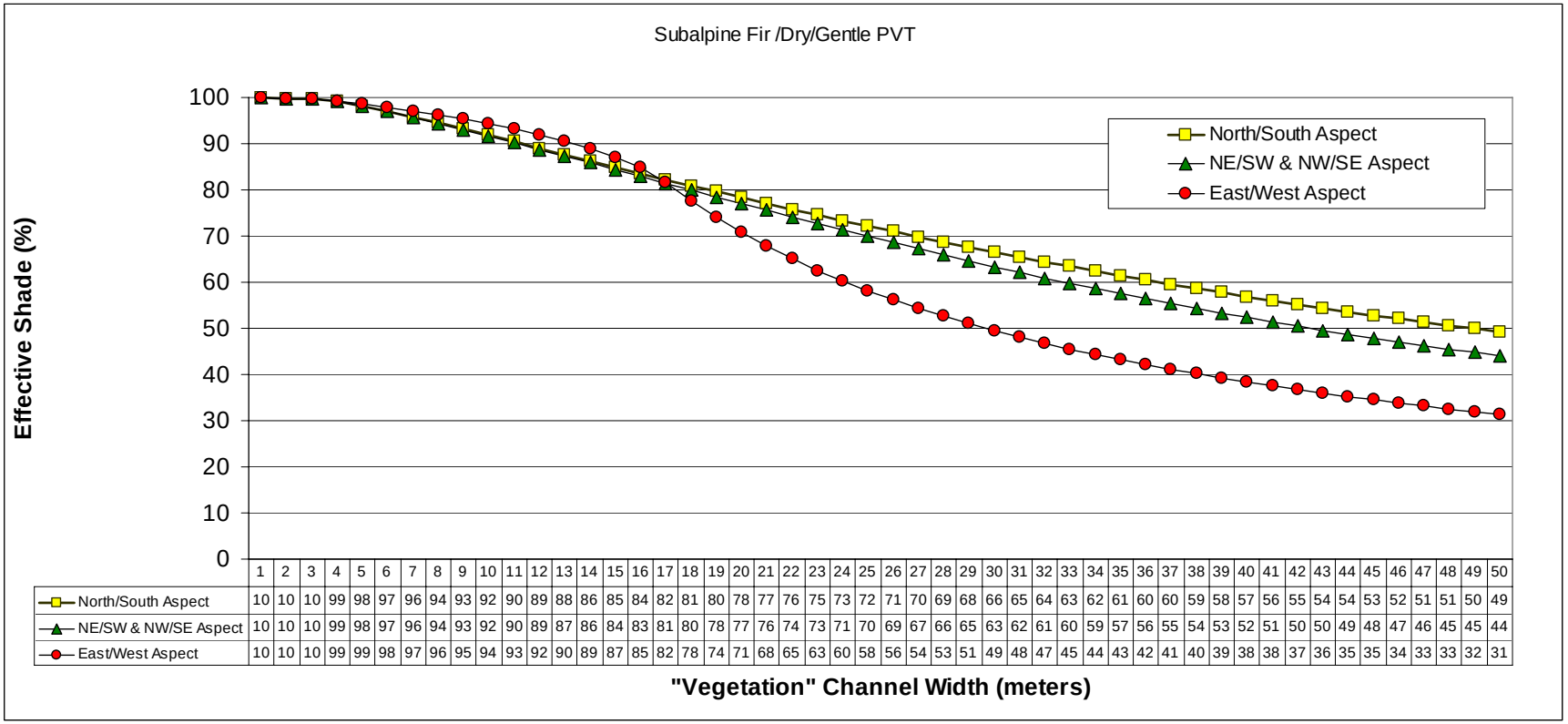
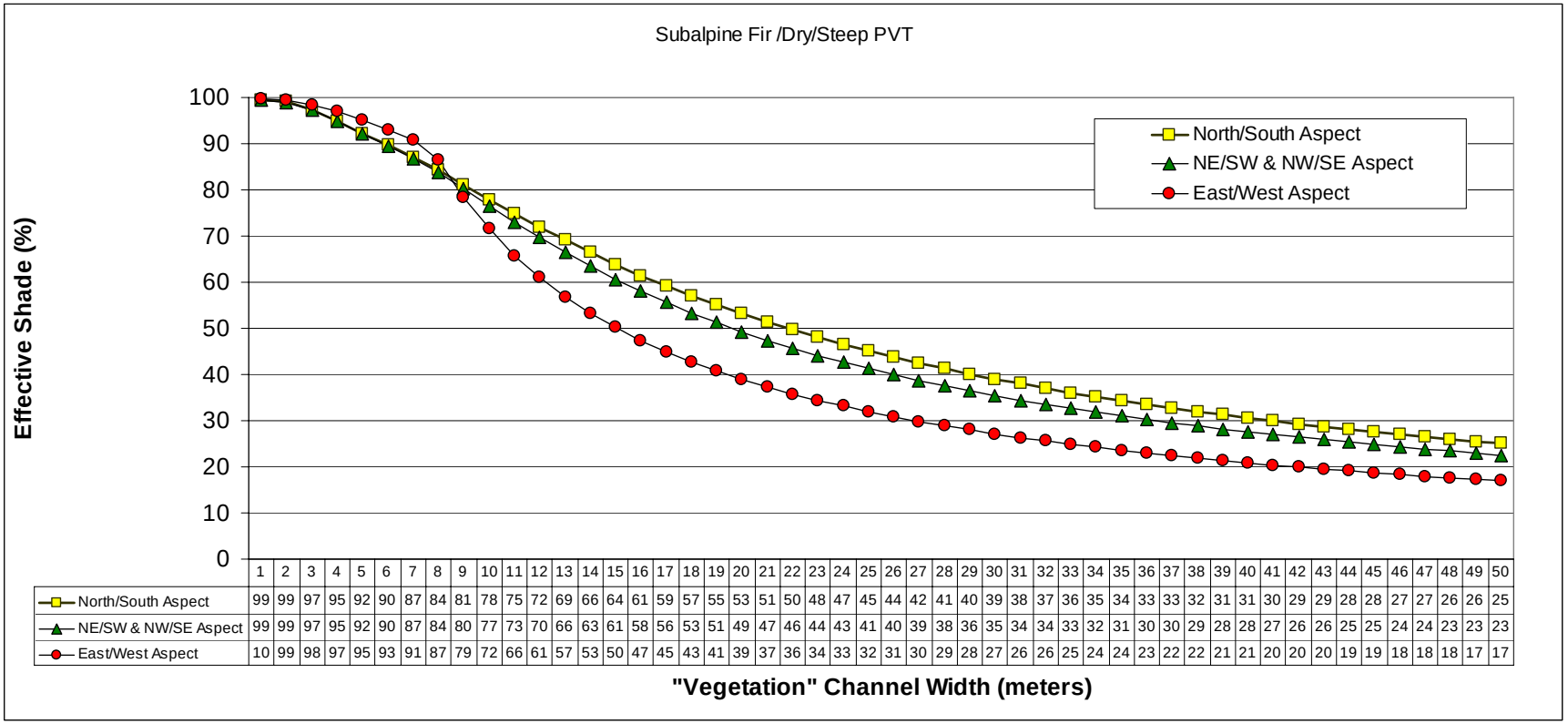
North/South Aspect	96	96	95	92	89	82	76	71	67	63	60	57	54	52	50	48	46	44	42	41	40	38	37	36	35	34	33	32	31	30	29	28	28	27	26	26	25	25	24	23	23	22	22	22	21	21	20	20	20	19
NE/SW & NW/SE Aspect	96	96	95	93	90	84	78	73	69	65	62	58	56	53	51	48	46	44	43	41	39	38	37	35	34	33	32	31	30	29	28	27	27	26	25	25	24	23	23	22	22	21	21	20	20	20	19	19	18	18
East/West Aspect	97	97	96	95	94	89	83	76	68	62	58	53	49	46	43	41	39	37	35	34	32	31	30	29	28	27	26	25	24	24	23	22	22	21	21	20	20	19	19	18	18	17	17	17	16	16	16	16	15	15

Figure A.3-59. Subalpine Fir-Dry/Gentle Vegetation Type.



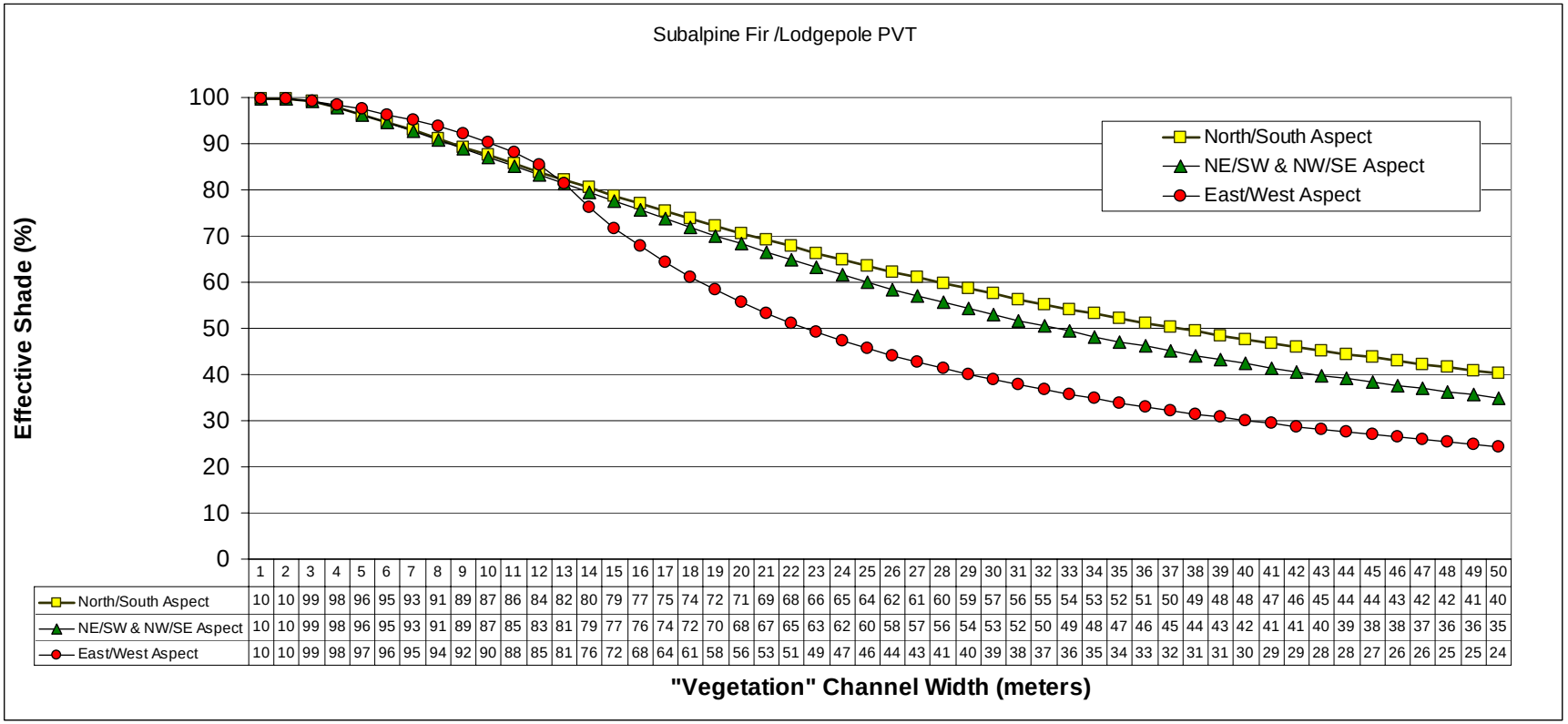
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	10	10	10	99	98	97	96	94	93	92	90	89	88	86	85	84	82	81	80	78	77	76	75	73	72	71	70	69	68	66	65	64	63	62	61	60	60	59	58	57	56	55	54	54	53	52	51	51	50	49
NE/SW & NW/SE Aspect	10	10	10	99	98	97	96	94	93	92	90	89	87	86	84	83	81	80	78	77	76	74	73	71	70	69	67	66	65	63	62	61	60	59	57	56	55	54	53	52	51	50	50	49	48	47	46	45	45	44
East/West Aspect	10	10	10	99	99	98	97	96	95	94	93	92	90	89	87	85	82	78	74	71	68	65	63	60	58	56	54	53	51	49	48	47	45	44	43	42	41	40	39	38	38	37	36	35	35	34	33	33	32	31

Figure A.3-60. Subalpine Fir-Dry/Steep Vegetation Type.



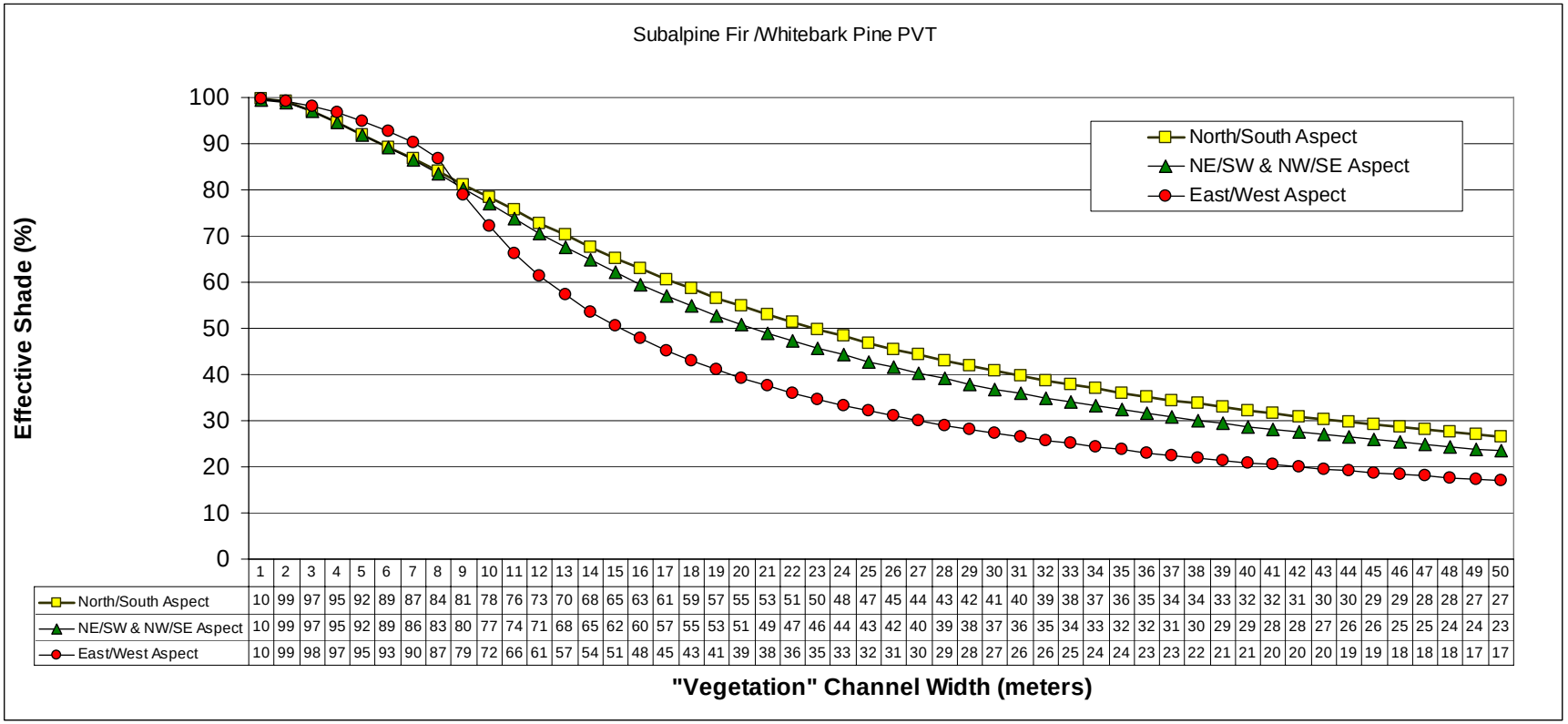
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	99	99	97	95	92	90	87	84	81	78	75	72	69	66	64	61	59	57	55	53	51	50	48	47	45	44	42	41	40	39	38	37	36	35	34	33	33	32	31	31	30	29	29	28	28	27	27	26	26	25
NE/SW & NW/SE Aspect	99	99	97	95	92	90	87	84	80	77	73	70	66	63	61	58	56	53	51	49	47	46	44	43	41	40	39	38	36	35	34	34	33	32	31	30	30	29	28	28	27	26	26	25	25	24	24	23	23	23
East/West Aspect	10	99	98	97	95	93	91	87	79	72	66	61	57	53	50	47	45	43	41	39	37	36	34	33	32	31	30	29	28	27	26	26	25	24	24	23	22	22	21	21	20	20	20	19	19	18	18	18	17	17

Figure A.3-61. Subalpine Fir with Lodgepole Pine Vegetation Type.



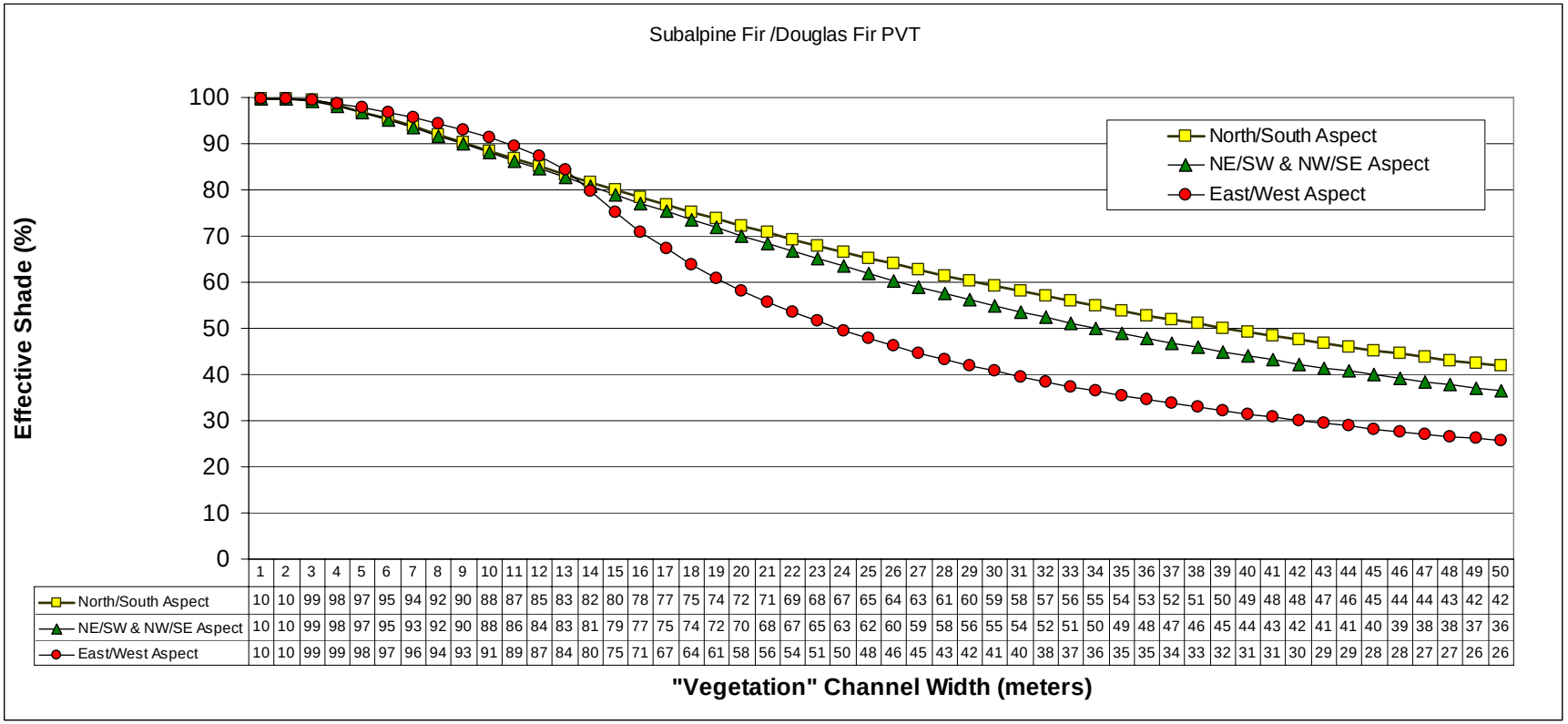
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	10	10	99	98	96	95	93	91	89	87	86	84	82	80	79	77	75	74	72	71	69	68	66	65	64	62	61	60	59	57	56	55	54	53	52	51	50	49	48	48	47	46	45	44	44	43	42	42	41	40
NE/SW & NW/SE Aspect	10	10	99	98	96	95	93	91	89	87	85	83	81	79	77	76	74	72	70	68	67	65	63	62	60	58	57	56	54	53	52	50	49	48	47	46	45	44	43	42	41	41	40	39	38	38	37	36	36	35
East/West Aspect	10	10	99	98	97	96	95	94	92	90	88	85	81	76	72	68	64	61	58	56	53	51	49	47	46	44	43	41	40	39	38	37	36	35	34	33	32	31	31	30	29	29	28	28	27	26	26	25	25	24

Figure A.3-62. Subalpine Fir with Whitebark Pine Vegetation Type.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	10	99	97	95	92	89	87	84	81	78	76	73	70	68	65	63	61	59	57	55	53	51	50	48	47	45	44	43	42	41	40	39	38	37	36	35	34	34	33	32	32	31	30	30	29	29	28	28	27	27
NE/SW & NW/SE Aspect	10	99	97	95	92	89	86	83	80	77	74	71	68	65	62	60	57	55	53	51	49	47	46	44	43	42	40	39	38	37	36	35	34	33	32	32	31	30	29	29	28	28	27	26	26	25	25	24	24	23
East/West Aspect	10	99	98	97	95	93	90	87	79	72	66	61	57	54	51	48	45	43	41	39	38	36	35	33	32	31	30	29	28	27	26	26	25	24	24	23	23	22	21	21	20	20	20	19	19	18	18	18	17	17

Figure A.3-63. Subalpine Fir with Douglas Fir Vegetation Type.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
North/South Aspect	10	10	99	98	97	95	94	92	90	88	87	85	83	82	80	78	77	75	74	72	71	69	68	67	65	64	63	61	60	59	58	57	56	55	54	53	52	51	50	49	48	48	47	46	45	44	44	43	42	42
NE/SW & NW/SE Aspect	10	10	99	98	97	95	93	92	90	88	86	84	83	81	79	77	75	74	72	70	68	67	65	63	62	60	59	58	56	55	54	52	51	50	49	48	47	46	45	44	43	42	41	41	40	39	38	38	37	36
East/West Aspect	10	10	99	99	98	97	96	94	93	91	89	87	84	80	75	71	67	64	61	58	56	54	51	50	48	46	45	43	42	41	40	38	37	36	35	35	34	33	32	31	31	30	29	29	28	28	27	27	26	26